

Early Mastery of Constraints on Binding and Coreference



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1 Introduction

- Many previous studies report that 4-6 year olds incorrectly allow a pronoun to corefer with a clausemate antecedent (*Delay of Principle B Effect*, DPBE; Chien & Wexler 1990, McKee 1992).
- A theoretically influential finding is that children respect Principle B when the antecedent is quantificational (1), but not when it is referential (2) (*Quantificational Asymmetry*, QA; Grodzinsky & Reinhart 1993, Thornton & Wexler 1999).

- (1) Every reindeer brushed him
- (2) Bert brushed him

- We show that the QA is a result of design flaws.
- When methodological concerns are corrected, children obey Principle B with all types of antecedents.
- No QA, No DPBE.

2 Background

- The QA is based on reports that children accept coreference at higher rates in sentences with a referential antecedent (2) than in sentences with a quantificational antecedent (1): over various studies (Table 1).

Table 1

Quantificational	Referential
0-25%	30-70%

- The QA has been presented as evidence that binding constraints apply only to bound variable anaphora (Reinhart 1983).

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- Chien & Wexler (1990) and Grodzinsky & Reinhart (1993) argue that since Principle B applies only to bound anaphora, children always obey Principle B, hence the adult-like performance on sentences like (1).
- However, they encounter difficulty with the mechanism responsible for coreference, hence the poor performance on sentences like (2).

3 Truth Value Judgment Task

- Bound variable reading must be TRUE and accessible
- Referential reading must be FALSE but nevertheless accessible

- These basic assumptions should be met in the same fashion in referential and quantificational conditions alike.
- These assumptions result from 3 basic criteria:

1) Equality of Readings: The BV and referential antecedents must be equally accessible

- If a child rejects the bound variable interpretation, the sole reason should be due to the grammar. There should be no contextual reasons for the child to reject the BV interpretation.

2) Plausible Dissent: Both readings must be available during the story (*Condition of Plausible Dissent*; Crain & Thornton 1998)

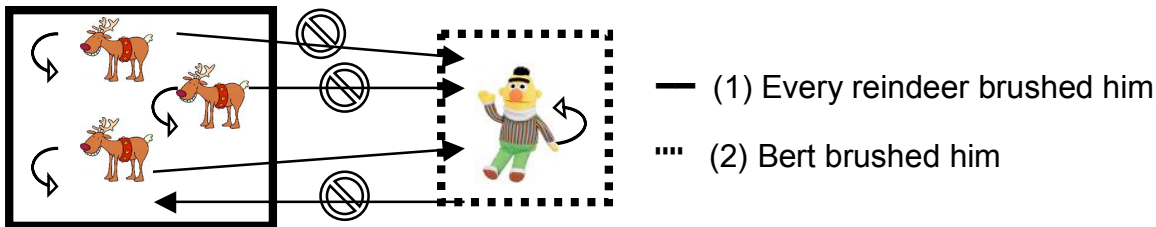
- There must be an accessible, non-bound (i.e. deictic) alternative antecedent for the pronoun, and the child must be able to judge that the sentence is not true under that interpretation.
- That reading must be a live possibility at some point in the story (*Condition of Plausible Dissent*; Crain & Thornton 1998).

3) Condition of Falsification: Falsification event must be the same in both conditions (*Condition of Falsification*; Crain & Thornton 1998)

- The event that makes the non-bound interpretation false should be identical for both referential and quantificational conditions, and should be equally salient in the story.
 - This is because both conditions should be maximally similar.
- Elbourne (2005) raised concerns specifically about some tests of QA; our review suggests that even the basic tests of DPBE raise concerns.
- There have been 14 previous TVJT-type tests of Principle B, including 6 tests of QA, but we found that most failed to satisfy these requirements.

