CHAPTER TWENTY-EIGHT

WHAT IS EASIER TO UNDERSTAND THAN TRUE NEGATIVES? ACQUISITION OF SENTENTIAL NEGATION IN GERMAN[1]

MAGDALENA WOJTECKA, CORINNA KOCH, ANGELA GRIMM AND PETRA SCHULZ

1. Introduction

Negation particles such as *no* and *not* belong to the first elements children produce in the early multiword stage (Wode 1977). It has been argued that at age three, children use sentence negation in a target-like way regarding its syntactic and pragmatic properties (Clahsen 1988). To date little research has addressed children's interpretation of this structure. For example, the stages that children go through towards mastering comprehension of negated sentences remain unclear.

Previous studies with adults have shown that pragmatic aspects of sentence negation play a major role in the comprehension of negated sentences (Chase and Clark 1971; Wason 1972). More specifically, the context in which a negated sentence is used and the truth value of a negated sentence in the given context were regarded as pragmatic aspects. In this paper, we investigate whether these factors are also relevant in the acquisition of sentence negation. The comprehension of sentence negation in monolingual learners of German was examined using a longitudinal

design. The participants were tested three times in a six-month interval at age 3;7, 4;2, and 4;7. The study is part of MILA, a large-scale study that compares the acquisition of morphosyntactic, semantic, and phonological abilities of monolingual children and early language learners of German.

The paper is structured as follows: Section 2 provides the theoretical background on pragmatic aspects of negation and a summary of previous studies on the acquisition of sentence negation. Our research hypotheses, the design, and the results of the study are presented in Section 3. Finally, Section 4 provides a general discussion of the findings and suggests directions for future research.

2. Pragmatic aspects of negation

Negation is generally used to express deviations from expectations (Givón 1978; Glenberg and Robertson 1999; Horn 1989; Wason 1972). First, negated sentences occur if the negated proposition was explicitly mentioned before by the discourse partner as can be seen in (1). Furthermore, negated sentences occur if the proposition being negated can be inferred from the discourse context as illustrated in (2).

(1) A: *I was told you went to Boston last month.*
    B: *No, I did not.*
(2) A to B: *Guess what, my train was not late this morning.*
    Context: The speaker's train is usually late.

Negated sentences can be used in two different types of contexts. True negatives are true in the given context (3), and false negatives provide an incorrect description of a situation (4) (examples taken from LiSe-DaZ, Schulz and Tracy 2011).

(3) Context: A boy is throwing a helmet away from Lise.
    The boy is not giving the helmet to Lise.   True negative
(4) Context: Lise is caressing a dog.
    Lise is not caressing the dog in the park.   False negative

Studies using sentence-verification or sentence completion tasks found that for adults false negatives are relatively easy to interpret, while true negatives are more prone to errors (Chase and Clark 1971; Wason 1972). This is due to the fact that in false negative sentences, the picture matches the action that is being negated. In true negative sentences, by contrast, the picture does not match the negated action (Kaup et al. 2006, 2007).

To date, detailed research on the interpretation of negated sentences in children is still lacking. De Villiers and Tager Flusberg (1975) used a sentence completion task with English speaking children aged two to five years. Interestingly, in contrast to adults, children showed few difficulties in the interpretation of true negatives. However, false negatives were not tested with this design. In a pilot study by Wojtecka et al. (2011) comprehension of negated sentences was assessed in a small sample of three- and four-year-olds using a truth value judgement task. Their results suggest that German speaking children - like adults - perform better on false than on true negatives. Based on the results from two testing rounds at the ages of 3;7 and 4;2, the authors proposed that false negatives are acquired before true negatives. However, a limitation of this study was that it could not specify the acquisition sequence, as at age 4;2 half of the children still had not mastered either true or false negatives.

3. Our study

Extending the data basis of the pilot study by Wojtecka et al (2011), the present study had two goals. The first goal was to substantiate the authors' findings that false negatives are easier to interpret by children than true negatives by testing a larger group of children. Accordingly, the Hypothesis 1 was as follows:

> (H1) Comprehension of false negatives is easier than comprehension of true negatives.

