LF *Wh*-movement and its Locality Constraints in Child Japanese

Abstract

In natural languages, the mapping from surface form to meaning is often quite complex, and hence the acquisition of this phenomena at the boundary between syntax and semantics has been one of the central issues in current acquisition research. This study addresses the issue of whether children have adult-like knowledge about LF *wh*-movement and its locality constraints. The results of my experiment demonstrate that knowledge about these properties is already in the grammar of Japanese-speaking preschool children. These results corroborate the findings of previous acquisition research on overt *wh*-movement that even preschool children conform to locality conditions on movement. This finding supports the continuity hypothesis (e.g. Crain & Thornton 1998) from a new perspective, in that the relevant movement occurs in the LF component and hence is invisible in the input children receive.

1. Early Emergence of Locality Constraints on Overt *Wh*-movement

An impressive number of studies on child language within the generative framework argue that children's linguistic knowledge conforms to the continuity hypothesis, which states that the course of acquisition is constrained by innate principles of UG from virtually the very beginning of life.[1] One important source of evidence for this hypothesis has been the early mastery of locality constraints on overt *wh*-movement. For example, Otsu (1981) demonstrated that English-speaking children have knowledge of the Complex NP Constraint (Ross 1967), by showing that children exclude overt *wh*-movement from a relative clause as in (1) as soon as they become able to use relevant lexical items and structures:

(1) *What$_1$ is Jane drawing a monkey [that is drinking milk with t_1]?

Similarly, de Villiers, Roeper, & Vainikka (1990) revealed that long-distance *wh*-movement in child English obeys the *Wh*-island Constraint (Chomsky 1973): They found that, when presented

1. See Crain & Thornton (1998) for a detailed summary.

with the sentence in (2), children associate the *wh*-phrase *how* with the matrix verb *ask*, not with the verb *paint* in the embedded infinitival *wh*-clause.

(2) How did the girl ask [who to paint]?

In contrast to the acquisition of overt *wh*-movement and its constraints, few studies have looked at children's knowledge of LF *wh*-movement and its locality restrictions, despite the fact that theoretical investigations into these properties have been playing a significant role in formulating the overall architecture of UG.[2] In light of this background, this study attempts to provide evidence that the grammar of Japanese-speaking children conforms to a certain locality principle on LF *wh*-movement, thereby supporting the continuity hypothesis from a new perspective.

2. LF *Wh*-movement and its Locality Constraints in Japanese

Languages like Japanese do not have obligatory overt *wh*-movement, and allow their *wh*-phrases to appear in-situ, as illustrated by the Japanese examples in (3).

(3) a. Ken-wa [Hanako-ga nani-o katta to] iimasita ka?
Ken-TOP Hanako-NOM what-ACC bought that said Q
'What did Ken say that Hanako bought *t*?'

b. Ken-wa [Hanako-ga naze sono hon-o katta to]
Ken- TOP Hanako-NOM why that book- ACC bought that
iimasita ka?
said Q
'Why did Ken say [that Hanako bought that book *t*]?'

Children acquiring Japanese seem to know about this absence of overt *wh*-movement before the age of three, as suggested by the following representative utterances from the CHILDES database (MacWhinney 2000).

2. See Richards (2008) and Watanabe (2003) for an overview.

(4) Examples from Tai corpus (Miyata 2004):

a.	*CHI:	Otoosan	doko	itchatta ?		
		father	where	gone		
		'Where did the father go?'				(2;04)
b.	*CHI:	kore	nande	katazukeru	no ?[3]	
		this	why	put-away	Q	
		'Why do (we) put this away?'				(2;10)

(5) Examples from Jun corpus (Ishii 2004):

a.	*CHI:	kore	torakku	nani	noseten	no ?
		this	autotruck	what	carrying	Q
		'What is this autotruck carrying?'				(2;10)
b.	*CHI:	taiya-ga	nande	haitten	no ?	
		tire- NOM	why	be-in	Q	
		'Why is the tire in (this)?'				(2;11)

A seminal work by Huang (1982) revealed that, even in *wh*-in-situ languages like Chinese and Japanese, certain adjunct *wh*-phrases seem to obey the locality constraints that restrict overt *wh*-movement in languages like English.[4] For example, the *wh*-phrase *why* in English cannot move out of a complex NP or out of an adjunct clause: The sentences in (6), which are superficially acceptable, do not permit the interpretation in which *why* is associated with the relative clause or with the adjunct clause. The corresponding Japanese examples in (7), in which *naze* 'why' appears in-situ and is located within these types of embedded clauses, are simply ungrammatical.