4 Previous Experiments

- Let us consider how the two central assumptions are satisfied in one sample TVJT scenario that has been used to motivate both DPBE and QA.
- The scenario is drawn from Thornton & Wexler [4] because it is representative of a design strategy that has been followed in a number of other studies of DPBE and QA.
- Additionally, a metaanalysis on 20 previous studies shows that similar stories were used in many other experiments (including Avrutin & Wexler 1992, etc.).
- Example story from Thornton & Wexler (1999):
Bert needs to be brushed off. Bert asks 1st and 2nd reindeer, who refuse and brush themselves off. Bert asks 3rd reindeer, who brushes him. Bert says “thank you, I wish I could help you back, but I need to finish brushing. Bert brushes himself.



- **Equality of Readings** not satisfied.
 - The story has *Bert* as the main protagonist.
 - In a recent critique, Elbourne [6] argues that children simply choose Bert as the referent of the pronoun simply because Bert is by far the most *salient* character in the story.
 - Consequently, a QA could be obtained if the pronoun were replaced with *Bert*.

<i>Every reindeer brushed Bert</i>	FALSE
<i>Bert brushed Bert</i>	TRUE

- Elbourne [6] hypothesizes that appropriately revised experiments might remove QA, but that DPBE would remain.

- **Plausible Dissent** not satisfied.

Referential condition

- Referential reading relies on considering Bert’s brushing of 3rd reindeer: not seriously under consideration in story
- No suitable non-bound interpretation of (2) for a child to deny.

Quantificational condition

- It is never a live possibility that *Every reindeer brushed Bert* would be in the story.
- The first 2 reindeers reject Bert’s pleas for help.

- **Condition of Falsification** not satisfied.
 - The falsification of the target sentences concern different events.
 - The event that makes the coreferential interpretation false are different for (1) and (2), and are not equally salient in the story.
 - The falsification event for (1) is that the first 2 reindeers did not brush Bert.
 - The falsification event for (2) is that Bert did not brush the 3rd reindeer.
 - This might further contribute to the concern that the QA might be an experimental artifact.

5 Current Investigation

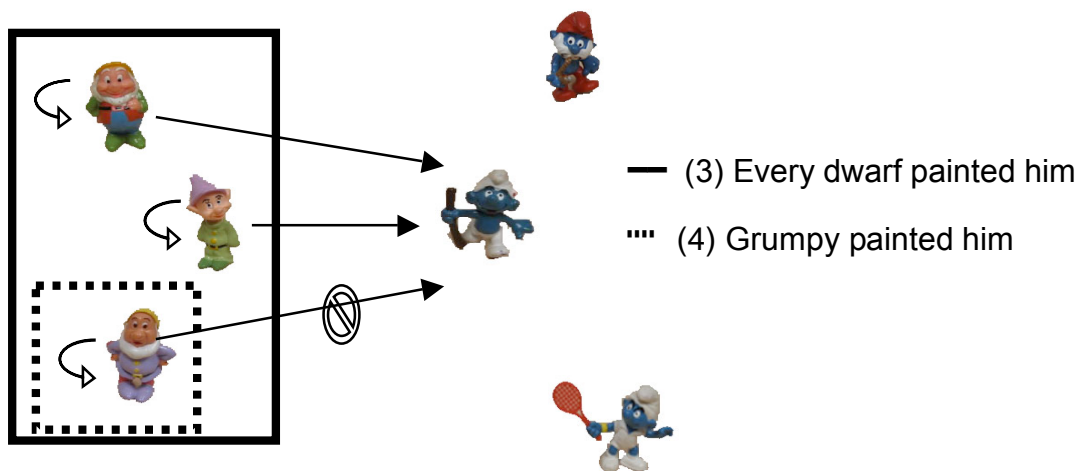
Is the QA an artifact of experimental design?

When the experimental flaws are removed, how will children perform with referential antecedents?

- We designed a set of TVJTs to meet the assumptions, which can test referential and quantificational antecedents using identical scenarios.

Will DPBE and QA persist once TVJT requirements are satisfied?

