

Modelling the selective effects of slowed-down speech in pronoun comprehension

Background. Up to the age of 6, children have been shown to experience difficulties in the interpretation of pronouns (but not reflexives) by incorrectly allowing the pronoun to corefer with the local subject about half the time (e.g., Chien & Wexler, 1990). Explanations for this Delay of Principle B-Effect (DPBE) range from a deficiency in pragmatic skills (Thornton & Wexler, 1999) and the effects of an unbalanced context (Conroy et al., ms), to limitations in processing resources (Reinhart, 2006; Hendriks, van Rijn & Valkenier, 2007). Hendriks et al. argue that the DPBE arises because children are unable to take into account the speaker's perspective. In their computational ACT-R (Anderson et al., 2004) model of the development of pronoun comprehension, adult pronoun comprehension is simulated as two consecutive steps: selecting the optimal meaning for the (ambiguous) pronoun, and then checking whether a speaker would have expressed this meaning with the same form. If children's speed of processing is not fast enough to perform both steps within a limited amount of time, pronouns remain ambiguous and a guessing pattern emerges. The ACT-R model thus predicts that children's performance will improve if given sufficient time to construct an interpretation. Slowing down the speech rate is a way to give children more time. This prediction is tested by comparing pronoun comprehension at a normal rate with slow speech.

Method. 62 native Dutch-speaking children (age 4;1-6;2, mean 5;1) were asked to judge sentences like (1) in a truth-value judgment task.

- (1) Look, an elephant and an alligator are on the pavement. The elephant is hitting him/himself with a hammer.

Each subject participated in two different speech rate conditions (normal, 4.0 syll/sec versus slow speech rate, 2.7 syll/sec). Each condition was presented as a block of 20 sentences.

Results. Analysis showed a significant difference between the correct interpretation of pronouns (61%) and reflexives (90%), but no significant effect of slowed-down speech (see Figure 1). However, a closer look at the individual data revealed that 28 children showed no DPBE at normal speech rate. They either (i) hardly made any errors with pronouns, or (ii) still made as many errors with reflexives as with pronouns, or (iii) used the extra-grammatical strategy of answering 'yes' to all pronouns. Therefore, their performance was unlikely to benefit from slowed-down speech. After excluding these subjects, a repeated measures ANOVA on the data of the remaining 34 children (19 boys and 15 girls, age 4;1-6;2, mean 4;11) showed a significant difference in the mismatch condition between the normal speech rate condition (29%) and the slow speech rate condition (43%) ($F(1,33)=6.238, p=.018$) (see Figure 2 and 3).

Conclusion. Slower speech rate has a beneficial effect on children's comprehension of pronouns, but only if the child displays a DPBE. Conversely, slowed-down speech tends to have a slight, although non-significant, detrimental effect on children's reflexive interpretation. This supports the hypothesis that children's difficulties with pronoun comprehension are caused by their inability as a hearer to also take into account the speaker's perspective.

References

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Figure 1. Correct interpretation of reflexives and pronouns of all participants. No effects of speech rate are found.

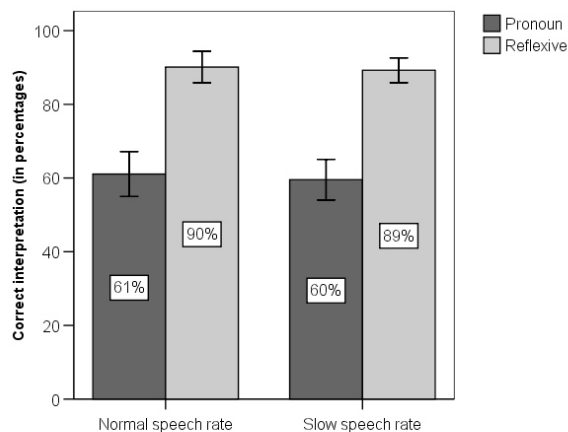


Figure 2. Correct interpretation of reflexives and pronouns of the children who show a DPBE.

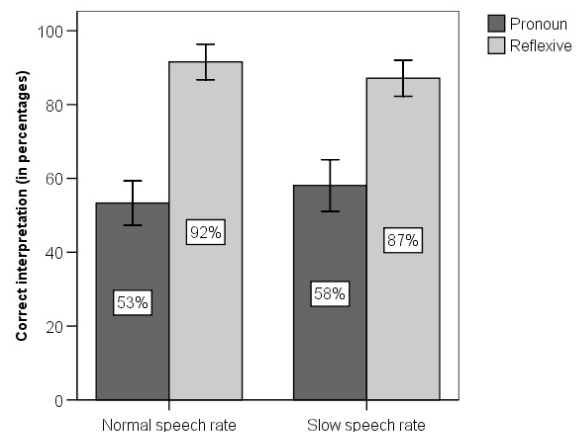


Figure 3. Correct interpretation of pronouns of the children who show a DPBE. Speech rate has a significant effect in the mismatch condition.

