Do 2.5-year-olds understand presupposition?

An eye-tracking study of the particles *too* and *again*.

Visit 4: Scientific Report

The fourth and final meeting of the two project members, Frauke Berger (University of Potsdam, Germany) and Nausicaa Pouscoulous (UCL, London, UK) took place in London between February 18th – 28th 2013.

The project investigated 2.5-year-olds understanding of sentences containing presupposition-triggering particles. Results of previous studies using sentence-picture matching tasks or picture selection tasks indicated that children up to school age do not consider additive particles in sentence interpretation, despite producing the particle from early on (around their second birthday). However, poor performance on comprehension tasks is likely to be task-related. Indeed, the meaning contribution of 'too' or 'again' to their host sentences is strictly presuppositional i.e., it comprises only background information. Hence its failure – as opposed to an incorrect sentence assertion - is not likely to be taken into account as an argument for sentence rejection in sentence-picture-matching tasks. As has been shown for other pragmatic phenomena, e.g., scalar implicatures, conventional tasks may also not meet the experimental requirements for testing preschoolers' understanding of additive particles. Results of from our own previous studies using alternative experimental methods indicated that German-learning 3-year-olds take into account the presuppositions triggered by *auch* ('too').

The current study built up on this argumentation and aimed to refine the exact onset age of the two particles' understanding. An eye-tracking paradigm was used to investigate whether 2.5-year-olds differentiate between utterances containing *AUCH* and *NOCHmal* – triggering two different presuppositions. Specifically, a simple looking-while-listening experiment was created, requiring no explicit reaction from participants. In each trial children were verbally and visually presented with two similar toy animals, one of which performed an action (e.g., jumping). After it finisheed the other one applauded. Children then heard one set of two subsequent test utterances - either containing *AUCH* or *NOCHmal* ('Now, Bingo should jump, too/again.', 'Come on, Bingo, jump, too/again.'). To assign the correct referent to the animal name and look at 'Bingo', children must have made an inference based on the presuppositions triggered either by *AUCH* or by *NOCHmal*. We predicted differing proportions of anticipatory looks to the same character after *AUCH*, compared to *NOCHmal*, in the timespan of 2000 ms following the offset of the last test sentence (and probably also already WHILE listening to the test sentences)

Prior to the fourth visit Frauke Berger and Nausicaa Pouscoulous worked out the full set of 24 different lists and orders of stimuli that were presented to the 24 German-speaking 2.5-year-olds participating in the study. Lists and orders were balanced and controlled for

- Order of presentation of animals (dogs, cats, horses, sheeps)
- Maximally 2 subsequent trials per condition
- Order of presentation of trials (ANNA, AANN, ANAN, NAAN, NNAA, NANA)
- Spatial position of the target character (left or right side of the screen)
- Color of the target character

Data collection of 24 analysable children was finished by the midst of February 2013. Also, 17 adults had been tested in the experiment prior to the fourth visit and the set was filled up to 24 adult participants after the final visit. By now, data collection has been finished.

During the ten days of the fourth visit, Frauke Berger and Nausicaa Pouscoulous spent most of the time on the detailed descriptive and statistical data analyses – a time-consuming process when dealing

with eye-tracking data. *R* was used to extract relevant data from raw data files and to transform and aggregate them into probabilities of looks. SPSS was used for running the statistical analyses.

It was agreed on the following criteria for data analysis:

- Two visual areas of interest (AoIs) were determined per trial, comprising the clapping character and the performing character. AoIs vertically covered the full hight of the screen (pixel 1-1024). Horizontally, AoI 1 comprised pixel 1-600, and AoI 2 comprised pixel 680-1280.

- Two temporal AoIs were defined: A first time window (TW), characterized as TW ' test sentences' had a duration of 4500 ms and began with the offset of the particle in the first test sentence and ended with the offset of the second test sentence (e.g., *Bingo soll jetzt AUCH mal/NOCHmal* [*springen. Los Bingo, spring AUCH mal/NOCHmal ja?*]). A second TW, TW 'Silence' comprised the first 2000 ms of the Pause, immediately following the offset of the second test sentence.

- In addition, the following validity criteria were determined:
  - 66% looks on screen in timespan between onset of performance of puppet A - offset handclapping of puppet B
  - 66% looks on screen in TW 'test sentences'
  - 66% looks on screen in TW „silence"
  - Participants should at least show 1 valid trial per condition meeting each of the mentioned criteria.

24 of the 25 tested children met the criteria. More specifically for 20 children 2 trials for each condition were analyzable, for another 3 children 1 *NOCHmal* trials had to be eliminated, for another child 1 *AUCH*-trial had to be eliminated, and 1 child was not considered for analysis because both *NOCHmal*-trials and 1 *AUCH*-trial did not meet the validity criteria.

For group data analysis, data was first aggregated for each condition within one subject and then averaged across subjects.

Group data analyses of the 2.5-year-olds showed that children looked to the target character, matching the test sentences, significantly above chance both in the *AUCH*- and the *NOCHmal*-condition. This held true for the TW 'silence', right after the presentation of the test sentences, but also already during the presentation of the test sentences, i.e., in the TW 'test sentences'. The same results were found for the 17 adults that have been tested so far.

Therefore, results unveiled that already 2.5-year-olds were able to consider the two different presuppositions, triggered by *AUCH*- and *NOCHMAL* in the test sentences, and reference assignment in the referent assignment task was based on considering the felicity constraints that were imposed by the two particles.

The study was presented in a talk, given by Frauke Berger and Nausicaa Pouscoulous at the LingLunch, a lunch time presentation session for the faculty members of the Linguistics Department at UCL on February 27th, 2013. The design and the results were intensively discussed with Andrew Nevins, Klaus Abels, Kriszta Szendröi, Alex Perovic, and Neil Smith. All researchers attested a semantically/pragmatically appropriate embedding to both the *AUCH*- and *NOCHMAL*-test sentences in the experiment. In addition, the prosody of the test sentences were evaluated to be natural as well as to be comparable between the *AUCH*- and *NOCHMAL*-condition, as also indicated by comparable pitch contours that were extracted and visualized by using PRAAT.

Details of the statistics were discussed with Richard Breheny in a separate meeting on February 28th.

An abstract of the study has been submitted to the X-Prag conference being held at the University of Utrecht, Netherlands, 4-6 September 2013.

As soon as the full set of adult data has been analysed, we will start writing up the study in the format of an experimental paper. A next (non-funded) meeting to step ahead is scheduled at the end of May in London on the occasion of the X-Prag London Master Class.