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Long-Distance Wh-questions in French Children: Revisiting Computational Complexity

Bart Hollebrandse, Stéphanie Durrleman, Luigi Rizzi, and Angeliek van Hout

1. Introduction

The recent surge of interest in long-distance wh-questions is inspired by questions about the acquisition of recursion (de Villiers, Kotfila & Roeper 2020), as well as novel insights in children's developing parser (Omaki, Davidson White, Goro, Lidz & Phillips, 2014). What is lacking in this discussion is a fine-grained analysis of computational complexity (Jakubowicz 2005): which factors render structures complex for children to acquire? The present study investigates long-distance wh-questions in French-speaking children, integrating two such factors: type of question (fronted wh-phrase versus wh-in-situ) and depth of embedding (one versus two embedded clauses).

2. Background

Omaki et al. (2014) investigated long-distance wh-questions, as in (1). Their hypothesis was that difficulties found in the interpretation of such sentences can be explained by sentence parsing. Earlier explanations were given in terms of the structural properties of long-distance questions (De Villiers, Roeper & Vainikka, 1990, a.o.). Omaki et al. tested English and Japanese. The reason for this is that those languages differ crucially in headedness: the order in English questions is main clause – embedded clause, whereas in Japanese the order is embedded clause – main clause. Their findings show that Japanese participants give mostly long-distance answers, whereas English participants prefer short-distance answers.

(1) Where did Lizzie tell someone that she was gonna catch butterflies.

Omaki explains this in terms of filler-gap strategies. They conclude that participants actively associate the wh-word with the first gap they encounter, regardless of the structural nature of the question. Whether the question started

out with a main clause, as in English, or an embedded clause, as in Japanese does not matter. What matters is the first gap that is encounter. Participants, according to Omaki et al. have a strong "fill-the-first-gap" strategy.

Lassotta, Omaki and Franck (2016) found the same strategy for French. They tested simple and 2-clause question in French. Children were only tested with wh-fronted questions, both for adjuncts and argument questions.

De Villiers et al. (2020) tested similar 2-clause questions. They hypothesized that the recursively embedded nature of these questions is the crucial factor. To test the importance of recursion, they added 3-clause questions (2). They found, not only that children preferred to answer embedded questions, but also that children's responses were more adult-like for 3-clause questions, than for the 2-clause ones.

De Villiers et al. propose that the recursive nature of the embedding makes these sentences easier to interpret, because the recursive syntactic facilitates the dependency between the gap and the first position of the sentence.[1]

(2) When did Mom think Dad said Billy got his train?

Hollebrandse and Van Hout (2015) also investigated 3-clause wh-questions (3). Contrary to De Villiers et al, they found that children often reduced 3-clause questions to 2-clause ones, omitting part of the information given in the original question. The experiment in this paper is an adapted version of the one in Hollebrandse and Van Hout (2015).

(3) What did the officer say the boy said his mom had in her hand?

3. Our study

This study compares wh-in-situ questions in French with wh-fronted questions. Examples are given in (4) and (5). The reason why we added wh-in-situ questions is the following: the wh-word is in the "gap" and so, it is clear to which clause the wh-word is associated with.

(4) Le policier a dit que le garçon a dit que sa maman avait quoi sur la main
    The officer said the boy said his mom had what in her hand?

(5) Qu'est-ce que le policier a dit que le garçon a dit que sa maman avait sur la main?
    What did the officer say the boy said his mom had in her hand?

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[1] Hollebrandse and Roeper (2007) proposed that the recursive structure of complement clauses facilitates passing on of propositional content to higher clauses. In this way, complement clauses are efficient. They call this the *Principle of Propositional Exclusivity*.

The wh-word could, in principle, be associated with all events mentioned in the sentence. There are four possibilities: what the boy said his mom had in her hand; what the woman really had in her hand; what the officer said that the woman had in her hand; and what the officer said the boy said his mom had in her hand. Adults gave in Hollebrandse and Van Hout (2015) only the latter answer. Hollebrandse and Van Hout (2015) proposed that children do not understand all the syntactic and semantic properties of recursive constructions.

Adding wh-in-situ might look odd, because at the interpretive level both kinds of derivations must end up with an operator variable structure at LF. In formal analyses, this interpretive uniformity is captured by assuming that the wh-word has moved in both cases to the first position, either overtly or covertly (Huang, 1982; May, 1985).

