

## **Probing 4 year old children's knowledge of the strong crossover constraint**

This study uses a new task to probe four-year-olds' knowledge of a syntactic constraint on bound pronouns: strong crossover (CO). Previous studies on children's knowledge of CO use truth value/acceptability judgment tasks (Crain and Thornton 1998; McDaniel and McKee, 1986). Their findings have been widely taken to demonstrate that children as young as four years old respect CO. However, the materials in prior studies may have been pragmatically biased towards a crossover-respecting interpretation, raising the possibility that these tasks overestimated children's knowledge. In this study, we introduce a new methodology to probe children's knowledge of CO by removing the biases toward a crossover respecting interpretation. Our results show that while the design effectively reveals adult knowledge of crossover, children do not behave in an adult manner, suggesting that previous evidence that children do respect CO in embedded Wh questions should be treated with caution.

Tests of grammatical constraints that rely on interpretation must be sensitive to children's tendency to commit to interpretations and their reluctance to revise these commitments (Trueswell et al 1999, Omaki et al 2014). Prior tasks had pragmatic factors that allowed children to arrive at an interpretation of the pronoun before being exposed to the relevant syntactic configuration. Crossover respecting interpretations, then, could arise without ever making reference to the syntax. Our task addresses this concern by making both a bound and unbound interpretations available. Additionally, the task requires the child to make an inference about what happened in the world on the basis of their interpretation of a statement, rather than asking them to match a statement to what they already know happened in the world.

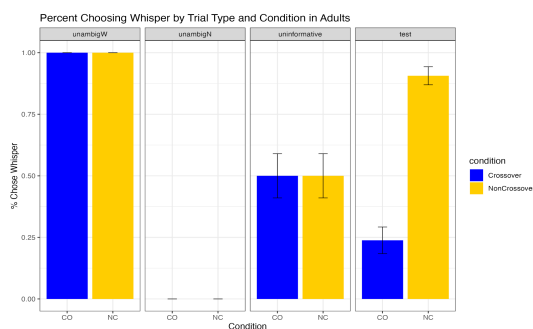
In the task, participants are first introduced to two dragons, Stella and Peter. Peter is trapped in a castle behind many locked doors. Peter explains that keys to each door are hidden in boxes and he has friends who can whisper a clue about the keys to Stella. The participant is then asked if they will help Stella if she gives them the clue (12 trials, 4 critical). On critical trials, the clue contains an embedded Wh-phrase and a pronoun which can either enter into a binding relation or not as a function of the presence of a crossover configuration. At the point of the clue, all conditions consist of the same actions and dialogue.

At the test sentence "I know who said she has the key" (non crossover) or "I know who she said has the key" (crossover), children must evaluate the relationship between who and she, while the salient nature of the whisperer should bias them toward interpreting the pronoun as the whisperer in the critical sentences in both conditions. Crucially, unlike in earlier studies, the sayer is never in doubt: it is the whisperer. The dependent variable, whose box the child chooses, corresponds to who the child believes has the key. That belief can only be determined by the form of the clue. Given the opportunity, 4 year olds readily bind pronouns (Koster & Koster, 1986; Thornton & Wexler, 1999), so any preference away from a bound interpretation (e.g. whisperer = key-haver) in the crossover condition should be taken as evidence that the clue has pulled them away from their prior bias to bind the pronoun.

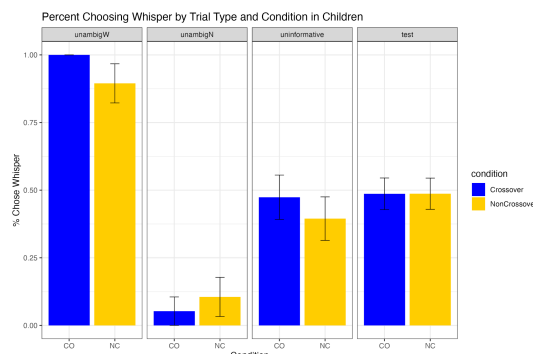
32 adults (16 per condition) completed the study. Results from the adult study (shown in Figure 1) demonstrate that the task effectively reveals adults' sensitivity to crossover and that the control conditions adequately control for all other factors. 41 4-year-old children (range=4;0-4;11, mean =4;5; 21 in crossover condition; data collection ongoing, target N=48) were recruited from local preschools. In the test trials, the children do not differ by condition: children behave at chance. Their behavior is identical in the irrelevant trials (Figure 2).

Our results suggest caution when interpreting other findings of children’s early knowledge of crossover. This design is effective at revealing the crossover constraint in adults, so children’s failure may reveal a lack of knowledge of the crossover constraint. However, the results could simply be masking children’s knowledge. They may have decided the clues are not particularly helpful, and thus not used them to make their choice. They may have been thrown off by the pragmatic oddness of the clue in the noncrossover condition. They may not prefer disjoint reference in cases where binding is not available; while adults prefer disjoint reference in these instances, it is not required by the grammar.

In this study, we corrected for one potential bias toward a crossover respecting interpretation in past studies of CO. Our results suggest that children do not reveal knowledge of the crossover constraint as readily as adults do. To further probe their knowledge, we must continue to modify experimental procedures and avoid extra grammatical biases.



**Figure 1: Adult’s Baseline Response.** Control items UnambigW and UnambigN were designed to probe willingness to choose both characters given unambiguous clues– Adults performed at ceiling. Uninformative condition tested baseline preference for each character without a disambiguating clue– Adult were at chance in both conditions. Test condition compares response to “I know who she said has the key” and “I know who said she has the key”



**Figure 2: Results from Children.** Children perform near ceiling in both unambiguous controls suggesting an ability to complete the task. In test trials, there is no effect by condition mirroring the irrelevant trials.

#### References

- Crain, S., & Thornton, R. (1998). *Investigations in Universal Grammar: A guide to experiments on the acquisition of syntax and semantics*. The MIT Press.
- Koster, J., & Koster, C. (1986). The acquisition of bound and free anaphora. Paper presented at the 11th annual Boston University conference on language development, Boston.
- McDaniel, D., McKee, C. (1992). Which Children Did They Show Obey Strong Crossover?. In: Goodluck, H., Rochemont, M. (eds) *Island Constraints*. Studies in Theoretical Psycholinguistics, vol 15. Springer, Dordrecht.
- Omaki, A., White, I. D., Goro, T., Lidz, J., & Phillips, C. (2014). No fear of commitment: Children’s incremental interpretation in English and Japanese wh-questions. *Language Learning and Development*, 10, 206–233.
- Thornton, R., & Wexler, K. (1999). *Principle B, VP ellipsis, and interpretation in child grammar*. (Current studies in linguistics; Vol. 31). The MIT Press.
- Trueswell, J. C., Sekerina, I., Hill, N. M., & Logrip, M. L. (1999). The kindergarten-path effect: Studying on-line sentence processing in young children. *Cognition*, 73(2), 89–134.