The Role of Partitivity in Child Language

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1. INTRODUCTION

In this squib, we investigate the nature of the phenomenon of isomorphism, which expresses the observation that young children, unlike adults, display a strong preference for the interpretation of sentences containing negation and quantified noun phrase (NPs) that corresponds to the surface syntactic position of these scope-taking operators (Gualmini (2003), Lidz and Musolino (2002), Musolino (1998), Musolino, Crain, and Thornton (2000)).

Here we focus on sentences containing negation and indefinite objects, as in The Smurf didn’t catch two birds or The detective didn’t find some guys. Based on the intuition that indefinites can give rise to what has been called either a “presuppositional/quantificational” or a “cardinal” interpretation (Diesing (1992), drawing on Milsark (1977)), we propose that isomorphism, as it pertains to indefinite objects, arises when children fail to select the so-called presuppositional interpretation of the NP and its associated logical representation.¹ This account predicts that when plain NPs like some Ns and two Ns are replaced by inherently presuppositional ones, such as partitives (e.g., two of the Ns and some of the Ns), children should be more likely to access the nonisomorphic, wide-scope interpretation of the indefinite objects with respect to negation. This prediction is tested and verified in two experiments designed to assess young children’s interpretation of sentences containing negation and partitive NPs in object position.

¹Although nobody would dispute that indefinites can give rise to the different interpretations discussed herein, the claim that they should be treated as presuppositional/quantificational (e.g., Diesing (1992)) has not been immune to criticism (i.e., Abusch (1994), Reinhart (1997), among others). Note, however, that children’s awareness of the different interpretations displayed by indefinites remains an interesting issue regardless of the actual mechanisms that are used to represent those interpretations.
Consider the examples in (1–3):

(1) Every horse didn’t jump over the fence.
(2) The detective didn’t find some guys.
(3) The Smurf didn’t catch two birds.

Notice that example (1) is ambiguous. On one interpretation, it can be paraphrased as meaning that all the horses are such that they didn’t jump over the fence, that is, none of the horses jumped over the fence. On this interpretation, the universally quantified subject takes scope over negation (abbreviated every > not). This corresponds to an isomorphic interpretation because the scope relation between every horse and negation can be directly read off their surface syntactic position. Alternatively, (1) can be paraphrased as meaning that not all the horses jumped over the fence, that is, some did and others did not. On this interpretation, negation takes scope over the quantified subject (abbreviated not > every). This corresponds to a nonisomorphic interpretation because in this case the scope relation between the two quantificational expressions (i.e., not > every) is the reverse of the one given by their surface syntactic position.

By contrast, it is generally assumed that the example in (2), which contains an existentially quantified object, requires a wide-scope, nonisomorphic interpretation. In other words, the most natural interpretation of (2) can be paraphrased as meaning that there are some guys such that the detective didn’t find them (i.e., some > not). Now replace some N by two N, as in (3), and the ambiguity is restored. That is, (3) can be paraphrased as meaning that it is not the case that the Smurf caught two birds (i.e., not > two), an isomorphic interpretation, or that there are two specific birds that the Smurf didn’t catch (i.e., two > not), a nonisomorphic interpretation.

The main finding emerging from child language research is that young children, unlike adults, display a strong preference for the isomorphic interpretation of sentences like (1–3). Accordingly, this phenomenon has come to be known as “the observation of isomorphism.”
Earlier accounts (Musolino (1998), Musolino, Crain, and Thornton (2000)) viewed isomorphism as reflecting a grammatical difference between children and adults. However, recent experimental evidence casts doubt on the grammatical nature of the phenomenon (Felber (2002), Gualmini (2003), Musolino (2001), Musolino and Lidz (in press)). In particular, it has been observed that, under certain contextual conditions, children’s ability to access nonisomorphic interpretations increases dramatically. For example, Musolino and Lidz reported that when sentences like (1) are preceded by affirmative statements, as in (4), children are much more likely to access the nonisomorphic interpretation. In a similar vein, Gualmini (2003) showed that when certain felicity conditions associated with the use of negative statements are met, children access the nonisomorphic interpretation of sentences like (5) as often as adults.

(4) Every horse jumped over the log but every horse didn’t jump over the fence.
(5) The troll didn’t deliver some pizzas.

Here, we extend this line of research by focusing on the phenomenon of isomorphism as it pertains to indefinite objects. To set the stage for the experimental section of this squib, we begin by laying out the theoretical assumptions as well as the motivations underpinning our account.

3. THEORETICAL BACKGROUND

In this section, we discuss in more detail one way formally to capture the intuition that indefinites can receive different interpretations. The analysis in question is due to Diesing (1992). By doing so, our goal is to illustrate how experimental findings—in this case children’s behavior—can receive a principled explanation within the framework of linguistic theory. We are aware of course that analyses are rarely immune to criticism, and in the case at hand, it is worth pointing out that Reinhart (1995; 1997) and Abusch (1994), for example, have questioned some of the assumptions underlying Diesing’s analysis (see footnote 1).