In spite of the interpretive uniformity, there is support for the view that wh-in-situ and wh-fronted are different. The support comes from language acquisition. Several researchers found that wh-in-situ is easier than wh-fronted in simple sentences (Jakubowicz, 2011; Bentea & Durrleman, 2013). Jakubowicz (2011) proposed the *Derivational Complexity Hypothesis*, which explains why wh-in-situ is less complex. She finds confirmation for this in an elicited production task. Though she also found that typically developing children (and SLI children) avoid producing wh-in-situ in embedded clauses of the kind we have tested.

4. Our predictions

We predict based on previous findings and of the idea of visibility of the "gap", that children are better in wh-in-situ questions, than they are in wh-fronted questions. With respect to the difference between 2- and 3-clause questions, it remains to be seen if the wh-in-situ helps in the interpretation of a complex question.

5. Participants

We tested 42 French-speaking Swiss children. Half of the participants were tested on wh-fronted questions (mean age: 9;0, range 7;2 – 10;0) and the other half on wh-in-situ (mean age: 9;5; range 8;10 – 9;8). Additionally, seventeen adults were tested. In contrast with the age of children tested in De Villiers et al (2020), we tested older children. Hollebrandse and Van Hout (2015) tested 3-clause questions. Hollebrandse, Hobbs, De Villiers and Roeper (2009) found that 3-clause questions involving belief reports are acquired after the age of 8.

6. The Experiment

The current experiment is modelled after the one in Hollebrandse and Van Hout (2015). In fact, the experiment was a 3-clause variant of the De Villiers and Pyers' (2002) *Memory for Complements Task*, which only tests 2-clause sentences. We used a question-after-story design (De Villiers and Roeper, 1996;

De Villiers. Roeper and Vainikka, 1990). In all of these experiments, the reality is different from what someone else said. In the current experiment, the test sentence is a 3-clause question with a wh-word in first position. The core test questions are given in (6) and (7). Besides 3-clause questions, also 2-clause questions were tested (8).

(6) Qu'est-ce que le policier a dit que le garçon a dit que sa maman avait sur la main?
What did the officer say the boy said his mom had in her hand?

(7) Le policier a dit que le garçon a dit que sa maman avait quoi sur la main
The officer said the boy said his mom had what in her hand?

(8) Qu'est-ce que le garçon a dit que sa maman avait sur la main?
What did the boy say the mom had in her hand?

(9) Le garçon a dit que sa maman avait quoi sur la main?
The boy said that his mom had what in her hand ?

An excerpt of the experiment is given in (10). All stories are construed in the same way: they have a protagonist who calls up another protagonist telling something has happened. The second protagonist mishears the first protagonist – we used rhyming words for this- and then he assumes that it must have been something else, then what the final protagonist said. At the end, the story provides what really happened. The reality is different from all the other possible answers.

(10) Excerpt of the experiment (potential answers to the question are underscored)

Un garçon a appelé la police et a dit que sa maman a une coupure sur la main. « Quoi ! » dit policier, "Un garçon a dit que sa maman a des points de suture sur la main. C'est bizarre, ça devait être des piqures de moustique." Mais regarde, en fait c'est seulement du Ketchup.

English translation of the excerpt
The boy calls the police and says that his mom had a cut in her hand. "What!" said the police officer, "a boy said that his mom had a donut in her hand. That's weird. It must have been a mosquito bite." But look it is really just Ketchup.

This design provided possible answers associated with all the different clauses. Given the story in (10), these possibilities are given in (11).

(11)   The boy: *une coupure* 'cut'
              What did the boy say his mom had in her hand?
      The officer about the boy: *des points de suture* "stitches"
              What did the officer say the boy said his mom had in her hand?
      The officer: *des piqures de moustique* 'mosquito bite'
              What did the officer say the mom had in her hand?
      Reality: "Ketchup"
              What did the mom have in her hand?

Participants were presented with ten items. After each item a 3-clause question was asked, as well as a 2-clause one. The –clause questions were equally divided between the first two protagonists (the mom and the boy in (10)). All questions were argument questions.

Additionally, we tested working memory by conducting a digit span forward and backward. This measure will give us insight to what extent the memory load is a factor in the interpretation of these kind of questions.