(6) a. * Why did Hanako hire the person [that Ken met *t*]?

b. * Why did Hanako leave [before Ken came *t*]?

(7) a. * Hanako-wa [Ken-ga naze atta] hito-o yatoimasita ka?
Hanako-TOP Ken-NOM why met person-ACC hired Q

3. *Nande* is a colloquial form of *naze* 'why'. See Fujii & Takita (2007) for a detailed discussion.
4. Apparently, argument *wh*-phrases in Chinese and Japanese are not constrained by locality principles. For approaches to this problem, see Hagstrom (1998), Nishigauchi (1990), Richards (2000), Tsai (1994), and Watanabe (1992), among many others.

b.	* Hanako-wa	[	Ken-ga	naze	kuru	maeni]	kaerimasita		ka?
	Hanako-TOP		Ken-NOM	why	come	before	left		Q

In order to account for the parallel behavior between (6) and (7), Huang (1982) proposed that, despite their apparent in-situ behavior, the adjunct *wh*-phrases in Chinese/Japanese that correspond to *why* in English must undergo movement to their scope position in the LF component, and hence their distribution is constraint by the same locality principle that restricts the overt *wh*-movement of the corresponding phrases.

Huang (1982) and Lasnik & Saito (1992) proposed that the relevant constraint is the Empty Category Principle (Chomsky 1981), which crucially relies on the notion of 'government'.[5] These analyses cannot be maintained in their original forms within the current minimalist framework, which abandoned 'government' due to the lack of conceptual necessity (Chomsky 1995). Even though a minimalist reformulation of the constraint that rules out (6) and (7) does not seem to be achievable at the current stage of syntactic research, the fundamental part of their proposal, that the relevant restriction is a reflection of UG, has not been challenged. So, we can still expect that the relevant locality condition emerges very early in children's grammar, no matter what the correct characterization of this constraint is.

In an example such as (8), the effects of LF *wh*-movement and its associated principle are reflected not in its grammaticality but in its possible interpretation.

(8)	Naze	Ken-ga	kuru	maeni	Hanako-wa	kaerimasita			ka?
	why	Ken-NOM	come	before	Hanako-TOP	left			Q

This example differs from (7b) in two respects: Given the free word-order property of Japanese, the adjunct clause is located in front of the matrix subject, and the adjunct *wh*-phrase appears at the edge of the sentence. The sentence is grammatical, but its interpretation is restricted: This question can only be used to ask the reason of Hanako's leaving, but not the reason for Ken's visit. Each of these interpretations should stem from the surface representations shown in (9).

5. Fukui (1988) casts doubt on these ECP approaches, and suggests that the relevant locality requirement is Subjacency.

(9)	a.	Naze	[	Ken-ga	kuru	maeni]	Hanako-wa	kaerimasita	ka?
		why		Ken-NOM	come	before	Eri-TOP	left	Q
	b.	[Naze		Ken-ga	kuru	maeni]	Hanako-wa	kaerimasita	ka?
		why		Ken-NOM	come	before	Hanako-TOP	left	Q

In (9a), the *wh*-phrase *naze* is an element of the matrix clause and is associated with the VP headed by *kaerimashita* ‘left’, while in (9b), *naze* is contained in the adjunct *before*-clause and is associated with the VP headed by *kuru* ‘come’. Even though the sentence in (8) is potentially ambiguous between the surface structure (9a) and the one in (9b), the latter representation is excluded by the LF movement of *naze*: This adjunct *wh*-phrase must move out of the adjunct clause in LF to the matrix specifier of CP, and this covert movement leads to a violation of the same locality restriction that rules out (6b) and (7b). The *wh*-phrase *naze* can never be located inside the adjunct clause, and as a consequence, the sentence in (8) cannot be interpreted as a question asking the reason for Ken’s visit.

Since the interaction of LF *wh*-movement and its locality constraints determines the possible interpretation of sentences like (8), we can address the question of whether Japanese-speaking children have knowledge of these properties by investigating how they comprehend these sentences: If preschoolers consistently exclude the interpretation which stems from the structure as in (9b) (despite the fact that they allow *wh*-phrases to appear in-situ as suggested by (4) and (5)), this would indicate that knowledge of LF *wh*-movement and its locality conditions are already in their grammar. The experiment reported in the next section was designed to provide such evidence.