In his seminal work on existential constructions, Milsark (1977) observed that whereas strong determiners (e.g., every, the, most) can have only a quantificational reading, weak determiners (e.g., some, many, two) are ambiguous between a cardinal reading and a quantificational reading (see also Postal (1966)). To see this, consider the example in (6) from Milsark (1977):

(6) Some salesmen walked in.

Sentence (6) can mean either that an undetermined number of salesmen walked into the room (the cardinal reading) or that, given a set of salesmen, some mem-
bers of this set (and not others) walked into the room (the quantificational reading).

More recently, Diesing (1992) proposed that the cardinal and the quantificational interpretation of indefinites are associated with two different logical forms. According to Diesing, an indefinite used on its cardinal reading is not quantificational, in the sense that it only introduces a variable that is bound through the existential closure operation proposed by Heim (1982). On this view, the cardinal interpretation of (6) can be represented as in (7):

\[ \exists x \ [\text{salesmen} (x) \ & \text{walked in}(x)] \]

By contrast, the quantificational reading, which Diesing referred to as a presuppositional reading, involves a tripartite structure. Important for Diesing, the presuppositions associated with quantified sentences are represented in a restrictive relative clause (RRC). This means that the use of a quantifier that triggers a presupposition will prompt the tripartite structure in (8):

\[ \exists x \ [\text{salesmen} (x) ]_{\text{RESTRICTIVE RELATIVE CLAUSE}} [\text{walked in}(x)]_{\text{NUCLEAR SCOPE}} \]

Coming back to sentences containing negation and indefinite objects, we can now use the distinction just discussed to represent the two interpretations of (9). On this view, the wide-scope reading of the indefinite with respect to negation is associated with the projection of a tripartite structure (9b). On this interpretation, the indefinite is treated quantificationally. By contrast, the narrow-scope reading of the indefinite with respect to negation corresponds to the cardinal reading on which the indefinite is treated as a variable (9a).

\[ \text{(9) The Smurf didn’t catch two birds.} \]
\[ a. \ \neg \ [\exists x \ [\text{Smurf caught} 2(x) \ & \text{bird}(x)]]_{\text{NS}} \ (\text{indefinite = variable}) \]
\[ b. \ \exists x \ [\text{bird}(x)]_{\text{RRC}} \neg [\text{Smurf caught} (x)]_{\text{NS}} \ (\text{indefinite = quantifier}) \]

In this view, one can hypothesize that children’s preference for the narrow-scope reading of the indefinite in sentences like (9) corresponds to a preference for the representation in (9a). In other words, children’s “isomorphic” behavior in this case can be seen as a preference for a representation of indefinite objects that does not involve the projection of a tripartite structure.

In sum, we have reviewed an analysis of the wide-scope interpretation of indefinites in negative sentences as involving the projection of a tripartite structure. Moreover, we have reviewed an account according to which the same structure correlates with the representation of a presupposition. A consequence of this line of reasoning is that the wide-scope interpretation of indefinites in negative sentences should be facilitated if the indefinite NP also triggers a presupposition. One linguistic expression that fits this description is given by partitive constructions, as in (10):
The Smurf didn’t catch two of the birds.

The strongly preferred—if not the only possible—interpretation of (10) is the reading on which two of the birds receives wide scope over negation. An explanation consistent with Diesing’s view would point to the presupposition triggered by the definite article the. On Diesing’s view, the necessity to accommodate the presupposition of existence triggered by the definite article will lead to a tripartite structure for (10), thereby generating the structure associated with the wide-scope interpretation of the indefinite object. Thus, if children’s preference for the narrow-scope reading of sentences like The Smurf didn’t catch two birds arises when they do not treat the object NP as being presuppositional, we predict that the presence of an inherently presuppositional NP, such as the partitive in (10), should lead children to assign such sentences a wide-scope interpretation much more often than in the former case.

4. EXPERIMENT 1

This experiment was designed to test the prediction just outlined by assessing children’s interpretation of sentences like (11). We also wanted to determine whether the presence of a preceding affirmative statement, as in (12), would have a similar effect (see section 2).

(11) The Smurf didn’t catch two of the birds.
(12) The Smurf caught all the cats but she didn’t catch two birds.

4.1. Participants

We tested 22 English-speaking children between the ages of 3;9 and 4;11 (M age = 4;4) and 22 adult native speakers of English. The children were recruited from day care centers in the Philadelphia area. The adult subjects were all undergraduate students at the University of Pennsylvania.