- A revised story:
Everyone needs to get painted to go to a party. Hiking Smurf forgot his paint. HS asks Happy and Dopey to paint him. Happy and Dopey first paint themselves, then paint HS. Grumpy is in a bad mood and does not want to go to the party. Grumpy gets painted after other dwarves convince him. HS asks Grumpy to paint him. Grumpy cannot since he used up all of his paint. Tennis Smurf offers to paint HS.



- **Equality of Readings** satisfied.
 - All characters had a clear individual identity, in addition to being part of a group.

- The “drama” surrounding Grumpy’s reluctance to get painted increases the accessibility of the bound reading in both conditions.
- QA could not be an artifact of replacement.

<i>Every dwarf painted Hiking Smurf</i>	FALSE
<i>Grumpy painted Hiking Smurf</i>	FALSE

- **Plausible Dissent** satisfied.
 - Clear referent for referential interpretations (Hiking Smurf), which is equal for both conditions.
 - Grumpy/every dwarf’s painting Smurf almost is under consideration and there is a clear reason (easily pointed to by children) for its falsification.
 - The first 2 dwarves paint Smurf, thus it is clearly almost true that every dwarf painted Smurf.
 - Condition of Plausible Dissent is satisfied.
- **Condition of Falsification** satisfied.
 - Symmetric target sentences.
 - The Condition of Falsification is satisfied by the very same event in both conditions.
 - The falsification event for both (3) and (4) is that *Grumpy ran out of paint*.

6 Experiments

- Identical stories used for experiment 1 and 2. Same storyline with critical points of variation used for Experiment 3.

Experiment 1 – Principle B

- Experiment 1 tests the referential and quantificational antecedents using revised stories and sentences in (3) and (4).

- (3) Every dwarf painted him
- (4) Grumpy painted him

- 16 children (M 4;6, range 4;0-5;6), 16 adults (undergraduate students at UMD)

Experiment 2 – Control

- The results of Experiment 1 and the critique by Elbourne raise concerns that children simply preferred the deictic reading, and reject the BV reading not due to Principle B, but for an independent preference.

- The pronouns were replaced with possessives (5), which freely allow coreference with a local antecedent.

- (5) a. Every dwarf painted his shirt
b. Grumpy painted his shirt

- Experiment 2 is a control that gives independent measure of accessibility of BV interpretation.
- Then, we can be sure that any rejection of the bound variable reading occurs for grammatical reasons, not secondary ones.
- 16 children (M 4;6, range 4;0-5;4), 16 adults (undergraduate students at UMD)