7. Results

Figure 1 shows the child responses in accuracy both wh-fronted and wh-in-situ in 3- and 2-clause sentences. The adults were at ceiling.
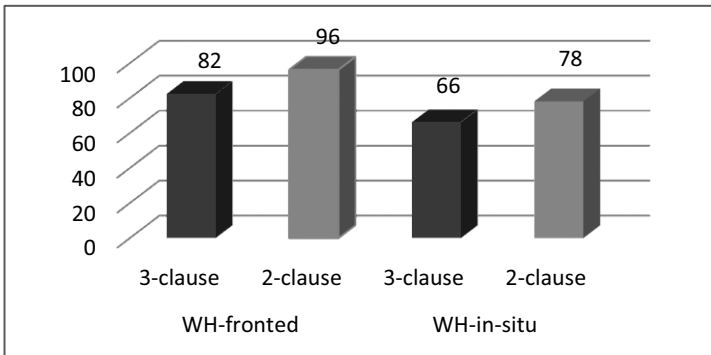

Figure 1. Child responses in percentages (accuracy)

These results show that child-participants were more accurate at wh-fronted than at wh-in-situ. Moreover, the children were also better at 2-clause sentences, than at 3-clause ones. An analysis of variance shows significant effects for NUMBER-OF-EMBEDDINGS (ANOVA $F(1,20) = 11$; $p = .004$) and for PLACE-OF-WH (ANOVA $F(1,20) = 20$; $p < .001$). There was, as expected, no interaction between the two effects.

There was no effect of working memory on the results of the wh experiment.

8. Discussion: Two possible analyses

The two main findings are: 1. children were more accurate on wh-fronted questions, than on wh-in-situ ones; 2. children were better at 2-clause questions, than at 3-clause ones.

The results, we found, are rather puzzling with respect to previous findings and with respect to our expectations. We expected, based on earlier work of wh-in-situ in main clauses (Jakubowicz, 2011; Bentea & Durrleman, 2013), that wh-in-situ in embedded clauses might also give an advantage to the child. Though Jakubowicz also found that typically developing children (and SLI children) avoid producing wh-in-situ in embedded clauses of the kind we have tested. We also hypothesized that wh-in-situ would be easier, because the wh-word would make the gap or the associated clause visible. However, we did not find that wh-in-situ are easier than wh-fronted questions. On the contrary. we found that wh-in-situ in embedded clauses does not give an advantage in interpreting questions. In fact, the wh-in-situ is harder. If we compare data on simple clauses and on complex sentences, we thus observe an intriguing reversal: children prefer wh in situ over wh movement in simple clauses, and wh movement over wh in situ in complex sentences. Why should it be so?

In her complexity metric, Jakubowicz (2011) states that non-movement is preferred over movement. Above we observed that the issue is more complex because in both cases movement (overt or covert) is taking place to create an operator-variable structure at LF. But it could still be the case that covert movement is preferred over overt movement in simple clauses because the two kinds of movements could be of a different nature. It has been proposed that overt wh-movement is phrasal, whereas covert movement is feature movement Chomsky (1995) (see Pesetsky (2000) for a more complex picture). This actually gives us a finer-grained version of the Derivational Complexity Hypothesis: feature movement would be the most minimal type of movement (as it would not involve any kind of pied-piping) and therefore, if a language allows such movement as an option, it would be preferred by the children.

The observation that wh-in-situ is feature movement and therefore easier, does not explain our finding that wh-in-situ in embedded clauses is harder. Let's explore the difference between feature and phrasal movement in the light of an intervention analysis. Feature movement makes different predictions for what counts as an intervener, than phrasal movement. The relevant configuration of the wh-in-situ question we used (9) is given in (12).

(12) [$_{CP}$ … Le garçon a dit [$_{CP}$ que sa maman avait quoi sur la main?
　　　+WH　　　　　　　　+C　　　　　　　　+WH

If the configuration in (12) is the right one, then it could be that the +C-feature on the complementizer *que* is a potential intervener for the +WH-feature, because C-features and WH-features have much in common. For one, they both like to be in the left-periphery of the clause, potentially, having a strong preference for the C^0 position.