4.2. Procedure and Materials

We tested participants using the Truth Value Judgment Task (TVJT) methodology (Crain and Thornton (1998)). The TVJT involves two experimenters. The first experimenter acts out short stories in front of the participants using small toys and props. The second experimenter plays the role of a puppet (in this case, Elmo®) who watches the stories alongside the participants. At the end of the story, the puppet makes a statement about what he thinks happened in the story. The participants’ role is to determine whether the puppet is “right” or “wrong.”
Finally, the participants are asked to justify their answers by explaining why they think that the puppet is right or wrong.

The experiment had two conditions. In both conditions, participants witnessed the same stories. In the partitive condition, the puppet described what happened using sentences like (11), whereas in the nonpartitive condition, the puppet used sentences like (12). In both conditions, the puppet’s statements were true on the wide-scope, nonisomorphic reading of the object NP (i.e., two /not/). In the story corresponding to sentences like (11, 12), this was achieved by having two birds that ended up not being caught by the Smurf. By contrast, the narrow-scope, isomorphic interpretation of the sentences was false in the context of the stories. In the case of (11, 12), this was achieved by having the Smurf catch exactly two birds.

In each condition, participants heard two sentences of the type illustrated in (11) and (12). See Table 1 for a complete list. In addition to test trials, participants were also given two warm-up stories and two control stories.4 Finally, the 22 participants were randomly assigned to each condition, yielding a 2 × 2 design with

<table>
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<td>Test Story 1: Minnie didn’t buy two of the rings.</td>
</tr>
<tr>
<td>Non-partitive condition (critical stories)</td>
<td>Test Story 1: Minnie bought all the balloons but she didn’t buy two rings.</td>
</tr>
<tr>
<td>Control stories (for both partitive and nonpartitive conditions)</td>
<td>Control 1: Joe didn’t buy any planes.</td>
</tr>
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4The puppet statements used in the control stories are given in Tables 1 and 2. As children and adults in our two experiments performed virtually perfectly on controls, we do not discuss these data further. It is worth noting, however, that the experimenter holding the puppet had a choice between two different outcomes for each control story. One outcome was designed to satisfy the truth conditions of the puppet’s statement and therefore elicit a yes answer. The alternative outcome, which did not satisfy the truth conditions of the puppet’s statement, was designed to elicit a no answer. If the child had answered yes to a given test story, the experimenter holding the puppet was instructed to pick the outcome for the following control story corresponding to a no answer, and vice versa. This precaution was taken to ensure that the number of yes and no answers was balanced and that children could provide either a or a yes or no answer when appropriate. Finally, it should be noted that there is by now overwhelming evidence that children in the age range described here experience no difficulty with the task whatsoever and that they are perfectly capable of providing both yes and no answers when appropriate.
age and condition as between-subject factors. The group of 12 children assigned
to the partitive condition ranged in age from 3;9 to 4;11 \((M \text{ age } = 4;4)\), and the 10
children assigned to the nonpartitive condition were between age 4;1 and 4;11 \((M \text{ age } = 4;5)\). These two means do not differ significantly, \(t(20) = -0.84, p = .4\).

### 4.3. Results and Discussion

In the upcoming analysis, our dependent measure is the proportion of *yes* responses to the puppet’s statements. We found that although the adults overwhelmingly accepted the puppet’s statements in both the partitive and nonpartitive condition (i.e., 96% and 95% of the time, respectively), \(t(20) = -0.12, p = .89\), the children’s acceptance rate in the nonpartitive condition was significantly lower than in the partitive condition (i.e., 25% vs. 75%, respectively), \(t(20) = -3.08, p = .005\).

The proportions of *yes* responses were entered into a 2 (children vs. adults) × 2 (partitive vs. nonpartitive) analysis of variance. The analysis revealed a significant main effect of age, \(F(1, 40) = 27.03, p < .0001\); a significant main effect of condition, \(F(1, 40) = 8.46, p = .005\); and a significant interaction between age and condition, \(F(1, 40) = 7.92, p = .007\).

Turning to justifications, we found that the children rejected the puppet’s statements 75% of the time in the nonpartitive condition. When asked to justify their negative answers, the children typically explained that the puppet was wrong because the character in question did \(V\) two Ns. By contrast, the children in the partitive condition accepted the puppet’s statement 75% of the time. When asked to justify the answers, they typically explained that the puppet was right because there were indeed two Ns that the main character did not \(V\).

These results point to two interesting observations. First, the presence of a preceding affirmative statement seems to have no effect on the children’s ability to access the wide-scope, nonisomorphic reading in the case of sentences like NP didn’t \(V\) two N—a point to which we come back later. Second, as we predicted, the presence of a partitive in sentences like (11) gave rise to a significant increase in the children’s ability to access the nonisomorphic interpretation.