The second goal was to extend the longitudinal perspective by adding a third testing round at age 4;7, to investigate whether false negatives are indeed acquired before true negatives, as proposed by the authors. The resulting acquisition sequence is formulated as Hypothesis 2:

> (H2) The acquisition of sentence negation develops in three stages:
> A. No mastery of false and true negatives
> B. Mastery of false negatives
> C. Mastery of false and true negatives

Participants

We tested 42 typically developing monolingual German speaking children (17 girls, 25 boys) in three test rounds[2]. The age ranged from 3;5 to 4;1 (*M* = 3;7, *SD* = 2 months) in the first test round, from 4;0 to 4;5 (*M* = 4;2, *SD* = 1.8 months) in the second, and from 4;5 to 4;11 (*M* = 4;7, *SD* = 2 months) in the third test round. All children had an age-appropriate non-verbal IQ, with a mean of 88 (*SD* = 13) assessed by the non-verbal part of the K-ABC (Melchers and Preuss 2003). According to a parent questionnaire, no child showed any signs of language impairment or language delay, of hearing problems, or psycho-social deprivation. Children's general language development was assessed using the standardized test SETK 3-5 (Grimm 2001), in which all children performed within age-appropriate norms.

Method

Children's comprehension of sentence negation was tested with the subtest *Comprehension of Negation* of the standardized test LiSe-DaZ (Schulz and Tracy 2011). The task, using a variant of the truth value judgement task, works as follows: The experimenter shows the child a picture introduced by a short lead-in sentence. Then a hand puppet makes a statement about the picture, while the child is looking at the picture. The task of the child is to decide whether the puppet's utterance is correct or incorrect with respect to the event depicted in the picture. A total of 12 negated sentences were presented to each child. There were two test conditions, true negatives and false negatives, each comprising six test items. Two example test items are given in (5) and (6).

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[2] The results of a subgroup of 34 of these children across the first two testing rounds are reported in Wojtecka et al. (2011).

(5) True negative
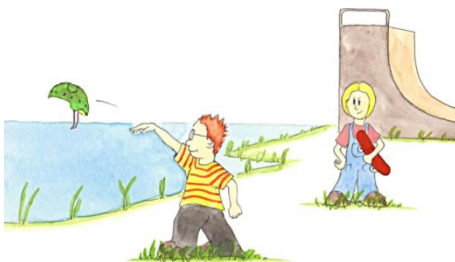
Experimenter:	*Guck mal, hier sind ein Junge, ein Helm und Lise.*
	'Look, there are a boy, a helmet, and Lise.'
Puppet:	*Der Junge gibt Lise den Helm nicht.*
	'The boy is not giving the helmet to Lise.'
Experimenter:	*Stimmt das?*
	'Is that right?'
Child:	*Ja, das stimmt.*
	'Yes, that's right.'

(6) False negative

Experimenter:	*Guck mal, hier sind Lise und der Hund.*
	'Look, there are Lise, and the dog.'
Puppet:	*Lise streichelt im Park den Hund nicht.*
	'Lise is not caressing the dog in the park.'
Experimenter:	*Stimmt das?*
	'Is that right?'
Child:	*Nein, das stimmt nicht.*
	'No, that's wrong.'

The two test conditions were constructed so that visual context and the puppet's statement matched (true negative) or did not match (false negative). In (5) the puppet's statement confirms the situation depicted in the picture, and hence requires an affirmative response. In (6) the puppet's

response has to be denied. The order of presentation was fixed, with true and false negatives in a pseudo-randomized sequence.

Each of the participants was tested individually in a quiet room in their kindergarten. There was an interval of roughly six months between each test round. The sessions were video-recorded for later data check against the onsite-coding and for further individual analysis. No response-contingent feedback was given by the experimenter. When the child failed to supply an answer, test items were repeated once.

Results

First, the proportion of correct responses to true negatives and false negatives were compared. The results are depicted in Fig. 1. As predicted by H1, children performed significantly better on false negatives than on true negatives at the first two test rounds (age 3;7: $t(41) = -3,380$, $p = .002$, age 4;2: $t(41) = -3.857$, $p = .001$). No significant difference between the two conditions was found at age 4;7.