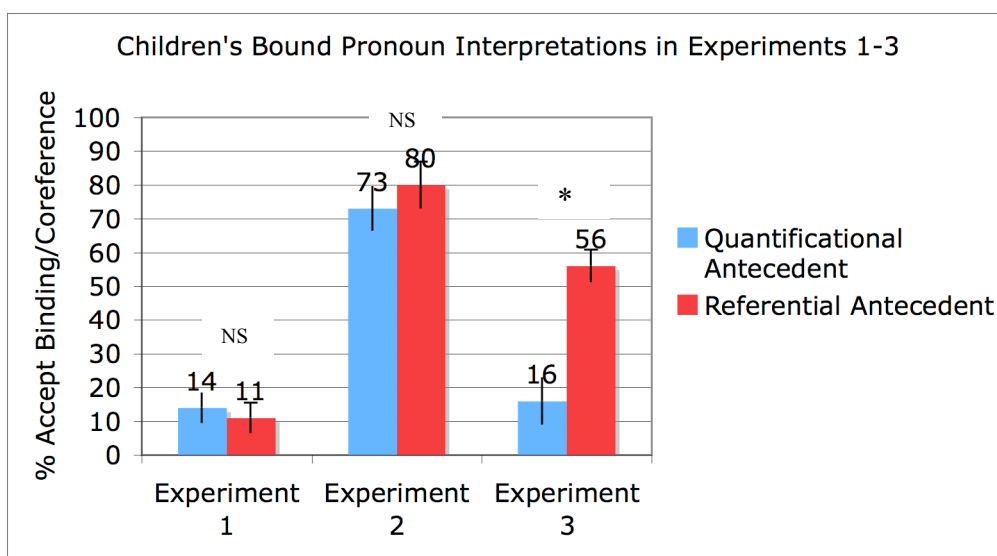
Experiment 3 – Replication

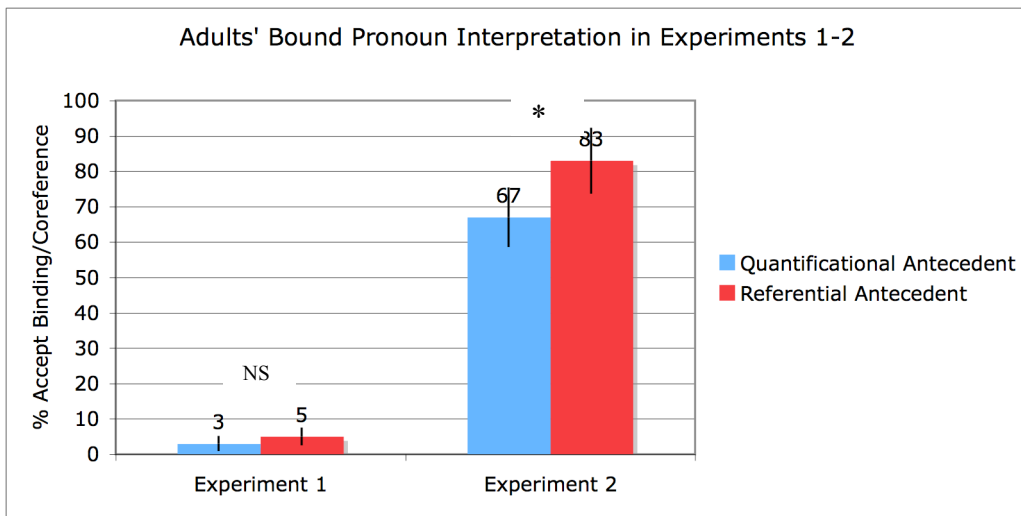
- Experiment 3 was designed to replicate Thornton & Wexler (1999), by re-introducing imbalances found in previous studies into our stories.
- Target sentences were changed to (6).
- Also, the format of the story was designed to mimic T&W.

- (6) a. Every dwarf painted him
b. Smurf painted him

- 16 children (M 4;7, range 4;1-5;2)

7 Results





- The puppet probed the child for further explanation irrespective of the child's initial response (i.e. even when the child's response had been "yes").
- Results are based on the number of trials on which responses reflected an interpretation with a bound pronoun.
- This is because the reading is the indication of a child's grammar, not a yes/no response.

Experiment 1

- Children consistently rejected the ungrammatical interpretation for the test sentences in both conditions.
- There was no DPBE, in addition to no QA.
- Error rates of 10-20% are consistent with previous studies on children's knowledge of Principle C (Crain & McKee 1985).

Experiment 2

- Acceptance rates rose to around 80% in referential and quantificational conditions alike.
- Children's success in Experiment 1 could not have been due to insufficient salience of the bound meaning.
- Therefore, we can be sure that the rejection of the bound variable interpretation is for grammatical reasons.

Experiment 3

- The QA reemerged with significantly higher acceptance of Principle B violations in the referential condition than in the quantificational condition.

8 Discussion

- This suggests the design improvements both removed the QA and greatly reduced the DPBE.
- This suggests design flaws are responsible for previously reported effects.

9 Research Implications

- Elbourne (2005) correctly predicted that, when the experimental factors were removed, the QA would disappear, but he incorrectly predicted that children would violate Principle B on both conditions alike.
- Given new data, we conclude that Elbourne's skepticism about the QA was warranted, but we found 4-year olds disallow coreference with both referential and quantified antecedents.
- Also, we found additional experimental methodology problems.
- The linguistic arguments for Reinhart's theory are unaffected by these findings. But our results remove the additional argument that was based on a developmental dissociation.

10 Selected References

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