One possibility that the present experiment does not entirely rule out is that the effect that we observed may be due to differences in length between the statements used in the two conditions rather than between the presence/absence of a partitive NP. The idea would be that children perform better in the partitive condition, that is, on statements like (11), because they are shorter than statements like (12). However, we doubt that length is the relevant factor here: As shown by Lidz and Musolino (2002), 4-year-olds interpret statements like The Smurf didn’t catch two birds (which happen to be shorter than the statements used in our partitive condition) in exactly the same nonadult way as the children in our experiment interpreted statements like The Smurf caught all the cats but she didn’t catch two birds (including the same kind of justifications).
Another possibility is that children do better in the partitive condition because the nonisomorphic interpretations in this case correspond with a yes response. This explanation, like the previous one, seems unlikely to us. First, there is by now overwhelming evidence from a large number of studies using the TVJT methodology that children in the age range described here can provide both yes and no answers when appropriate (see footnote 4). More important, the essence of the isomorphism effect, which has by now been replicated in a number of studies and observed cross-linguistically, is that children reject the puppet’s statements precisely when the nonisomorphic reading corresponds to the yes answer.

5. EXPERIMENT 2

In this experiment we tried to determine whether the effect of the partitive NP observed in Experiment 1 would extend to sentences like (13):

(13) The fireman didn’t find some of the guys.

Recall that previous studies also found that children have a strong preference for the isomorphic interpretation of sentences like The detective didn’t find some guys.

5.1. Participants

We tested 15 English-speaking children between the ages of 3;6 and 5;1 (M age = 4;4) and 15 adult native speakers of English. The children were recruited and tested at the Center for Young Children at the University of Maryland. The adult participants were all undergraduate students at the University of Maryland.

5.2. Procedure and Material

As in Experiment 1, we tested participants using the TVJT. Participants witnessed stories in which the wide-scope, nonisomorphic reading of sentences like (13) was true whereas the narrow-scope, isomorphic reading was false. In the case of (13), this was achieved by having the fireman find two of his friends (i.e., not > found some = false) and fail to find the other two (i.e., some > not found = true). In this case, participants heard four test stories of the kind in (13) and three control stories. The complete list is given in Table 2. Note that the materials used here are identical to the materials of Musolino (1998) except that the plain NPs were replaced by partitives.
5.3. Results and Discussion

In the following analysis, our dependent measure was the proportion of yes responses to the puppet statements. We found that our group of children and our group of adults accepted the puppet’s statements 83.3% and 73.3% of the time, respectively. Statistical analysis revealed no difference between these two means, \( t(28) = -0.96, p = .34 \). Thus, we find that children’s ability to assign sentences like NP didn’t V some of the N a wide-scope interpretation is fully adultlike.

6. CONCLUSIONS

We conclude with some remarks on the phenomenon of isomorphism. First, the results presented here, when combined with other recent findings (e.g., Felber (2002), Gualmini (2003), Musolino and Lidz (in press)) now point to a performance-based account of the phenomenon (contra earlier accounts, see section 2).\(^5\) Second, as our empirical basis broadens, we are now beginning to see the limits of the phenomenon of isomorphism. Moreover, as we come to understand the roots of the phenomenon better, it is now possible to make predictions about when isomorphism should occur and when it should not. This is essentially the thrust of the account proposed here. Third, our results along with other recent findings sug-

\( ^5 \)As we observed, children’s difficulty with indefinites in negative sentences was also investigated by Krämer (2000). The account proposed by Krämer shares with our account the idea that children’s difficulties are limited to particular uses of indefinites. Our account and the one proposed by Krämer also present two important differences, however. First, Krämer endorsed the view that children’s difficulty with indefinites in negative sentences reflects a lack of grammatical competence. We believe that this view cannot be maintained in light of the results documented in the present article. Second, Krämer adopted an explicit evaluation metric, which makes children’s initial interpretation of indefinites the least costly option. We would like to remain agnostic with respect to this point. The data we present constitute a first attempt in determining the semantic representations accessed by children for all the interpretations they can access. However, the data do not provide any evidence as to what representation is more costly.
gest that there may be several ways to help children overcome their isomorphic tendencies (e.g., using preceding affirmative statements; satisfying certain felicity conditions; and, as we discovered here, using partitives). The challenges for future research will be to explain why each of these seemingly unrelated factors has the effect that it does and why some of these factors have an effect in some cases but not in others. For example, why does a preceding affirmative statement affect children’s performance in the case of sentences containing universally quantified subjects (see section 2) but not in the case of sentences containing numerically quantified objects (see Experiment 1)? Finally, the fact that children appear to be sensitive to the presuppositional status of different kinds of NPs invites the inference that children are sensitive to presuppositions (see Crain (1982) and Crain and Thornton (1998) for a discussion of the relevance of this observation).

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REFERENCES


