No equal treatment for antecedents in a coherent discourse

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The Delay of Principle B Effect (DPBE) in language acquisition is a well-known effect that has motivated widely distinct views on the relation between grammar and other linguistic resources necessary for interpretation. However, in a recent paper entitled "Equal treatment for all antecedents: How children succeed with Principle B", Conroy, Takahashi, Lidz and Phillips (2009) argue that this effect is mainly an experimental artifact arising from shortcomings in the experimental tasks used. This squib reviews their arguments and discusses recent empirical evidence showing that if the linguistic discourse of the experiment is controlled and all antecedents receive a truly equal treatment, the DPBE reappears again. This suggests, first of all, that the DPBE is a real effect and, second, that experimental tasks employed to assess children's knowledge of grammar will need to take into account the structure of the preceding linguistic discourse.

1 Delay of Principle B Effect

Many experiments in various languages have established that children who correctly interpret reflexives from the age of 4 or 5 on have trouble interpreting pronouns correctly until the age of 6 or even later (e.g., Chien and Wexler 1990 for English; Deutsch et al. 1986 for Dutch). Consider the following examples, taken from Chien and Wexler (1990:262):

(1) This is Goldilocks; this is Mama Bear. Is Mamma Bear touching herself?

(2) This is Mama Bear; this is Goldilocks. Is Mamma Bear touching her?

Children consistently interpret *herself* in (1) as coreferring with the local subject Mama Bear. They thus appear to have knowledge of Principle A of Binding Theory, which governs the use and interpretation of reflexives. At the same time, when presented with (2), the same children frequently choose Mama Bear as the referent for *her*. This suggests that they do not yet have knowledge of Principle B of Binding Theory, which governs the use and interpretation of pronouns. This difference between children's mastery of Principle A and their mastery of Principle B is often referred to as the Delay of Principle B Effect (DPBE).

2 DPBE as an experimental artifact?

Many studies have tried to reconcile the DPBE with a nativist view on language, according to which Principle A and Principle B are both part of an innately specified grammar and therefore should already be present from the start. One strategy, accepting the observed asymmetry between pronouns and reflexives, is to argue that the cause for children's errors with pronouns lies outside the grammar, for example in their lack of pragmatic knowledge (Thornton and Wexler 1999) or insufficient processing resources (Reinhart 2006). Another strategy is to argue that the observed asymmetry between pronouns and reflexives is not real but rather is a reflection of shortcomings of the experimental tasks used. In a recent study, Conroy et al. (2009) adopt this latter strategy.

In their study, Conroy et al. consider both the DPBE and the quantificational asymmetry. Whereas children frequently make errors when the local subject is a referential noun phrase, as in (2), several studies have claimed that children interpret object pronouns correctly when the local subject is a quantificational noun phrase such as *every bear* (e.g., Chien and Wexler 1990). This difference has been taken as evidence for a distinction between coreference and variable binding. However, reviewing earlier studies of this quantificational asymmetry (QA), including Chien and Wexler's and Thornton and Wexler's, Elbourne (2005)

argues that their results may also be explained by the confounding factor of salience. As the referents in the stories or pictures accompanying the test sentence were not equally salient, children may have simply used the strategy of choosing the most salient referent. Given the materials used, this would have resulted in a tendency to respond correctly with quantificational subjects but incorrectly with referential subjects. Hence, the QA may be an experimental artifact. According to Conroy et al., similar methodological concerns can be raised regarding the studies finding a DPBE. Rather than considering the entire set of materials used in earlier experiments (stories as well as pictures), as Elbourne did, they focus on the stories that are typically used in a Truth Value Judgment Task (TVJT). Below, I will discuss a third aspect of the experimental materials used in acquisition experiments, namely the structure of the linguistic discourse preceding the test sentence.

In a TVJT, a child and a puppet together watch an experimenter act out a story with props. After the story, the child has to judge whether a statement about the story produced by the puppet is true or not. According to Conroy et al., these stories must satisfy a number of conditions to be able to make a fair assessment of children's knowledge of binding and coreference. These conditions ensure that the interpretations under investigation are equally available in the experimental context. First, a potential antecedent for the coreferential as well as the disjoint interpretation should be available in the discourse (the Availability Assumption). Second, in order to make a true/false judgment plausible, the story should make both interpretations genuine potential outcomes at some point (the Disputability Assumption, also known as the Condition of Plausible Dissent).

