The Acquisition of Scalar Implicatures

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This paper describes a modified replication study of Noveck's experiment (2001) on the scalar terms *must* and *might*. In the original study, Noveck conducted an experiment on the acquisition of the scalar terms *must* and *might* and the quantifier *some*. He found that children use the semantic interpretation of the modal *might* more frequently than adults and accept *might* in situations where *must* would also be true. While the Pragmatic Delay Hypothesis (Chierchia, 2005) states that children have access to semantic knowledge but lack – at least for the computation of scalar implicatures (SIs) - an essential piece of pragmatic knowledge - Grice's Maxim of Quantity, the Processing Limitation Hypothesis suggests that children have - due to a limited working memory - problems to keep and compare two representations of a statement and therefore fail to compute SIs. Another hypothesis by Chierchia (2005) suggests that children focus on the truthfulness or falsity of a statement rather than on its appropriateness.

22 monolingual native speakers of German of the age-groups 5, 7 and 10 participated in the experiment. Materials were similar to Noveck (2001). The statements were presented in German. Only positive statements were presented and 2 additional ones added to stress the contrast between the modal verbs *might* and *must* to see whether children are more likely to compute SI if the contrast between the statements is stronger. Since Noveck's study contained the logical term *or* in the task, I reformulated the task so that it contained no possible distracting scalar terms to ensure that the logical term *or* will not give children additional trouble to evaluate the statements.

Participants were confronted with three boxes. Box I contained item A, e.g. a bear, box II contained items A and B, e.g. a bear and a rabbit. Both boxes were open and the content was clearly visible. Box III remained closed and the subjects were told that this box contained the same toys as one of the open boxes. Participants were instructed that they would hear statements about box III and have to decide whether the statements are either correct, incorrect or partially correct. The following sentences were uttered in terms by two glove-puppets: *(1) There has to be B in the box. (false); (2)There might be A and B in the box. (true); (3)There has to be A in the box in any case. (true); (4) there might possibly be A in the box. (true); (5) There might possibly be B in the box. (true); (6) There might be A in the box. (true)*. The procedure was repeated so that each child evaluated three sets of statements with different toys.

The distribution of yes- and no-answers for each age-group per statement is similar to Noveck (2001) (see table A). At the first glance it appears that 5-year-olds are too young to manage this reasoning task. This is not because their reasoning skills are not developed enough but because they interpret statements differently than expected and tend to understand the uttered statements as exhaustive descriptions of the content. For example, younger children reject the statement *There must be A in the*

box and accept the statement *There might be A in the box* more often than older subjects. This is because they understood the statement as *There might only be A in the box* and *There must only be A in the box* (table 1). Based on this interpretation it is impossible to compute the expected SI for the statements *There might possibly be A in the box* and *There might be A in the box.* In this situation *might/might possibly be A* is the most informative statement.

Based on an exhaustive reading of the statements there is another statement for which SIs can be computed: *There has to be A in the box*. Participants who consider this statement as an exhaustive description of the content and calculate SI reject it because it is too strong in the current context (since there could also be A+B in box III). I call these early implicatures which are based on exhaustive reading "child-implicatures". In contrast to the expected SIs (which are lower bound), Child-implicatures are upper bound implicatures. Many children compute child-implicatures for the statement *There might be B in the box* and reject it since it is impossible that there is only B in box III (table 2). The results of 5-year-old children prove that they are able to compute SI, however the implicatures they compute differ from the ones adults calculate.

Moreover, younger and older participants consider scalar strengthening at different points. Only the 7-year-old children interpreted the statement *There might be A in the box* semantically (might, not excluding must) at rates which are significantly above chance level and significantly higher than that of the 5- and 9-year children (table A). This is because fewer 9-year old children consider the statements as exhaustive descriptions and calculate SIs since they expect that A is necessarily in box III. While SIs are increasing with age, child-implicatures are decreasing (compare tables 3 and 4).

Concerning the acquisition of SIs my interpretation of these findings is that especially young children exploit the Q-Principle ("Say as much as you can"; Horn, 1996) and rely on the speaker to supply sufficient information. They therefore interpret the statements as exhaustive descriptions and calculate implicatures based on the Q-Principle since they do not expect that the speaker applies to the R-Principle ("Say no more than you must"; ibid.) and says less than is actually meant. Slightly older children are aware of the R-Principle and for this reason interpret the uttered statements differently and realise that the speaker violated the Q-Principle.

The general conclusion is that - under certain circumstances - even five-year-old children are able to calculate the expected adult-SI. However, they calculate child-implicatures more frequently than 'normal' SIs (compare tables 3 and 4). From this perspective, the claim that implicatures are in general acquired late can not be uphold. It seems more important to differentiate between early and late implicatures.

Table 1: shows the amount of interpretations with the implicature that the description of the content of the box must be exhaustive for each age group in percentage.
The question marks refer to the fact that some subjects applied a different strategy to the task. They did not focus on the modal verb but on the item mentioned, considered the statement *There*

might/might possibly be A in the box as exhaustive description and rejected it or evaluated it as *halbrichtig* since it is also possible that there is A and B in box III.

	5-year-olds	7-year-olds	9-year-olds
In any case there has to be A in the box.	41.2	33.3	5.6
There might/might possibly be A in the box.	?	?	?
There might possibly be B in the box.	33.3	33.3	16.7

Table 2: shows the average amount of calculated child-implicatures out of those children who interpreted the statements in the way that the content of the box must be exhaustive in percentage.
*: $p < 0.05$, **: $p < 0.01$

	5-year-olds	7-year-olds	9-year-olds
In any case there has to be A in the box.	38.9	93.3**	33.3
There might possibly be B in the box.	100**	72.2	100**

Table 3: shows the average amount of calculated SIs for each age group in percentage.

	5-year-olds	7-year-olds	9-year-olds
There might be A in the box.	7.6	5.3	44.4
There might/ might possibly be A in the box.	11.1	29.2	50

Table 4 shows the average amount of calculated child-implicatures for each age group in percentage.

	5-year-olds	7-year-olds	9-year-olds
In any case there has to be A in the box.	17.6	29.2	5.6
There might possibly be B in the box.	33.3	23.8	16.7

Table A: shows the average amount of correct responses to modal statements in percentage. In this table I consider yes as the correct answer for the statements *There might/might possibly be A in the box* although it underdetermines that there actually has to be A in the covered box. I do so because once a statement is true for at least one of the open boxes, it is also true for the covered box.

$*: p < 0.05, ** : p < 0.01$

Statement	Expected answer	Age (Years)		
		5	7	9
there has to be A in any case	Yes	82,4**	66,6	94,4**
might be A	Yes	61,5	94,7**	44,4
might/ might possibly be A	Yes	50	58,3	38,7
total		64.6	73.2**	59.3
must be B	No	40	63,3	94,4**
might possibly B	Yes	80**	80,9**	83,3**
might be A und B	Yes	100**	91,3**	100**
total		74.5**	78.6**	92.3**

References:

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