3. Experiment

The subjects were thirty-seven Japanese-speaking children, ranging in age from 3;10 to 6;05 (mean age: 5;01). Each subject was presented with two target trials, one warm-up, and one filler trial. In each trial, a child was told a story, which was accompanied by a series of pictures presented on a laptop computer. At the end of each story, a puppet posed two questions about the story to the child. The task for the child was to answer these questions.

One of the target trials is presented in (10). After the story, the puppet asked the questions given in (11) and (12) in a pseudo-random order.

(10) This is a story about a small frog and his mother. When the mother came back home from shopping for dinner, she found her son's baseball equipment at the front door. Since she had seen her son's stuff, the mother thought that her small frog had already come back home. She thought that he had come back because he had gotten very hungry.

The small frog was sitting at the dining table. He said, "I played baseball a lot today, and I am very hungry. Can I have my dinner right now?" His mother told him, "You must have got very dirty, so you should take a bath before the dinner." The frog went to the bath, and cleaned himself up. After the bath, the frog enjoyed the wonderful dinner his mother had made for him.

(11) Naze gohan-o taberu maeni kaerusan-wa ofuro-ni
why meal-ACC eat before frog-TOP bath-DAT
hairimasita ka?
entered Q
'Why did the frog take a bath before having a dinner?'

(12) Naze kaerusan-ga kaettekita to okaasan-wa
why frog-NOM came-back COMP mother-TOP
omoimasita ka?
thought Q
'Why did the mother think that the frog had come back home?'

The question in (11) is of the type given in (8), and is potentially ambiguous with respect to the structural position of *naze*. However, if children already have knowledge of LF *wh*-movement and its locality restriction, they should never locate the adjunct *wh*-phrase inside the *before*-clause. Therefore, children should interpret (11) only as a question asking the reason why the frog took a bath, and not as a question asking the reason why the frog had the dinner. Given the story in (10), we expect that children should answer "Because the frog got very dirty," and not "Because he was very hungry."

It should be noted that the linear order of the adjunct-clause predicate and the

matrix-clause predicate may increase the chances of getting the adjunct-clause interpretation of *naze*. For example, according to Aoshima et al. (2004), Japanese-speaking adults preferentially attach the fronted *wh*-dative NP to the embedded-clause predicate, which suggests that the parser generally attaches a structurally ambiguous *wh*-phrase to the first position that can integrate that phrase, in order to assign an interpretation. Consequently, it seems reasonable to expect that *naz*e would be preferentially attached to the first complete proposition, namely to the adjunct clause. If children disprefer the (potentially more parser-friendly) adjunct-clause interpretation of *naze*, then this would argue for the view that the grammatical constraint indeed plays a role here.[6]

There is an alternative possibility to be taken into account, however. Even if children answer in the way we expect, this may be just a reflection of children's preference for interpreting the sentence-initial *wh*-adjunct as an element of the matrix clause (due to processing reasons). The question in (12) is included to evaluate this possibility. This sentence is structurally ambiguous with respect to the syntactic position of *naze*, as shown in (13).

(13)	a.	[Naze	kaerusan-ga	kaettekita	to]
		why	frog-NOM	came-back	COMP
		okaasan-wa	omoimasita	ka?	
		mother-TOP	thought	Q	
	b.	Naze [	kaerusan-ga	kaettekita	to]
		why	frog-NOM	came-back	COMP
		okaasan-wa	omoimasita	ka?	
		mother-TOP	thought	Q	

In (13a), *naz*e is part of the complement *that*-clause, and the sentence is interpreted as a question asking the reason why the frog came back in the mother's mind. On the other hand, in (13b), *naz*e is located in the matrix clause, and the sentence is interpreted as a question asking the reason why the mother got the idea that her son had already come home. Since a complement *that*-clause is not an island and does not prohibit LF *wh*-movement out of it, the structure in (13a) is permitted, in addition to (13b). If children indeed prefer to interpret the sentence-initial *wh*-adjunct as an element of the matrix clause, this preference should also be observed with the question in (12) as

6. I thank an anonymous reviewer for bringing this point to my attention.

well: They should tend to assign the structure (13b) to (12), and consequently tend to answer "Because the mother found the baseball equipment."

The test sentences as in (11) and (12) were carefully pronounced with a neutral intonation, in order to avoid biasing children toward a certain interpretation.

