Quantifier Raising in 4-year-olds
By Lidz et al.

Quantifier raising (QR) refers to how quantifiers (every, each, two etc.) influence the semantic content of their sentences.

(1) The Smurf didn’t catch two birds
(2) Every horse didn’t jump over the fence

Surface scope readings:
(1a) It is not the case that the Smurf caught two birds.
(2a) No horses jumped over the fence

Inverse scope readings:
(1b) There are two birds that the Smurf didn’t catch
(2b) Not every horse jumped over the fence

In order to get the inverse scope readings from sentences (1) and (2), one must apply QR. Since children only accepted (1a) and (2a), the surface scope readings, while adults accepted both, it appeared that children under the age of 6 could not use QR in these sentences.

Two possible explanations:

1. at that developmental stage, the children's grammars do not yet contain the “covert displacement operation” necessary to facilitate the inverse scope readings
2. these types of sentences are too complex for the children to fully explore within the “computational resources that [they] deploy” either because implementing QR would be “too taxing” or because they have fallen victim to the garden-path effect

Two experiments were carried out to test these hypotheses.

**Experiment 1: Quantifier-variable Binding**

In this experiment, 4-year-olds and adults were tested on whether they treated pronouns, such as “him” in

(3) The king kissed every boy before the queen introduced him

as variables bound by “quantificational noun phrases” (QNPs) like “every boy” in (3). It was tested in both the subject condition (SQNP) and object condition(OQNP). If they were successful in this, it would indicate that they could apply QR.

**Results:**
<table>
<thead>
<tr>
<th></th>
<th>SQNP</th>
<th>OQNP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults</td>
<td>90% demonstrated QR</td>
<td>88% demonstrated QR</td>
</tr>
<tr>
<td>Children</td>
<td>85% demonstrated QR</td>
<td>83% demonstrated QR</td>
</tr>
</tbody>
</table>

**Experiment 2: Antecedent Contained Deletion**

In most cases of VP elipsis, such as

(4) Smurfette jumped over every frog and Minnie did too

there is an antecedent for the elided VP, in (4) “jumped over every frog”.

In other cases, like

(5) Smurfette jumped over every frog that Minnie did

the antecedent to the elided VP includes the elided VP, and trying to reinsert the elided VP leads to an endless loop of VPs within VPs.

(5a) Smurfette jumped over every frog that Minnie [jumped over every frog that Minnie [jumped over every frog that Minnie [etc.]]]

In order to understand the actual meaning of such a sentence, one must be able to apply QR. If QR is not applied, a child would interpret the relative clause as a coordinate clause, leading them to believe that sentences (4) and (5) would have the same meaning.

**Results:**

<table>
<thead>
<tr>
<th></th>
<th>Set 1 (ACD-true)</th>
<th>Set 2 (Coord-true)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults</td>
<td>100% ACD true</td>
<td>0% ACD true</td>
</tr>
<tr>
<td>Children</td>
<td>93% ACD true</td>
<td>18% ACD true</td>
</tr>
</tbody>
</table>

**Conclusions:**

- children as young as 4 years can apply QR
- both quantifier-variable binding and antecedent constrained deletion are computable within the mental resources allotted by children’s brains for speech comprehension
- ambiguous sentences like (1) and (2) are interpreted with difficulty by the children for other reasons, such as the garden-path effect