Conroy et al. claim that many studies of the DPBE, such as Thornton and Wexler's (1999), do not satisfy these conditions. To test this claim, they carried out three experiments. In their first experiment, they used a story design satisfying the two conditions sketched above. An example story is presented in the next section. Under these conditions, children

made very few errors, accepting the coreferential interpretation for the pronoun in only 11% of trials. To test whether these results could have been due to a general preference to choose disjoint interpretations, they carried out a second experiment where the object pronoun *him* was replaced by a possessive noun phrase *his costume*. Binding Theory permits both interpretations for a possessive noun phrase in object position. In this second experiment, children were found to accept reference to the subject in 80% of the trials, indicating that they are not guided by a general preference for disjoint interpretations. In a third experiment, some of the shortcomings of previous experiments were reintroduced in the design. This resulted in a percentage of incorrect coreferential interpretations of 56%.

From the results of these three experiments and a survey of over 30 earlier studies of the DPBA and the QA, Conroy et al. conclude that in appropriately controlled experiments the QA disappears entirely and the DPBE disappears largely (except for a 'residual' effect of 15-30% of trials, which they attribute to children's difficulty in inhibiting an initial but incorrect interpretation). That is, if antecedents are given an equal treatment, the QA as well as the most of the DPBE disappears. Hence, the QA and the DPBE should be considered mainly experimental artifacts.

3 Equal treatment of antecedents

The explanation offered by Conroy et al. seems highly attractive because of the theoretical consequence that it simplifies the grammar and results in a more straightforward relation between grammar and language use: there would be no need to maintain a theoretical distinction between variable binding and coreference, nor would there be any need to assume crucial pragmatic knowledge or linguistic computations that adults have access to but children do not yet. However, their explanation also has a number of weaknesses. First, it is not immediately clear that the antecedents in their first experiment indeed receive an equal

treatment. Consider the following text, which Conroy et al. (2009:460) present as a description of a scenario presented to children in the referential condition. Note that the text is not a literal transcription of the narrative the children actually heard.

(3) *The Painting Story:*

Characters: Hiking Smurf, Tennis Smurf, Papa Smurf [collectively Smurfs], Grumpy, Dopey, Happy [collectively dwarves]

Papa Smurf announces that Snow White is going to have a party, and that she is going to have a painting contest. Papa Smurf declares that he is going to be the judge. Each of the dwarves shows and discusses the color of paint that he is going to use to get painted, as does Tennis Smurf. However, Hiking Smurf does not have any paint, and he wonders whether one of the other characters will be willing to share. He first approaches Happy, who says that he would be glad to help out if any paint remains after he is painted. Fortunately, when Happy is finished some paint remains, and so he paints Hiking Smurf. Hiking Smurf, however, is not yet satisfied, so he approaches Dopey with a similar request, which is similarly successful. Then Grumpy, who is in such a bad mood that he doesn't even want to go to the party, declares that he doesn't need to get painted. The other dwarves really want him to go, and Grumpy agrees to get painted, using all of his paint in the process. After Grumpy is painted, Hiking Smurf approaches him and asks for some paint. Grumpy politely apologizes that he would like to help but cannot, because he has used up all of his paint. Hiking Smurf realizes that his best remaining chance is to ask Tennis Smurf for some extra paint, and Tennis Smurf obliges when he is asked. Finally, everybody is ready for Snow White's party. OK, this was a story about painting. Hiking Smurf didn't have any paint, and Grumpy almost didn't go to the party. Let me see . . . I think . . .

Test sentence:

(4) Grumpy painted him.

The stories in the quantificational condition were exactly the same, except for the lead-in sentence (following the sentence "OK, this was a story about painting") and the test sentence. The two referents relevant for the present discussion are Grumpy (the incorrect coreferential antecedent for the pronoun *him*) and Hiking Smurf (the intended disjoint antecedent for *him* in both the referential and the quantificational condition). Conroy et al. admit (2009:461) that although Grumpy "is a prominent character in the story and is associated with the most vivid event in the narrative", "[t]he central character in the story is Hiking Smurf". This indeed minimizes any potential concerns about the availability of a suitable disjoint referent for the pronoun. However, it also results in the two antecedents not being treated in an entirely equal way. If the relative prominence of the two characters has any effects, it would lead the children in Conroy et al.'s first experiment to select the correct disjoint antecedent for the pronoun in both the referential and the quantificational condition, without any need to appeal to Principle B.

