Some knowledge children don’t lack*

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Abstract

Experimental studies on children’s understanding of indefinite NPs and negation report a systematic non-adult interpretation of sentences like “The detective didn’t find some guys” (see Musolino 1998). In this article, we question whether these findings require a grammatical explanation. We draw upon the observation that negative statements are generally used to point out discrepancies between the facts and the listener’s expectations, and that this felicity condition was not satisfied in previous studies. The findings of a truth value judgment task show that children’s interpretation of indefinites in negative sentences is adultlike, when the felicity conditions associated with negative statements are satisfied.

Introduction

This article investigates the interaction between quantification and negation in child language by focusing on children’s interpretation of indefinite noun phrases (e.g. some apples). Previous research has argued that children’s interpretation of these quantificational elements in negative sentences conforms to the so-called “observation of isomorphism” (see Musolino 1998; Musolino et al. 2000). The present study challenges this conclusion, both on theoretical and empirical grounds. First, we highlight several features that are unexplained under previous accounts. Second, we present empirical support for a different account of children’s behavior documented by previous research. Our proposal draws upon the observation that the use of negative statements is subject to a specific set of felicity conditions, which must be incorporated into the experimental design in order to assess children’s linguistic competence. The findings show that children’s interpretation of the indefinite some in negative sentences is fully adultlike. By inference, we argue that children’s non-adult
behavior documented in previous studies results from the failure to satisfy the felicity conditions associated with negative statements.

1. The English indefinites *some* and *any*

Children’s interpretation of quantified expressions is the subject of vast literature. In recent years, considerable attention has also been devoted to the interaction between quantifiers and negation. In order to sketch the current assumptions about children’s understanding of quantifiers in negative sentences, we will rely on the results collected and carefullly reported by Musolino (1998). Before we illustrate the findings of this experimental investigation of child English, let us briefly summarize the properties of adult English. Consider (1):

(1) John didn’t eat some apples.\(^1\)

Adult speakers of English accept (1) in contexts in which John ate some but not all of the apples available to him. As suggested by the acceptability of (2) as a paraphrase of (1), one can describe adults’ interpretation of (1) saying that the indefinite *some* is interpreted as having scope outside of negation, that is, wide scope.

(2) There are some apples that John didn’t eat.

More precisely, one can represent the logical form of (1) as (3).

(3) \(\exists(x) \left[\text{apples}(x) \& \neg \text{John ate}(x)\right]\)

It is pertinent to observe that the relative order of the existential quantifier and negation in (3) is the opposite of the order of the indefinite *some* and negation in (1): adult English only licenses the “nonisomorphic” interpretation of sentences like (1). The isomorphic interpretation of (1) is not licensed in adult English. In short, (1) cannot be paraphrased as (4), that is, (5) is not a possible logical form of (1).

(4) It is not the case that John ate some apples.

(5) \(\neg \exists(x) \left[\text{apples}(x) \& \text{John ate}(x)\right]\)

In order to describe the pattern reported above, many linguists have assumed that the indefinite *some* is a positive polarity item, a linguistic expression which cannot be interpreted in the scope of any downward entailing operator (see Ladusaw 1979; Horn 1989; but also Szabolcsi 2004).\(^2\) On this view, the interpretation of a sentence like (1) follows from this idiosyncrasy of *some* and the fact that negation is a downward entailing operator.
It is pertinent to observe that English presents a different linguistic expression which is also ordinarily rendered as an existential quantifier, but which shows the opposite pattern from *some*. This is the negative polarity item *any*. Consider (6):

(6) John didn’t eat any apples.

The sentence in (6) can only receive an isomorphic interpretation, in which *any* is interpreted inside the scope of negation. In short, adult speakers of English do not consider (7) a correct paraphrase of (6), that is, (8) is not a possible logical form of (6).

(7) There are some apples that John did not eat.

(8) $\exists(x) [\text{apples}(x) \& \neg \text{John ate}(x)]$

The only interpretation licensed by the English grammar for sentence (6) is the isomorphic interpretation paraphrased in (9), the interpretation in which syntactic and semantic scope coincide. As a consequence, (10) constitutes the only possible logical form of (6).

(9) It is not the case that John ate some apples.

(10) $\neg \exists(x) [\text{apples}(x) \& \text{John ate}(x)]$

To recap, the English indefinite *some* and the negative polarity item *any* interact with negation in different ways. The indefinite *some* tends to receive wide scope over negation, whereas its negative polarity counterpart *any* must receive narrow scope with respect to negation.

The difference in the interpretation of *some* and *any* in negative sentences is not the only difference between these two expressions. For the present purposes, however, it is instructive to focus on the account of the properties of *any* proposed by Kadmon and Landman (1993), which emphasizes the similarities between *some* and *any*. The approach to the distribution and the interpretation of *any* proposed by Kadmon and Landman (1993) consists of three parts. First, *any* is treated as an indefinite. It is therefore expected to display the same kind of variability in its quantificational force revealed by all indefinites. Second, *any* is distinguished from other indefinites in that it widens the domain under consideration. Third, the use of *any* is subject to a constraint, namely *any* “must STRENGTHEN the statement it occurs in, that is the semantic operation associated with it must create a stronger statement” (Kadmon and Landman 1993: 368–369, emphasis in original). It is useful to emphasize how the account proposed by Kadmon and Landman relates to the scope facts illustrated above. Kadmon and Landman (1993) argue that the negative polarity item *any* must be used instead of its positive polarity
counterpart *some* in downward entailing contexts, because in downward entailing contexts, the widening of the domain of quantification leads to a more informative statement. Thus, a cooperative speaker will use *any* in any downward entailing context. Now, this does not mean that the plain indefinite *some* cannot occur in negative statements. Rather, the indefinite *some* can occur in a negative statement if that indefinite noun phrase is interpreted outside the scope of the negative operator. On this view, the interpretation of the indefinite *some* outside the scope of negation and the interpretation of the negative polarity item *any* in the scope of negation follow from similar principles.