Nevertheless, we have to make a critical note here. By proposing, that +C is an intervener for +WH, we are stating that they are largely alike. We run the risk of proposing that children do not really distinguish between declaratives and questions. Given the age of participants, this is untenable. This feature-analysis needs to be more fine-grained.

Consider the following refinement: the +WH feature is associated with the +C feature, the latter expressing the fact that the landing site of movement is the C-system. Then, an intervening +C element (like *que* in (12)) partially overlaps with the featural specification +WH, +C, a state of affairs which is claimed to be problematic for children in Friedmann et al. (2009) (see Rizzi 2018 for a recent assessment of the approach). Successive cyclic movement of the wh-element in cases like (8) would not be similarly problematic because it is phrasal movement that is involved, so that we would not expect adverse effects from an intervening head if specifications of phrases and of heads do not give rise to Relativized Minimality effects, as in the original formulation (Rizzi 1990: phrases interact with phrases and heads interact with heads). This refinement is consistent with the fact that children distinguish between questions and declaratives. It still raises an age problem, though: in the age range considered here (around age 9), the partial overlap of intervening featural specification in the sense of Friedmann et al. (2009) should have ceased to be problematic.

Further refinements come to mind, but let us explore another difference between phrasal and feature movement. For feature movement, it is plausible that a feature does not move successive cyclically, but rather it moves in one "fell swoop" to its final destination. This is suggested, e.g., by the fact that quantifier scope (arguably an instance of feature movement) tends to be clause-bound (May 1985); theoretically, this property of feature movement may be derived from the fact that, once the feature moves to a given target, it cannot "excorporate" from it and continue to move alone, whereas a phrase in a Spec position can continue to move indefinitely. So, in case of a complex sentence, a one-step long-distance movement for features –rather than the successive cyclic movement for phrases-would raise the memory load considerably, because the whole structure including the main and the embedded clause should be held in operative memory to make the long one-step feature movement possible. This could explain why children prefer wh-fronted, over wh-in-situ in complex sentences: in this context cyclic movement, which can proceed in a sequence of local steps, is less demanding than wh-in-situ, (we do not discuss here how the two kinds of movement interact with Phase Theory, in the sense of Chomsky (2001)).

This analysis potentially explains the other finding, namely children are better in 2-clause questions, than in 3-clause questions. The distance in 3-clauses questions is bigger, than in 2-clause ones. So, the feature movement for the 3-clauses would determine a heavier memory load. However, we would expect, for this analysis, to find a correlation between the wh-in-situ data and short-term memory. Recall, that we did not find such a correlation between the digit span data and the wh-in-situ responses. The lack of a memory effect suggests that the differences in the findings are not due to memory difficulties, or that digit span measures do not properly tap on the memory problems we are interested in here.

In this connection it should be noticed that Digit Span might not be the most useful memory task for wh-movement. Digit Span mostly measures the memory need to recall strings, which could be quite distinct from the memory needed for dependencies in hierarchically organized syntactic structure.

9. Conclusion

We predicted that wh-in-situ in embedded clauses would make long-distance questions easier to understand than wh-fronted questions. That prediction was not borne out: French speaking children understood complex sentences with wh-movement better than their in situ counterparts. We proposed two analyses to explain this. The two analyses have in common that they are built on a difference between wh-in-situ and wh-fronting. Wh-in-situ involves feature-movement and wh-fronting phrasal movement. The two analyses differ in that the first one makes use of structural intervention and the second one of memory loads.

We started this paper with contrasting two earlier studies, De Villiers et al (2020) and Omaki et al (2014). Our first analysis is in terms of intervention effects, which can indirectly be seen as going in the direction of De Villiers et al (2020), since the analysis is in terms of structural properties of recursively embedded CPs. Our analysis diverges from De Villiers et al. though, since we found that depth of embedding makes the structure more difficult.

The second analysis is based on the idea that feature-movement takes place in one "fell swoop", whereas phrasal movement happens (successive) cyclically. This shares elements with both Omaki et al. (2014) and De Villiers et al (2020). Our results are consistent with De Villiers et al (2020)'s assumption that the dependency between the gap and first position of the sentence crucially makes use of cyclicity, i.e., it makes use of the intermediate CP-layers. Our results also go in the direction of Omaki et al (2014), because we found that wh-in-situ is harder to interpret in complex structures, and 3-clause configurations are harder than 2-clause configurations. Our analysis in terms of non-cyclic movement for wh-in-situ immediately predicts a heavier memory load for this case, consistently with Omaki et al.'s approach.

