Are three year olds really insensitive to factivity?

Rachel Dudley, Naho Orita, Morgan Moyer, Valentine Hacquard and Jeffrey Lidz, University of Maryland

How early do children understand presupposition? Are preschoolers able to make inferences based on the presence of a presupposition trigger? In this study, we address such questions by investigating three year olds understanding of the verbs *think* and *know*. We ask in particular whether they are able recognize the factivity of *know* and the non-factivity of *think*.

Previous studies show that children have difficulty with *think* until at least age four, and tend to respond based on the truth of the complement clause, rather than the truth of the whole sentence. They would thus reject a sentence like *John thinks that Mary is home* in contexts in which Mary is not home, even if John thinks that she is [1-5]. If children always assume that *think* sentences report true beliefs, their responses to affirmative *think* and *know* sentences should be similar and be based on the truth of the complement in the actual world. To see whether children are able to distinguish *think* and *know*, we need to look at their understanding in negative contexts. Given three year olds' tendency to assume that *think* only reports true beliefs, our paper addresses two questions: (a) have some children lexicalized *think* as *know*? and (b) what semantic representations do children have for *know*? More specifically we asked whether children are able to recognize the factivity of *know* and the non-factivity of *think* in negative contexts. In a context where the truth of the complement clause is unknown, are they able to use the factivity of *know* to infer the truth of the complement clause?

Previous research suggests that children do not differentiate *know* and *think* until at least age four [6-8] and some even argue that children might not have a fully adult-like understanding of *know* until much later [9-14]. However, this failure could be due to the metalinguistic nature of many of the tasks. We thus designed a task that allows children to demonstrate their understanding without having to explicitly compare sentences. We asked children to find a toy hidden in one of two boxes using clues in the form of attitude reports, using a 2x3 within subjects design with verb (*think* and *know*) and negation (none, embedded, matrix) as factors:

A) No negation: *Lambchop knows/thinks that it's in the blue/red box*
B) Embedded negation: *Lambchop knows/thinks that it's not in the blue/red box*
C) Matrix negation: *Lambchop doesn't know/think that it's in the blue/red box*
D) Control: *It's not in the blue/red box*.

Our results suggest that three year olds do distinguish *think* and *know.* We see that children are sensitive to the difference between verbs, the location of negation and the interaction of these factors. Children treated ¬*think p* differently from ¬*know p;* and they treated ¬*know p* differently from *know* ¬*p*. However, children's performance on ¬*know p* was distributed bimodally, with 16 children getting 0 or only 1 trial correct and 6 children getting 2 or all 3 correct. Performance was distributed normally around the mean in all other conditions. Sixteen of the participants reliably choose the opposite of the box that was mentioned, consistent with a non-factive representation for *know.* The remaining 6 participants reliably choose the box that was mentioned in their clue, consistent with a factive representation for *know.*

Our data suggests that some preschoolers might begin to understand *know* at an earlier age than earlier literature indicates. The behavior of roughly one third of our subjects is consistent with an adult-like understanding of *know*. The others, however, do not distinguish *think* and *know* even under negation, effectively treating neither one as factive. Thus some children distinguish *think* and *know* before age 4, even when they still assume by default that *think* sentences only report true beliefs. Moreover, we find no evidence that children build a factive representation for *think*. Still, our results suggest that children's early representations of *know* may be non-factive and raise the question of how children come to recognize that *know* is factive and *think* is not.

Selected References:

[1] Wellman, H. M., D. Cross, and J. Watson (2001) Meta-analysis of theory-of-mind development: the truth about false belief. *Child Development* 72 (3): 655–684.
[2] Sowalsky, E., V. Hacquard and T. Roeper (2009) 'PP Opacity' in J. Crawford et al. (eds.) *Proceedings of the 3rd Conference on Generative Approaches to Language Acquisition North America* (GALANA 2008). 253-261. Somerville, MA: Cascadilla Proceedings Project.
[3] de Villiers, P.A. (2005) The role of language in theory of mind development: What deaf children tell us. In J. Astington & J. Baird (eds.), *Why language matters for theory of mind*. Oxford University Press.
[4] deVilliers, J. and J. Pyers (2002) Complements to Cognition: A Longitudinal Study of the Relationship between Complex Syntax and False Belief Understanding. *Cognitive Development* 17: 1037-1060.
[5] Lewis, S., V. Hacquard, and J. Lidz (2012) The semantics and pragmatics of belief reports in preschoolers. *Proceedings of SALT 22*.
[6] Abbeduto, L., and S. Rosenberg (1985) Children's knowledge of the presuppositions of know and other cognitive verbs. *Journal of Child Language* 12: 621-641.
[7] Macnamara, J., E. Baker, and C. L. Olson (1976) Four-year-olds' understanding of pretend, forget, and know: Evidence for propositional operations. *Child Development* 47: 62-70.
[8] Moore, C., D. Bryant, and D. Furrow (1989). Mental terms and the development of certainty. *Child Development* 49: 1107–1113.
[9] Moore C., and J. Davidge (1989) The development of mental terms: pragmatics or semantics? *Journal of Child Language* 16s: 633-641.
[10] Falmagne, R.J., J. Gonsalves, and S. Bennett-Lau (1994). Children's Linguistic Intuitions About Factive Presuppositions. *Cognitive Development* 9: 1-22.
[11] Harris, R. J. (1975) Children's comprehension of complex sentences. *Journal of experimental child psychology* 19: 420-3.
[12] Hopmann, M. R., and M. P. Maratsos (1978). A developmental study of factivity and negation in complex sentences. *Journal of Child Language* 5: 295-310.
[13] Léger, C. (2008) 'The acquisition of two types of factive complements' in Anna Gavarró and M. João Freitas (eds.) *Language Acquisition and Development: Proceedings of GALA 2007*. 337–346. Newcastle, UK: Cambridge Scholars Publishing.
[14] Scoville, R. P., and A. M. Gordon (1980) Children's understanding of factive presuppositions: An experiment and a review. *Journal of Child Language* 7: 381-399.