2. **Quantifiers and negation in child language**

From an acquisitionist perspective, the distinction between negative and positive polarity items constitutes an interesting domain of research. The goal of research in this area is to explain how children make sense of an intricate pattern of linguistic properties, exclusively on the basis of positive evidence (see Gualmini 2001, 2003; Gualmini and Crain 2001, 2002; van der Wal 1996). Since the present study is mainly concerned with the interpretation of indefinites in the scope of negation, our discussion of child language will be limited to the interaction between downward entailment and the interpretation of indefinites.

Children’s interpretation of the negative polarity item *any* in negative sentences was investigated in a study by Thornton (1994). Thornton (1994) investigated whether children are aware of the difference in meaning between questions like (11) and (12).

(11) Didn’t *any* of the turtles buy an apple? 
(12) Did *any* of the turtles *not* buy an apple?

The responses collected by Thornton (1994) show that children as young as 3;6 discriminate between the questions in (11) and (12). In particular, children responded “yes” to questions like (11) if at least one turtle available in the context had bought an apple, and they responded “yes” to questions like (12) if at least one turtle had *not* bought any apple. The findings suggest that children have adultlike understanding of the interaction between *any* and negation in the earliest stages of language development.

A similar conclusion is found in a study by O’Leary and Crain (1984). These researchers conducted an elicited production task with eleven
children (ages: 4;4 to 5;4) evoking downward entailing (DE) and non-
downward entailing environments in the child’s response. In the exper-
imental condition designed to evoke non-DE contexts, one experimenter
told children a story about some dogs. The dogs were very hungry, and
every dog eventually ate some food. At this point, the puppet manipu-
lated by a second experimenter uttered the target sentence in (13), which
children consistently rejected.

(13) Only one dog got any food.

The interesting result of the experiment lies in the responses that children
gave when asked “what really happened?” In particular, children often
described what happened in the story by using sentences like (14a). Sen-
tences like (14b), in which the negative polarity item any lacks a proper
licensor, are almost unattested in children’s responses.

(14) a. No, every dog got some food!
   b. *No, every dog got any food!

In other words, despite the experimenter’s use of any, children refrained
from using any in upward entailing contexts, such as the nuclear scope of
the universal quantifier every.

In order to evoke a DE linguistic environment, the story presented to
children was changed so that one dog decided not to eat any food. At this
point, the puppet offered (15) as a description of the story.

(15) Every dog got some food.

Children correctly rejected the target sentence. Moreover, in accordance
with the licensing conditions of any in the adult grammar, children often
used the negative polarity item any in the scope of negation in their re-
sponse, uttering sentences like (16).

(16) No, this dog did not get any food!

It is worth observing that some children also corrected the puppet utter-
ing sentences like, “No, this dog did not get some food!” On a cursory
look, this suggests that those children allowed the use of the positive po-
larity item some in the scope of negation, in contrast with the properties
of some in the target grammar.

In sum, children’s comprehension and production of the negative po-
larity item any conforms to the target grammar in the earliest stages of
language development. By contrast, children’s use of the positive polarity
item some seems to require further consideration. For the present pur-
poses, it is important to observe that children’s use of some in response
to an affirmative sentence like (15) could also be explained as a case of
metalinguistic negation (see Horn 1989, Chapter 6). Thus, before we can reach any conclusion about children’s interpretation of negative sentences containing \textit{some}, one has to consider contexts that make metalinguistic uses of negation less prominent.

In order to investigate children’s interpretation of the positive polarity item \textit{some} in negative sentences, Musolino (1998) conducted a truth value judgment task using sentences like (17).\(^4\)

(17) The detective didn’t find some guys.

Sentence (17) was presented as a description of a context in which the detective had only succeeded in finding two of the four guys participating in the story (see Figure 1).\(^5\)

The context employed by Musolino (1998) was designed to make (17) true in its adult interpretation (i.e. the interpretation paraphrased in [18]), and false in its (isomorphic) non-adult interpretation (i.e. the interpretation paraphrased in [19]).

(18) There are some guys that the detective didn’t find.

(19) It is not the case that the detective found any guys.

The finding was that children as old as 5;9 rejected the target sentence, whereas the adult controls consistently accepted it. In particular, many of the children interviewed by Musolino (1998) pointed out that (17) was incorrect because the detective had indeed found some guys (i.e. the two guys that appear on the top-right corner in Figure 1). Apparently,
children’s rejection of (17) follows from the interpretation in (19), an interpretation that is unavailable in the adult grammar.

To summarize, the findings from previous research on children’s interpretation of indefinites in negative sentences lead to a conflicting picture. Children’s interpretation of the negative polarity item *any* conforms to the adult grammar, but their interpretation of the indefinite *some* does not reflect adult competence. In order to provide a unified description of children’s interpretation of indefinites (in both their positive and negative version), Musolino (1998) proposed the “observation of isomorphism,” which states “when syntactic scope and semantic scope do not coincide [for adults – $AG$], children’s interpretations correlate with the interpretations determined by syntactic scope” (Musolino 1998: 145).