A second weakness of Conroy et al.'s explanation is the fact that it leaves about 15-30% of the data unexplained. For this 'residual' DPBE, Conroy et al. resort to a processing explanation. In particular, they suggest that this 'residual' effect may be related to the recent finding in on-line studies of pronoun resolution in adults that adults temporary also consider ungrammatical coreferential antecedents in Principle B contexts. If children do the same but find it more difficult than adults to inhibit an initial but incorrect interpretation, this may make them prone to error in their interpretation of pronouns. Although this explanation of a 'residual' DPBE is not incompatible with their conclusion that most of children's errors in experimental tasks are due to shortcomings in the experimental tasks used, it emphasizes the

special status of Principle B compared to Principle A without providing any motivation for this difference based on properties of the grammar.

The third and final weakness of Conroy et al.'s explanation discussed here is that, although they find a clear difference between children's performance on pronoun interpretation in their first experiment (which satisfies their two conditions) and their third experiment (in which some of the shortcomings of earlier experiments are reintroduced), they are unable to pinpoint the exact cause of this difference: "We should emphasize that because the two versions of the story differ in several ways, this experiment cannot identify the exact cause of any differences that might emerge in children's responses" (2009:466). This is very unfortunate because only if it can be firmly established that the observed difference between children's performance on pronoun interpretation in their first experiment and in their third experiment is due to a task effect induced by the content of the story, rather than to a linguistic effect resulting from particular properties of the linguistic materials, the conclusion of the DPBE as an experimental artifact can be upheld.

4 Antecedents in a linguistic discourse

In a recent study with Dutch children, Spenader et al. (2009) showed that linguistic properties of the preceding discourse can have a huge effect on the DPBE, and can even make the DPBE disappear completely. Spenader et al. employed a task in which children had to indicate whether a prerecorded sentence played on the computer was a correct description of the picture shown on the computer screen. The pictures all featured two animals of equal sizes engaged in a reflexive or non-reflexive action. A puppet told the child that the computer had been built by the experimenter, but that the puppet believed the computer was built wrong and that the pictures and sentences were all messed up. The child was then asked to help them to repair the computer. This experimental procedure made it plausible that the pictures and

sentences in the task could but might not match, thus satisfying the Disputability Assumption without using an elaborate discourse.

Spenader et al. point out that the factor salience, which Elbourne (2005) claims to have influenced many of the earlier studies of the DPBE, is strongly related to discourse coherence. Employing Centering Theory (Grosz et al. 1995), a formal theory of local discourse coherence and choice of referring expression, they argue that at least some of the materials used by Chien and Wexler (1990) and others are unnatural with regard to the use of the pronoun. If children are helped by coherent materials but hindered by less natural materials that disobey linguistic constraints on discourse coherence, this may have had a huge effect on their interpretation of pronouns in earlier experiments. To test this, Spenader et al. contrasted a classic introduction of the two referents, as in (5), with an introduction that is more coherent in terms of Centering Theory, as in (6).

Classic Condition:

(5) Hier zie je een olifant en een krokodil. De olifant slaat hem/zichzelf.
'Here you see an elephant and an alligator. The elephant is hitting him/himself.'

Single Topic Condition:

(6) Hier zie je een krokodil. De olifant slaat hem/zichzelf.
'Here you see an alligator. The elephant is hitting him/himself.'

In the Classic Condition, the coreferential and the disjoint referent are introduced in a conjunction and can therefore be taken to be equally salient. As a result, the structure of the linguistic discourse does not provide the listener with any clues as to which of these two referents is to be preferred as the topic of the second sentence, i.e., the test sentence. In the Single Topic Condition, only the disjoint referent is introduced. As a result, this referent is

established as the topic of the test sentence according to the definitions of Centering Theory. In addition, one of the rules of Centering Theory says that if any referent mentioned in the current sentence is referred to by a pronoun, then the backward looking center (i.e., the discourse topic) must be referred to by a pronoun also (Grosz et al. 1995:214) . Therefore, Centering Theory predicts that the pronoun in the second sentence in (6) will be resolved to the topic *alligator*. If this account of the relation between discourse coherence and pronoun use is correct and if children are able to use this linguistic knowledge, they will interpret the pronoun in (6) correctly. Because there is no unambiguously established topic in (5), children will have to base their response for the pronoun in (5) on their knowledge of grammar only. Under some accounts of children's knowledge of grammar (Hendriks and Spenader 2005/6; Reinhart 2006), this amounts to children randomly selecting one of the antecedents.