In conclusion, we have found an interesting discrepancy between wh-in-situ in embedded clauses and main clauses. We have sketched out two analyses, one in structural terms of intervention, and the other one in terms of memory load, leaving open, for the time being the issue of choosing between them or, possibly, combining them in part.

References

Bentea, Anamaria and Durrleman, Stéphanie. 2013. A'-dependencies in French: A study in L1 acquisition. In: Sergio Baauw, Frank Drijkoningen, Luisa Meroni and Manula Pinto (Eds.). *Romance Languages and Linguistic Theory 2011, Selected papers for 'Going Romance'*. John Benjamins Publishing Company: Amsterdam: 1-16.

Chomsky, Noam. 1995. *The Minimalist Program*. The MIT Press, Cambridge, Mass.

Chomsky, Noam. 2001. Derivation by Phase. In: Michael Kenstowicz (Ed.). *Ken Hale, A life in language*. M.I.T Press, Boston: 1-52.

De Villiers J., Kotfila J., Roeper T. (2020) When Is Recursion Easier for Children?. In: Guijarro-Fuentes P., Suárez-Gómez C. (eds) New Trends in Language Acquisition Within the Generative Perspective. Studies in Theoretical Psycholinguistics, vol 49. Springer, Dordrecht: 239-256. https://doi.org/10.1007/978-94-024-1932-0_10

De Villiers, Jill & Roeper, Tom. 1996. 'Questions after Stories: On supplying context and eliminating it as a variable'. In: Dana McDaniel, Cecile McKee & Helen Smith Cairns (Eds.). Methods for Assessing Children's Syntax. M.I.T. Press, Cambridge, 163-187.

De Villiers, Jill, Roeper, Tom and Vainikka, Ann. 1990. The acquisition of long-distance rules. In: Lynn Frazier and Jill de Villiers (Eds.), *Language Processing and Language Acquisition,* Kluwer, Dordrecht: 257-297.

Friedmann, Naama, Belletti, Adriana and Rizzi, Luigi. 2009. Relativized relatives: Types of intervention in the acquisition of A-bar dependencies. *Lingua* vol 119:1, 67-88.

Hollebrandse, Bart and Van Hout, Angeliek. 2015. Comprehension and production of double embedded structures: A kindergartenpath in long-distance dependencies in Dutch school-aged children? In: C. Hamann & E. Ruigendijk (Eds). Language Acquisition and Development: Proceedings of GALA 2013. Newcastle upon Tyne: Cambridge Scholars Publishing, 190-204. Huang 1982. *Logical Relations in Chinese and the Theory of Grammar.* PhD dissertation, MIT.

Hollebrandse, Bart and Roeper, Tom. 2007. Recursion and propositional exclusivity, talk at Recursion in Human Languages conference, University of Illinois, Normal, Illinois, April 27 – 29.

Jakubowicz, Celia. 2011. Measuring derivational complexity: new evidence from typically developing and SLI learners of L1 French. *Lingua* 121: 339–351.

Lassotta, Romy, Omaki, Akira and Franck, Julie. (2016). Developmental changes in misinterpretation of garden-path wh-questions in French. *The Quarterly Journal of Experimental Psychology*, vol 69:5, 829-854.

May, Robert. 1985. *Logical Form Its Structure and Derivation*. M.I.T. press: Cambridge.

Omaki, Akira, Davidson White, Imogen, Goro, Takuya, Lidz, Jeffrey and Phillips, Colin. 2014. No Fear of Commitment: Children's Incremental Interpretation in English and Japanese Wh-Questions, Language Learning and Development, 10:3, 206-233, DOI:10.1080/15475441.2013.844048

Rizzi, Luigi. 1990. *Relativized Minimality*. MIT Press: Cambridge, Mass.

Rizzi, Luigi. 2009. Relativized Relatives: Types of intervention in the acquisition of A' dependencies, *Lingua* 119 (2009) 67-88.

Rizzi, Luigi. 2018. Intervention effects in grammar and language acquisition. *Probus*, 30(2): 339–367.

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