The observation of isomorphism is invoked by Musolino (1998) to describe a richer set of facts than children’s interpretation of indefinites in negative sentences. For example, Musolino (1998) shows that children’s dependence on surface syntactic scope extends to their interpretation of negative sentences containing the universal quantifier *every*. Consider (20):

(20) Every horse didn’t jump over the fence.

In adult English, sentence (20) is ambiguous between the isomorphic reading paraphrased in (21a) and the nonisomorphic reading paraphrased in (22b).

(21) a. Every horse is such that it did not jump over the fence.
    b. $\forall(x) (\text{horse}(x) \rightarrow \neg \text{jumped over the fence}(x))$

(22) a. Not every horse is such that it jumped over the fence.
    b. $\neg \forall(x) (\text{horse}(x) \rightarrow \text{jumped over the fence}(x))$

Consistent with the findings about children’s interpretation of the indefinite *some* in negative sentences, Musolino (1998) found that young children interpreted sentences like (20) on the isomorphic interpretation in (21a). In short, children’s interpretation of the universal quantifier *every* in negative sentences can also be described by the observation of isomorphism.

In the remainder of this article, we focus on children’s interpretation of *some* in negative sentences. Our decision is motivated by three facts. First, children’s non-adult interpretation of negative sentences containing *every* can be described as children’s failure to access adults’ preferred interpretation. By contrast, under standard assumptions, children’s non-adult interpretation of *some* in negative sentences must be described as children’s failure to access the only interpretation available to adults. Second, children’s non-adult interpretation of the positive polarity item *some* in
negative sentences contrasts with their adultlike knowledge of negative polarity items and related phenomena (viz. downward entailment). Third, recent studies discussed by Musolino (2001) and Musolino and Lidz (2002b) suggest that young children can access the nonisomorphic interpretation of negative sentences containing the universal quantifier every in particular experimental conditions. In light of these findings, children’s interpretation of the indefinite some in the scope of negation stands out as the unresolved discrepancy between children’s and adults’ interpretation of quantifiers in negative sentences.

It is pertinent to observe that the observation of isomorphism is not presented by Musolino (1998) as a learning principle. The observation of isomorphism is a descriptive generalization that can be derived from other properties of the language acquisition device or from idiosyncratic properties of the particular quantifiers involved. As a consequence, children’s adherence to the isomorphic interpretation of sentences containing negation and a quantifier could in principle receive a different explanation for each quantifier. For instance, Musolino et al. (2000) derive young children’s interpretation of indefinites in the scope of negation as resulting from children’s developing knowledge of the linguistic properties that distinguish between some and any, and children’s preference for more restricted grammars, that is, grammars that license interpretations true in the narrowest set of circumstances (see Crain et al. 1994). An alternative account of children’s interpretation of indefinites in negative sentences has been proposed by Krämer (2000). Importantly, Krämer (2000) reports new experimental findings showing that Dutch-speaking children also experience difficulties with indefinites in negative sentences, although the observation of isomorphism cannot readily describe the pattern of response provided by Dutch-speaking children. To account for the behavior of both English- and Dutch-speaking children, Krämer (2000) develops a novel account of children’s interpretation of indefinites that draws upon the theory of indefinites proposed by Van Geenhoven (1998).

Despite the differences between the accounts proposed by Musolino et al. (2000) and Krämer (2000), both accounts share the assumption that children’s behavior must receive a grammatical explanation. Musolino et al. (2000) and Krämer (2000) assume that the experimental findings show that children’s grammar fails to license the interpretation attested in the adult grammar. In our view, this interpretation of the experimental findings is unwarranted, and so is the need for a grammatical explanation of the differences between child and adult grammars. In fact, quite the opposite is true. Children and adults share the same grammar. What children and adults do not share is the ability to respond to experimental material that, we will argue, is infelicitous.
3. Empirical problems for the observation of isomorphism

This section raises some empirical shortcomings of previous studies of children’s interpretation of indefinites in negative sentences. We are not concerned with any specific grammatical proposal about children’s interpretation of the indefinite some in the scope of negation. Both accounts proposed by Musolino et al. (2000) and Krämer (2000) are plausible accounts of the apparent differences between child and adult grammars. What we doubt is whether any difference exists. Let us now illustrate what aspects of children’s behavior lead us to doubt the need for a grammatical explanation by scrutinizing the data reported by Musolino (1998). We concentrate on the findings reported by Musolino (1998) and discussed by Musolino et al. (2000), because these findings are reported in great detail and because the experiments conducted by Musolino (1998) incorporate all the relevant features of the truth value judgment task.

Two features of the data reported by Musolino (1998) are relevant. First, fifteen children out of thirty accessed both the isomorphic and the nonisomorphic reading of the target sentences (across different trials). Moreover, the isomorphic reading was accessed on all experimental trials only by seven children, less than one-fourth of the subjects who participated in the experiment. Second, a trial effect can be detected. In fact, four of the five subjects who only provided one non-adult response did so on the same experimental trial, namely the fourth experimental trial. Moreover, none of the seven subjects who provided three non-adult responses ever did so on the fourth experimental trial.

