The Interaction of Negation and Factivity in Acquisition

In this talk, we report the results of a study on the acquisition of negation and its interaction with factive predicates. Following work by Léger (2008), we tested children's understanding of sentences with the factive predicates *know* and *be happy* in combination with negation--in the matrix clause, as well as in the embedded clause. We replicate Léger's main result, but we also find a new and revealing pattern of errors in certain sentence-types with *know*. To account for this full pattern of results, we suggest that children may initially treat *know* as a neg-raising verb.

Participants and Design 43 English-speaking children so far (ages 6-11) participated in the study. Based on Leger (2008), we used a simple story in which each of 4 animals receives either a strawberry or a watermelon, and the animals vary as to whether or not they *know/are happy* about what they received. After the story, the child is questioned with a set of sentences involving *know* or *happy* and negation. The study had a 2x2x2 design manipulating matrix negation (P/N), embedded negation (P/N) and matrix predicate (*know/happy*). *Know* vs. *happy* was a between-subjects factor: each participant heard either the *know* items or the *happy* items (given in Table A), in one of six pseudorandomized orders.

Results and discussion The overall results show that children had a much harder time grasping the relation *know* + negation than they do grasping *happy* + negation. For the *happy* items, kids are well above chance and highly accurate on all conditions by age 7, and are at ceiling for percentage of correct responses at age 9 (Table B). For the *know* items, kids are highly accurate on the PP and NP conditions from the earliest ages tested, but perform very poorly on the NN and PN conditions, even through age 11 (Table C). Our results thus confirm Léger's (2008) core finding of a strong contrast between *know* and *happy*. Children's low accuracy on the NN and PN conditions for *know*, compared with their performance on the these same condition for *happy*, shows that children do not treat all factive verbs similarly with respect to negation.

There is also an important way in which our results differ from the results of Léger's (2008) study. While in Léger's study the older children's errors with *know* were limited to the NN condition, we found that these errors were made in both the NN and the PN *know* conditions. It is revealing to examine the distribution of the incorrect responses children gave for these items (Table D). In particular, when children answer the PN *know* question incorrectly, they give the answer that would be correct for the NP question. In other words, children seem to be answering "Who knows he didn't get a strawberry?" as if it were "Who doesn't know he got a strawberry?". Our hypothesis is that the children making this error are incorrectly treating *know* as a neg-raising verb. We discuss how this hypothesis bears on grammatical theories of neg-raising, and we suggest that children do not incorrectly treat *happy* as a neg-raising predicate, because of the generalization that emotive factives are never neg-raising predicates.

Comparison with Léger (2008) We used a variant of Léger's (2008) procedure, with two main differences. First, we used a between-subjects rather than a within-subjects design, to rule out the possibility that a child's exposure to one predicate influenced her performance on the other. Second, Léger used pictures of smiley faces to represent *happy* and blindfolded faces to represent *doesn't know*, and we wanted to rule out the possibility that the differing results for *happy* and *know* was due to the fact that *happy* was represented in a very transparent way, while *know* was represented relatively indirectly.

We used enriched scenarios where happiness/knowledge (or lack thereof) are expressed by the animals as part of the story. This modification did not lead to increased accuracy in the *know* conditions, which we take to confirm that children's differing performance on *know* vs. *happy* reflects a genuine fact about their linguistic competence, rather than a presentational asymmetry in the experiment. Our results did, however, reveal a response pattern that differs from Léger's, as described above.

Moreover, our results are at odds with Léger's proposed explanation for the differences between *know* and *happy* in children's comprehension. The idea was that sentences with negated *know*, but not sentences with negated *happy*, force the child to entertain a presupposition that conflicts with the belief-state ascribed to the attitude holder. This explanation actually entails that the *know*-NP condition will be as problematic as the *know*-NN condition, a prediction that was not borne out, either in Léger's (2008) original study or in our current results. In fact, our results show that, beyond the NN condition, it is actually the *PN* condition, rather than the NP condition, that causes children trouble. We argue that this is explained if children are performing a neg-raising operation that allows an equivalence between matrix and embedded negation in certain cases.

A. *Happy* and *Know* items

condition	question	answer
PP	Who is happy / knows he got a strawberry?	Lion
NP	Who isn't happy / doesn't know he got a strawberry?	Dinosaur
PN	Who is happy / knows he didn't get a strawberry?	Tiger
NN	Who isn't happy /doesn't know he didn't get a strawberry?	Horse

B. Correct response % for conditions with *happy* (11-yr-olds still to be tested).

age /condition	PP Lion	NP Dino	PN Tiger	NN Horse
6	84	77	50	100
7/8	84	84	84	77
9	100	100	86	100
11	-	-	-	-

C. Correct response % for conditions with *know*

age /condition	PP Lion	NP Dino	PN Tiger	NN Horse
6	75	75	50	0
7/8	87	100	13	13
9	100	100	50	50
11	84	100	34	34

D. Response type by item in the *know* condition (all children). Boxed cell in each row = correct response.

condition/response	Lion = PP	Dino = NP	Tiger = PN	Horse = NN
Lion = PP	91%	4	4	0
Dino =NP	0	96	0	4
Tiger = PN	0	65	35	0
Horse = NN	14	41	18	27

References: Léger C. (2008). "The acquisition of two types of factive complements". In Language Acquisition and Development: Proceedings of GALA 2007. Eds. Anna Gavarró & M. João Freitas. Newcastle, UK: Cambridge Scholars Publishing, 2008. 337–346.