The results were as follows. When presented with sentences like (11), children always interpreted *naz*e as an element of the matrix clause, and answered "Because the frog got very dirty" 98.6% of the time (73 out of 74 trials). In contrast, with respect to sentences like (12), two types of answers were observed to an equal extent: The answer "Because the mother found the baseball equipment", which stems from the matrix interpretation of *naze*, was observed 36.5% of the time (27 out of 74 trials), and the answer "Because the small frog got very hungry", which stems from the embedded interpretation of *naze*, was observed 44.6% of the time (33 out of 74 trials).[78] These results indicate that children always interpret *naze* as outside an island, even though they do not have a strong preference to interpret *naze* as part of the matrix clause. This finding suggests that knowledge of LF *wh*-movement and its locality principle is already in the grammar of Japanese-speaking preschool children, thereby forcing them to locate the adjunct *wh*-phrase outside an island in the case of sentences like (11).[9]

In order to determine whether there is any possibility that children learned the relevant locality principle from the input, I analyzed the child-directed speech in three corpora (Aki, Ryo, and Tai) available in the CHILDES database (Miyata 2004a, 2004b, 2004c). The number of sentences involving *naze* or *nande* produced by the mother was as follows: 0 in the Aki corpus, 10 in the Ryo corpus, and 186 in the Tai corpus. Even though child-directed utterances involving *naze* or *nande* were observed reasonably often in the Tai corpus, only two of them clearly contained an embedded clause. Thus, it would be fair to conclude that bi-clausal sentences with

7. With respect to sentences like (12), 14 out of 74 trials (18.9%) were "I don't know"-type answers, which came from 12 children. Such answers were never observed with sentences as in (11). I speculate that this contrast may have stemmed from the fact that the former sentence does not contain an island and hence is truly ambiguous: This ambiguity may have confused children about what to answer.

8. Among the 25 children who answered both of the control sentences as in (12), 8 children provided a matrix response to both, 10 children provided an embedded response to both, and the remaining 7 children provided one embedded and one matrix response. All of these three groups varied in age, and hence no clear developmental pattern was observed.

9. Building on a previous study (Sugisaki 1999), Kabuto (2007) provides evidence that Japanese-speaking children are able to distinguish between *naze* 'why' and *dooiu riyuu-de* 'for what reason': In adult Japanese, the latter can appear within an island, and Kabuto demonstrated that Japanese-speaking preschool children know this island-insensitive behavior of *dooiu riyuu-de*.

naze are extremely rare in child-directed speech, which suggests that there is little possibility that children could learn the relevant constraint directly from the input.

One potential problem remains, however. In the experimental stories, the answer that stems from the structure placing *naze* within the adjunct clause is too obvious: For example, in (11), the relevant answer was that the fog ate dinner because he was hungry. In contrast, the answer that stems from the structure locating *naze* in the matrix clause is much more pertinent to the events portrayed in the story and hence is more likely to be asked. Together, the experimental context could have biased children towards the matrix interpretation of the test sentences as in (11), independently of the structural property of these sentences. A revised experiment in which the content of the clauses is reversed would be necessary to exclude such an alternative interpretation of the results, which I have to leave for future research.[10]

4. Conclusion

In natural languages, the mapping from surface form to meaning is often quite complex, despite the fact that data which directly indicate how this mapping is achieved is largely unavailable to children. Thus, the acquisition of this phenomena residing at the boundary between syntax and semantics has been one of the central issues in current acquisition research. However, these studies on the acquisition of LF properties have mainly focused on children's knowledge of quantification, negation, and the scope interactions between them (e.g. Musolino 1998, Gualimini 2005, Goro 2007, Syrett & Lidz 2011). In light of this background, this study looked at children's knowledge of LF *wh*-movement and its locality constraints. Our experimental results suggested that the knowledge of these properties is already in the grammar of Japanese-speaking preschool children. These results corroborate the findings of previous acquisition research on overt *wh*-movement that even preschool children conform to the locality conditions on movement. This finding supports the continuity hypothesis from a new perspective, in that the relevant movement occurs in the LF component and hence is invisible in the input that children experience.

10. An anonymous reviewer points out another potential problem in the experimental design: The target sentence in (11) and the control condition in (12) do not form a minimal pair, in that (11) lacks an overt subject in the adjunct clause while the embedded clause in (12) does not. Even though I am not sure how this difference could affect the obtained results, I agree that such a difference should be maximally avoided, which I also have to leave for a future experiment.

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