We can illustrate our point by comparing two trials from Experiment 3 in Musolino (1998) in further detail. On the fourth experimental trial in that experiment, children were told a story about an old man and four friends at a barbecue. When the barbecue was over, the old man decided to mow the lawn. While he was mowing the lawn, he accidentally hurt two of his guests, though two other men were unscathed. At the end of the story, children were presented with the sentence in (23):

(23) The old man didn’t hurt some guys.

Despite their structural similarity, the two trials yielded a significantly different response pattern from children. In particular, the thirty
children interviewed by Musolino (1998) rejected the target sentences in (23) twenty (67%) times and the sentence in (24) twelve (40%) times. Among all the trials of the experiment, (24) gave rise to the lowest number of non-adult responses, whereas (23) yielded the highest number of non-adult responses.

In our view, this pattern calls for further consideration. If one respects all the features of experimental design as Musolino (1998) did, the results should yield a clearer pattern than the one depicted above. Whenever such patterns arise, the research strategy should be to determine what factor is responsible for the particular reading that is accessed in each experimental trial. We pursue this hypothesis in Section 5, where we argue that previous research has failed to control for the felicity of the linguistic materials. This proposal draws on the assumption that children are sensitive to the satisfaction of felicity conditions, an assumption which is source of much current discussion (see Meroni et al. 2001 and Musolino and Lidz 2002a, 2002b for a review). Despite the availability of numerous studies on this topic, there is little agreement on the role of felicity conditions in child language (see Geurts 2004; Philip 1996). Thus, before we present our own account of children’s interpretation of indefinites in negative sentences, we would like to discuss some empirical evidence showing that infelicitous linguistic stimuli can lead children to systematic non-adult responses.

4. Children and felicity conditions

The role of felicity conditions in language comprehension has received an increasing amount of attention in the last decade. In this section, we review some empirical evidence showing that (a) children’s linguistic competence can be obscured by experiments that do not satisfy the felicity conditions associated with the target sentences, and that (b) children can respond to infelicitous experimental stimuli with “motivated” rejections of the target sentences.

The role of felicity conditions associated with specific linguistic constructions in child language can be illustrated by children’s interpretation of temporal conjunctions. In several studies, children were reported to be more successful in acting out the request in (25) than the one in (26) (see Amidon and Carey 1972; Clark 1971).

(25) After you push the car, push the truck.

(26) Before you push the car, push the truck.
Children’s behavior was often interpreted as reflecting a difficulty in interpreting temporal conjunctions, especially when the order of mention does not match the order with which the events should take place (i.e. [26]). Crain (1982) focused on a different source of children’s errors. In particular, Crain (1982) pointed out that both (25) and (26) presuppose that the child should push the car, and they assert that there is an additional activity the child should perform before or after pushing the car. This presupposition was not satisfied in the experimental context, however, because it had not been established that the child should push the car. Thus, Crain (1982) argued that children’s behavior reflects a difficulty in accommodating the presuppositions triggered by both sentences (25) and (26), rather than any difficulty with the subordinating temporal conjunctions. Consistent with this hypothesis, Crain showed that children’s “errors” were significantly reduced once the presupposition was satisfied.

In light of this, and many similar findings, we can now focus on the particular response pattern documented by previous studies of children’s interpretation of negative sentences. It is usually assumed that infelicitous tasks lead children to overaccept the target sentences (see Grimshaw and Rosen 1990). Against this background, it is hard to see how children’s rejection of the target sentences in previous experimental research on negative sentences could result from the violation of a felicity condition. In addition, children’s ability to motivate their rejection of the target sentences might be viewed as an additional difficulty for the claim that a felicity condition is at issue. Nevertheless, recent studies on children’s interpretation of universally quantified sentences show that children can produce a pattern of non-adult rejection (of experimental stimuli) as a result of the infelicity of the task. Let us briefly review one relevant study.

Research on children’s understanding of the universal quantifier *every* dates back to Inhelder and Piaget (1964). One of the most discussed findings is that preschool, and even school aged, children occasionally reject a sentence like (27) in a context in which three boys are each riding an elephant and there is an additional elephant that is not ridden by anybody.

(27) Every boy is riding an elephant.

To justify their rejection of (27), children often point to the extra object, that is, the elephant that is not being ridden. Several accounts of children’s non-adult responses have been offered. These accounts can be divided into ones that attribute children’s responses to deviant linguistic analyses of the universal quantifier *every*, and ones that attribute them to nongrammatical factors. Among the nongrammatical accounts, Crain et al. (1996) draw upon the observation made by Bertrand Russell (1948: 138) who stated that “perception only gives rise to a negative judgment
when the correlative positive judgment has already been made or con-
sidered.” According to Crain et al. (1996), the phenomenon considered
by Russell is not exclusive to the judgment of negative sentences, and
extends to the judgment of affirmative sentences, when the task is to in-
dicate agreement or disagreement with what has been expressed. On this
view, the sentence in (27) is not a felicitous description of the context
employed in previous studies, because the context did not allow the
subject to conceive an alternative scenario that would make the sentence
false. The sentence in (27) becomes felicitous if, for example, some boy at
least considered riding an animal besides an elephant. In experimental
contexts that make this possible outcome available to children, the non-
adult responses documented in previous studies disappear.

To recap, we have reviewed two representative studies highlighting
children’s sensitivity to felicity conditions. In light of the growing body
of evidence underscoring children’s sensitivity to felicity conditions, it
becomes important to determine whether anything of this sort might be
at issue in experiments assessing children’s interpretation of indefinites in
negative sentences.