Fig. 2. Proportion of correct responses to true and false negatives
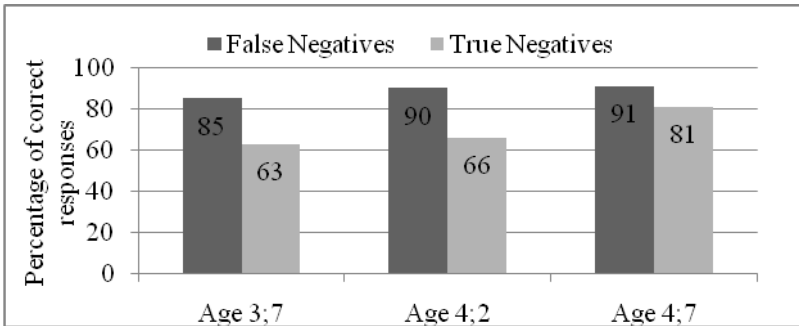
To investigate the developmental stages in comprehension of negated sentences, mastery of true and false negatives was calculated for each child at each test round. Mastery was defined as performance above chance per condition. Based on binominal distribution, mastery was reached if a child responded correctly to at least five out of the six test items. In a second step, children were classified according to the three acquisition stages formulated in Hypothesis 2. 32 out of 42 children (76%) follow the acquisitional sequence Stage A < Stage B < Stage C, as illustrated in Table 3; only ten out of 42 children (24%) did not follow any clear pattern. We will return to their responses below. Table 4 summarizes

the distribution of mastery across the two conditions for the 32 children who adhere to the developmental pattern, predicted by Hypothesis 2.

Table 1. Number of children out of 32 with mastery (✓) and non-mastery (-) of false negatives and true negatives at each test round

Stages		Test round 1 Age 3;7	Test round 2 Age 4;2	Test round 3 Age 4;7
A	True negatives (-) False negatives (-)	1	0	0
B	True negatives (-) False negatives (✓)	15	18	7
C	True negatives (✓) False negatives (✓)	16	14	25

In the first test round, only one out of the 32 children (3%) failed in both conditions. This child reached mastery of false negatives in the second test round. 15 children (47%) mastered false negatives, but not true negatives in the first test round. In the second test round, five of them also mastered true negatives; ten did not improve their performance. In the third test round, seven out of these ten children reached mastery of true negatives, thus reaching target-like performance in both conditions. 16 out of 32 children (50%) mastered false and true negatives already in the first test round, 14 (44%) in the second and 25 (78%) in the third test round.

No clear developmental path could be observed for ten out of 42 children (24%) for two reasons. These children either gave random responses, i.e. they guessed, or consistently responded with "yes" to all test items. Such a response pattern may reflect a yes-bias, which has been argued to occur if a child is not able to perform a task (Siegal 1997).

In sum, we found that children's performance on false negatives was significantly better than on true negatives at age 3;7, and 4;2. Furthermore, the analysis of individual response patterns indicates that false negatives are acquired before true negatives for the majority of children.

4. Discussion

Focusing on pragmatic aspects of negation this longitudinal study investigated the comprehension of negated sentences in German speaking children. Children's interpretation of sentence negation was assessed using

the truth value judgement task *Comprehension of Negation* of the standardized language test LiSe-DaZ (Schulz and Tracy 2011) in three test rounds.

Concerning the two types of negated sentences under investigation, this study provides evidence that three- and four-year-olds find false negatives easier than true negatives, confirming hypothesis (H1). These results corroborate previous findings from adults (Chase and Clark 1971; Wason 1972) and children (Wojtecka et al. 2011). However, the results conflict with the findings of de Villiers and Tager Flusberg (1975) in whose sentence completion task four-year-old children had little difficulty with true negatives. We suggest that this advantage for true negatives is due to a task effect. A truth value judgement task is more complex than a sentence completion task, because only in the truth value judgement task the negated statement has to be evaluated with respect to a given picture. According to Kaup et al. (2006, 2007), this evaluation is easier for false negatives than for true negatives. In false negatives, the picture matches the state of affairs that is being negated, whereas in true negatives the picture does not match this state of affairs.

Regarding the acquisition path for the interpretation of negated sentences, the results support the three-stage model, as formulated in Hypothesis 2, and first suggested in Wojtecka et al. (2011). Children start without proper knowledge of either false negatives or true negatives. At the next stage, children master false negatives, and finally, they also master true negatives resulting in target-like performance on both conditions.

A final concern is whether the lead-in sentence licences both types of negations equally well. Children's better performance on false negatives might indicate that the presented context was not specific enough to licence true negatives. To explore whether a more plausible context can improve children's interpretation of true negatives, further studies are needed.

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