Overall, Spenader et al. found that children's comprehension of reflexives was significantly better than their comprehension of pronouns, consistent with the existence of a DPBE. But whereas children's comprehension of reflexives was similar across conditions, the DPBE was only observed with pronouns in the Classic Condition. In this condition, children made errors with pronouns in 31% of trials, which was significantly higher than their percentage of errors with reflexives. However, in the Single Topic Condition the DPBE had disappeared completely. Children only made errors in 17% of trials, which was comparable to children's percentage of errors with reflexives. These results suggest that linguistic properties of the preceding discourse can have a dramatic effect on children's interpretation of pronouns and the size of the DPBE. From these results, Spenader et al. conclude that children's grammar alone does not prevent children from selecting the local subject as the antecedent of the pronoun. Only when the linguistic discourse makes a disjoint referent highly salient (as in the Single Topic Condition), children consistently pick out this referent as the antecedent of the pronoun.

A weak point of Spenader et al.'s explanation seems to be that they assume children in the Classic Condition to randomly select an antecedent for the pronoun. That should have resulted in a percentage of errors of around 50%, rather than the 31% they actually found in their experiment, which is very close to the percentage of 'residual' errors estimated by Conroy et al. However, to select the verbs for their test sentences, Spenader et al. first conducted an on-line experiment asking adult speakers of Dutch to make a choice between the simplex reflexive *zich* 'himself' and the complex reflexive *zichzelf* 'himself' for a series of transitive verbs (2009:37). Selecting only verbs that adults strongly preferred to co-occur with *zichzelf* allowed them to straightforwardly compare children's performance with the pronoun *hem* 'him' to their performance with the reflexive *zichzelf*. However, as a consequence the verbs used were somewhat more likely to express non-reflexive actions, and hence the test sentences were slightly biased toward a disjoint interpretation. So children's percentage of errors with pronouns must be interpreted in light of this bias toward the correct interpretation.

On the basis of the results of Spenader et al., we can speculate about the effects of the linguistic discourse on children's interpretation of pronouns in earlier experiments. The coherence of a linguistic discourse can be determined for every two-sentence sequence, so for every test sentence that has a linguistic context of at least one preceding sentence. As was already pointed out above, the first experiment of Conroy et al. (2009) may have led to fewer errors on pronoun interpretation by presenting the coreferential antecedent as merely a prominent character, whereas the disjoint antecedent is presented as the central character in the story and perhaps even the discourse topic. Discourse may have had an opposite effect in Conroy et al.'s third experiment. As Conroy et al. themselves already suggest (2009:467), one of the causes of children's errors in the referential condition but not in the quantificational condition in this third experiment may be that children simply take *him* as referring to the central figure in the narrative, that is, interpret the pronoun according to the pronoun rule of

Centering Theory. The crucial role of discourse prominence is also suggested by Conroy et al.'s survey of over 30 studies of the DPBE: In TVJT studies where the correct disjoint referent for the pronoun is "accessible in the context" (2009:476), relatively low rates of non-adult-like judgments are found. However, because of the complexity of the discourses that are typically used in a TVJT, their mix of verbal and non-verbal actions, and the fact that we do not have access to the literal transcripts of the verbal material, it is difficult to be more precise about the coherence of these discourses. This underscores the need for controlled linguistic contexts and an awareness of the influence of such contexts on the interpretation of utterances in language acquisition experiments.

5 Conclusions

If the potential antecedents of a pronoun are given a truly equal treatment, a clear Delay of Principle B Effect can be observed. However, a balanced discourse in which the potential antecedents are equally salient is not the same as a natural, coherent, discourse. In a coherent discourse in which the topic can be unambiguously established, the DPBE largely or even completely disappears. Differences in the local discourse coherence of the linguistic materials used may have been responsible for part of the variation found among earlier studies of the DPBE. Fair tests of children's knowledge of binding and coreference should therefore not only consider the non-linguistic aspects of the task, but should also take into account the structure of the preceding linguistic discourse.

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Footnotes

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