5. Negation and felicity conditions

Negative sentences constitute a rich domain of linguistic research. Draw-
ing upon the principles of pragmatic theory, numerous psycholinguists
have also been interested in the felicity conditions associated with negative
sentences. We can introduce the role of felicity conditions in interpreting
negative sentences through the example in (28), due to Wason (1972).

(28) 5 is not an even number.

The sentence in (28) is true. Still, (28) appears to be more difficult for
people to evaluate than a positive sentence like (29), although (28) and
(29) seem to express the same proposition.

(29) 5 is an odd number.

Interestingly, the difficulty associated with (28) is considerably mitigated
if the sentence is preceded by a positive statement, as in (30).

(30) a. 4 is an even number, and 5 is not an even number.
    b. 4 is an even number, but 5 is not an even number.

Similar considerations about the difficulty associated with negative sen-
tences have been offered by De Villiers and Tager Flusberg (1975). Con-
sider (31):
As pointed out by De Villiers and Tager Flusberg (1975: 279), the statement in (31) “is more plausible, and consequently easier to comprehend, if it is made by someone who normally drives rather than by someone who commutes by train.” According to De Villiers and Tager Flusberg (1975: 279), this property of negative sentences results from the fact that “negative statements are generally used to point out discrepancies between a listener’s presumed expectations and the facts” (see also Wason 1965 and Givon 1978). The observation that negative sentences present a specific set of felicity conditions led De Villiers and Tager Flusberg (1975) to an experimental investigation of children’s comprehension of negation. In the experiment, children were asked to complete negative questions (i.e. ‘This is not a ___?’) in contexts in which the use of a negative sentence was or was not plausible (e.g. in the plausible context, the experimenter had pointed to various instances of a particular object before pointing to a different object). The results show that children as young as two respond significantly faster when the negative question is presented in the plausible context. De Villiers and Tager Flusberg (1975) interpret this finding as evidence that very young children know that the use of negative sentences is subject to the satisfaction of specific felicity conditions.

A similar conclusion for adult subjects was reached by Glenberg et al. (1999). These researchers conducted three experiments investigating adults’ difficulty in interpreting negative sentences. In one of the experiments, subjects were asked to read negative sentences in contexts that supported the positive expectation triggered by the negative sentence and in contexts that did not support this expectation. The finding was that “when negated sentences are used in an appropriate context, readers do not take longer to understand them” (Glenberg et al. 1999: 19). According to Glenberg et al. (1999: 19), the experimental findings support the conclusion that “difficulty with negation is demonstrated to be an artifact of presentation out of context.”

Taking stock, we have reviewed previous studies with children and adult subjects investigating the difficulty of negative sentences. The findings suggest that the difficulty associated with negative sentences can be mitigated if the target sentence is preceded by a positive lead-in or the sentence is used to point out that an expectation went unfulfilled. The exact “nature” of the difficulty associated with negative sentences remains to be determined. This issue was extensively addressed by Horn (1989), who argued that the facts above do not highlight a property of negative sentences per se, but rather reflect a consequence of the way negative sentences are ordinarily used. For the purposes of the experimentalist,
however, this should not undermine the importance of the phenomenon itself. Be it a semantic or a pragmatic phenomenon, the difficulty of negative sentences remains.

The paragraphs above suggest that negative statements are accompanied by a specific set of felicity conditions. In light of the conflicting findings documented by previous research on children’s interpretation of the negative polarity item *any* and its positive counterpart *some*, it becomes important to evaluate whether the felicity conditions associated with negative sentences were satisfied in previous studies. To this aim, let us recall the relevant trials employed by Musolino (1998). As we mentioned, on one experimental trial administered by Musolino (1998), children were told a story about an old man and four friends at a barbecue (see Story 4 from Experiment 3). When the barbecue is over, the old man decides to mow the lawn and while he is mowing the lawn, he accidentally hurts two of his guests. At the end of the story, children were presented with the sentence in (32).

(32) The old man didn’t hurt some guys.

The question is whether (32) is a felicitous statement in the context under consideration. The context does not provide any reason why the old man was supposed to hurt any of the guys. In absence of any explicit expectation about the old man’s behavior, children were left to their expectations about real life. However, even a four year old probably knows that one is not expected to run over his friends with a lawnmower. In short, the sentence is infelicitous because it does not point out a discrepancy between the final outcome and an expectation that is supported by the story. Moreover, if children were to use their own knowledge about the real world, they would probably expect the old man not to hurt any of his friends. The sentence in (32) would provide a felicitous utterance in a context in which it was established that the old man was likely (or expected) to hurt all of his friends. Out of this context, however, the story we just considered represents a likely candidate for a nonfelicitous use of a negative sentence.

Let us now compare this trial with Story 1 of Experiment 3 from the Musolino study, the story about the detective playing hide and seek with his friends. Recall that in this story, the detective found two guys, but he failed to find the remaining two. Children were asked to evaluate the following sentence:

(33) The detective didn’t find some guys.

Let us now consider whether (33) is felicitous in the context under consideration. By looking at Musolino (1998), one can observe that the
story did not explicitly convey the expectation that the detective would find all the guys. This is an assumption that a typical five-year-old who ever played hide and seek could make, however. Although it is reasonable that a typical five-year-old would know that when playing hide and seek, all the characters have to be found. It is less reasonable to assume that every child would take this knowledge to be relevant for the task.

In short, although neither trial explicitly builds an expectation about the main character’s actions, real world knowledge could yield a different effect in the two trials. Now, could this be enough to enhance children’s correct interpretation of the target sentence? By looking at the data reported by Musolino (1998), one can observe that real world knowledge does not suffice to yield an adult pattern, but it produces an effect. Recall that Story 1 gave rise to the lowest number of non-adult responses, whereas Story 4 yielded the highest number of non-adult responses. This difference is consistent with our speculation on the role of implicit assumptions and children’s use of real world knowledge to accommodate the infelicity of the target sentence. Neither trial yielded a fully adultlike pattern, but real world knowledge is potentially responsible for the different responses between the two trials.

To recap, linguists and psycholinguists have investigated the differences between affirmative and negative statements with respect to ambiguity and felicity. We have argued that the felicity conditions associated with negative sentences must be incorporated into the experimental design of studies assessing children’s linguistic competence, and we have claimed that the failure to do so might be at the origin of previous findings about children’s interpretation of indefinites. The difference between different trials in previous experimental studies is consistent with the hypothesis that previous studies failed to control for the felicity of the linguistic material. The next section presents the findings of an experiment designed to seek more robust evidence in favor of this hypothesis.

6. Experimental design

This section presents the findings of an experiment employing the truth value judgment task. The truth value judgment is an experimental technique that allows one to investigate whether a specific interpretation of a target sentence is licensed by the child’s grammar (Crain and McKee 1985; Crain and Thornton 1998). In a truth value judgment task, one experimenter acts out a short story in front of the child using props and toys. The story constitutes the context against which the child evaluates
the target sentence, which is uttered by the puppet manipulated by a second experimenter. The acceptance of the target sentence is interpreted as indicating that the target sentence can receive an interpretation that is true in the context under consideration. By contrast, the rejection of the target sentence is interpreted as suggesting that the child’s grammar does not license any interpretation that makes the target sentence true in the context under consideration.

The optimal design of the truth value judgment task requires a context that falsifies the adult interpretation of the target sentence and verifies the non-adult interpretation under investigation (see Crain and Thornton 1998: 130). As discussed by Musolino (1998), however, this ideal state of affairs cannot be obtained in the investigation of sentences like (34), since the nonisomorphic reading of (34) is true in a superset of the circumstances in which its isomorphic reading is true.8

(34) The detective didn’t find some guys.

Given this state of affairs and the desire to minimize the differences between our experiment and previous studies, our experiment mirrors Experiment 3 in Musolino (1998): the context makes the isomorphic reading false and the nonisomorphic reading true.

The experiment was conducted at the Center for Young Children, a preschool on the campus of the University of Maryland at College Park. Children were initially introduced to the task collectively by two experimenters who visited their classroom and acted out an illustrative story. Afterwards, one experimenter participated in some of the activities of the preschool in order to become acquainted with the children. Then, children were invited individually to play “the game with the puppet” in a separate room. Each testing session was preceded by one or two warm-up trials, depending on the child’s familiarity with the task, and included four target trials and an equal number of filler trials. Each session lasted less than thirty minutes. The adults who participated as adult controls were all undergraduate students at the University of Maryland at College Park.

To investigate the role of felicity conditions in children’s interpretation of negative sentences, we manipulated children’s expectation about the final outcome of the story. Thirty children participated in the experiment, divided into two groups. One group of fifteen children (Group I, age: 4;01 to 5;06 — mean: 4;10) was asked to evaluate a negative sentence that truthfully described the final outcome of the story and expressed a mismatch between the final outcome and the expectation built during the story. The second group of fifteen children (Group II, age 4;02 to 5;8 — mean age: 4;11) was asked to evaluate a negative sentence that also
truthfully described the final outcome of the story, but failed to express a
mismatch between the final outcome and the expectation built during the
story. Let us illustrate the experimental design using a typical trial. Con-
sider the trial in (35), which is a modified version of Story 1 of Experi-
ment 3 conducted by Musolino (1998).

(35) This is a story about a firefighter who is going to play hide and seek
with four dwarves. While the firefighter counts, the dwarves look
for a spot to hide. When the firefighter has finished counting, he
starts looking for the dwarves. Initially, the firefighter cannot find
any of the dwarves and he is ready to give up, but then he decides
to try harder. He finds one dwarf who was hiding behind a barrel
and he asks the dwarf: “Ok, am I done now?” and the dwarf says:
“No! there’s three more dwarves for you to find.” The firefighter
spots a second dwarf who was hiding inside the barrel, and he asks
him: “Ok, am I done now?” but the dwarf says: “No! there’s two
more dwarves for you to find.” The firefighter starts looking again,
but then he says: “You know guys, those two dwarves did a very
good job, I cannot find them. I must give up.”

At this point, one group of children was presented with the sentence in
(36) and the second group was asked to evaluate (37).9

(36) This was a story about a firefighter playing hide and seek with four
dwarves and I know what happened. The firefighter didn’t find
some dwarves.

(37) This was a story about a firefighter playing hide and seek with four
dwarves and I know what happened. The firefighter didn’t miss
some dwarves.

Before we report the results, let us consider the extent to which the two
target sentences differ. The target sentences in (36) and (37) do not differ
in truth value, since both sentences are true in the scenario under consid-
eration. In particular, (36) is true because there are two dwarves that the
firefighter did not find, and (37) is true because there are two dwarves that
the firefighter did not miss, namely the dwarves that he could find. The
two sentences differ with respect to their felicity, however. The story con-
veys the expectation that the firefighter would find all the dwarves, and it
does not build the expectation that the firefighter would miss all of them.
As a consequence, (36) is felicitous because it expresses a mismatch be-
tween what happened and what was expected to happen (i.e. the number
of dwarves that the firefighter found and the number of dwarves that he
was expected to find). By contrast, (37) is infelicitous because there is no immediate mismatch between what happened and what was supposed to happen (i.e. the number of dwarves that the firefighter missed and the number of dwarves that he was supposed to find). This follows from the lack of any expectation that the firefighter would miss all the dwarves. As a consequence of this difference, the experimental hypothesis was that children would respond in a fully adultlike fashion to sentences like (36), and that possible cases of non-adult responses would be limited to (37). This is exactly what we found. Children accepted sentences like (36) in 54 out of 60 trials (90%), and they accepted sentences like (37) only in 30 out of 60 trials (50%).

Thirty-six native speakers of English participated as adult controls in a video-taped version of the experiment. Twenty-two subjects accepted sentences like (36) in 66 out of 86 trials (77%), and the remaining fourteen subjects accepted sentences like (37) only in 27 out of 56 trials (48%).

Before we consider the relevance of the present findings, it is important to comment on the linguistic materials used in (37). The reader might object that the meaning of the verb miss has some negative component to it. Thus, at some abstract level, an increased processing cost might derive from the presence of negation and a negative-like verb.11 In our view, this objection is irrelevant. First, the focus of research in child language should be on the conditions under which children’s linguistic competence emerges in the experimental setting, rather than on the conditions under which such competence is artificially put off. Second, if our hypothesis is on the right track, the verb hurt used in the Musolino study yields the same effect as the verb miss in our experiment, although the former does not seem to share the negative flavor of the latter. Third, we believe it is possible to hinder children’s competence without changing the verb used in the experiment. For example, imagine a context in which an archer is trying to hit four targets, each one held by a different man. Now, suppose that the archer can hit two of the four targets but misses the remaining two and accidentally hits the men holding those targets. Now consider the sentences below:

(38) The archer didn’t hit some targets.

(39) The archer didn’t hit some men.

Intuitively, (38) is more felicitous than (39), despite the fact that the same verb occurs in the two sentences. This difference is consistent with our hypothesis: sentence (38), but not (39), points out a contrast between the context under consideration and the expectation that the archer would hit all the targets.
7. Conclusions

The experimental findings reported in the present study reveal children’s adultlike interpretation of negative sentences containing the indefinite some when the felicity conditions associated with the target sentences are satisfied. In light of these results, the differences between children’s interpretation of the positive polarity item some and the negative polarity item any are reconciled. The reader might view the main point of our study as methodological in nature. However, as Crain and Wexler observe “methodology is intertwined with theory in nontrivial ways” (Crain and Wexler 1999: 387). The present study attempted to develop experimental methodology in accordance with recent results of semantic and pragmatic research.

The present article focused on one specific aspect of the difference between children and adults in interpreting negative sentences. In particular, we focused on children’s interpretation of negative sentences containing the indefinite some. This was a pretext, however. Our goal was not to adjudicate between alternative explanations of children’s non-adult interpretation of some in negative sentences. Our goal was to determine whether children’s non-adult interpretation of some in negative sentences documented by previous research calls for a grammatical explanation. We have argued that this is not the case, and we have credited four-year-olds with knowledge of the grammatical properties of the indefinite some. This does not exclude the possibility that children might fail to distinguish between some and any at earlier stages of language development. Our results, however, show that it would be unwarranted to argue that four-year-olds have incomplete knowledge of the linguistic properties of some. More importantly, our results show that it would be unwarranted to argue that children’s interpretation of some in negative sentences is dictated by surface syntactic scope. The interpretive properties of lexical items like some and any are subject to crosslinguistic variation. Therefore, it would not be surprising if child language turned out to differ from adult language in this respect. However, it would be surprising if semantic scope in child language turned out to be securely tied to syntactic scope, since most (if not all) natural languages make available covert operations that affect syntactic scope (for similar remarks, see Musolino and Lidz 2002b). As we repeatedly observed, previous research has underlined the descriptive character of the observation of isomorphism. The present study extends this line of research by suggesting that the observation of isomorphism is a descriptive generalization about the way English-speaking children (and adults) interpret a particular class of infelicitous sentences.
The experimental findings reported in the previous section have further implications for the account proposed by Krämer (2000). First, the experimental design employed by Krämer (2000) did not satisfy the felicity conditions associated with negative sentences. Assuming that the pattern of responses documented by Krämer (2000) would fail to emerge in experiments that do satisfy those felicity conditions, a grammatical account of Dutch-speaking children’s mistakes is unwarranted. Until evidence to the contrary becomes available, the null hypothesis should be that English- and Dutch-speaking children’s difficulty with negative sentences must receive the same explanation. It should be noted, moreover, that the claim that children’s difficulty is due to the failure to satisfy the felicity conditions associated with negative sentences does not make any prediction about how children should respond to the infelicity of the target sentence. Thus, Krämer’s observation that Dutch-speaking children’s responses did not conform to the observation of isomorphism is perfectly compatible with the present proposal.

In conclusion, we wish to qualify our interpretation of the experimental findings. The focus of our research has been on children’s interpretation of indefinites in negative statements, when these sentences are used felicitously. This no doubt relates to the experimental features that possibly make infelicitous the use of negative statements. Our particular way of making negative sentences felicitous (or infelicitous) should not distract the reader from the main concern of this study, namely children’s interpretation of felicitous uses of negative sentences. A growing body of evidence suggests that the felicity of negative sentences can also be attained if the negative sentence is preceded by a positive lead-in. For example, Gualmini (2001) and Gualmini and Crain (2001, 2002) argued that this factor facilitates children’s comprehension of sentences containing the quantified expression None of the Ns (e.g. none of the pirates). A similar interpretation applies to more recent findings about the interpretation of the universal quantifier every in negative sentences.

In a series of experimental investigations, Musolino and Lidz (2002b) showed that the use of a positive lead-in dramatically improves children’s performance with negative sentences containing the universal quantifier. Recall that Musolino (1998) showed that children’s adherence to syntactic scope extends to their interpretation of negative sentences containing the universal quantifier. In particular, Musolino (1998) found that young children’s preferred interpretation for sentences like (40) was the isomorphic interpretation in (41a).

(40) Every horse didn’t jump over the fence.
Every horse is such that it did not jump over the fence.

\[ \forall(x) \text{ (horse}(x) \rightarrow \neg \text{jumped over the fence}(x)) \]

Interestingly, the use of a positive lead-in as in (42) led children to access the nonisomorphic interpretation of the target sentence.

(42) Every horse jumped over the log and/but every horse didn’t jump over the fence.

The use of positive lead-ins certainly constitutes an additional tool for the experimentalist. But this fact is by no means at odds with the claim defended in this study.

As acknowledged in Section 2, Musolino (1998) presented the observation of isomorphism as a descriptive generalization. The observation of isomorphism described what is common to children’s interpretation of a variety of quantifiers in negative sentences. On this view, a different aspect of children’s developing linguistic knowledge might explain children’s resorting to syntactic scope as the origin of semantic scope for all the quantifiers under consideration. This grammatical view has been recently challenged by Musolino (2001) on the basis of more recent experiments assessing children’s interpretation of the universal quantifier every in negative sentences (see above). The findings, Musolino argues, suggest that the grammatical view of children’s non-adult responses to negative sentences is unwarranted in that they show that children can access the nonisomorphic interpretation of negative sentences containing every as a result of contextual manipulation. On the basis of these more recent findings, Musolino (2001) attributes children’s non-adult responses to their developing performance system. In particular, Musolino (2001: 29) argues that “further investigation is therefore required to determine whether isomorphism effects are due to performance factors across the board and therefore whether the phenomenon is uniform.” The research reported in the present paper apparently supports this conclusion, in that it shows how contextual manipulations lead children to access the nonisomorphic interpretation of negative sentences containing the indefinite some. However, this is not our interpretation of the findings. Musolino’s conclusion fails to recognize that the contextual manipulation that leads to children’s improved performance with negative sentences might also lead to adults’ improved performance with negative sentences, as suggested by the responses provided by the adult controls who participated in our own experiment. If anything, the present findings, as well as the ones documented in Musolino and Lidz (2002b), show that children and adults share the same linguistic competence as well as the same performance system (see Crain and Thornton 1998).12 What adults and children
do not share is the ability to accommodate experimental stimuli that violate any form of felicity.

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Appendix

Target sentences for children in Group I:

Story 1: The firefighter didn’t find some dwarves.
Story 2: Chucky didn’t put some bottles on the table.
Story 3: The Troll didn’t deliver some pizzas.
Story 4: Bart didn’t find some jewels.

Individual data from children in Group I

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</table>

Target sentences presented to children in Group II:

Story 1: The firefighter didn’t miss some dwarves.
Story 2: Chucky didn’t drop some bottles on the floor.
Story 3: The Troll didn’t lose some pizzas.
Story 4: Bart didn’t lose some jewels.
Individual data from children in Group II

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Notes

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1. For the purposes of this study, we concentrate on the stressed version of the indefinite *some*.

2. The defining property of downward entailment is the licensing of inferences from a set to its subsets (e.g. *John did not eat any apples* ⇒ *John did not eat any red apples*).

3. We refer the reader to Thornton (1996) and Crain and Thornton (1998) for a detailed description of the elicited production task.

4. We will describe the truth value judgment task momentarily.

5. Musolino’s experiment included stories acted out in front of the child subjects. Figure 1 is only included for illustrative purposes.

6. We will discuss some implications of our account for negative sentences containing the universal quantifier in the concluding section.

8. If the detective did not find any of the guys, then it is also true that there are some guys that the detective did not find, but not vice versa. More generally, if a sentence like (34) is true on its isomorphic interpretation, that sentence is also true on its nonisomorphic interpretation, but not vice versa. To distinguish between the two interpretations, one has to consider a situation in which the nonisomorphic interpretation is true but the isomorphic interpretation is false.

9. The experimental stimuli are listed in the Appendix.

10. The individual data are reported in the Appendix.

11. The same objection could be extended to two additional trials of the experiment (see Appendix).

12. The present findings also highlight children’s pragmatic competence in that they reveal children’s ability to carry out the “pragmatic inferencing” that makes the nonisomorphic interpretation of some prominent. As a consequence, the findings cast doubts on much current research on children’s pragmatic competence (see Gualmini 2001 for a review and an alternative view).

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