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ABSTRACT

This study views structure-dependence as a Universal Grammar (UG) principle and explores how and why children are able to attain the target grammar, in this case, the subject-auxiliary inversion rule. The hypothesis was tested that second language (L2) acquisition is guided by UG. In other words, L2 learners also adopt the structure-dependent yes/no question formation rule as in L1 acquisition. Japanese learners of English in Grade 9 completed a training session in relative clause structure, were tested on recognition and use of relative clauses, and then were tested for their preference for structure-dependent versus structure-independent versions of the question formation rule. Seven of 11 subjects employed the structure-dependent rule, and three other subjects did not make structure-independent errors. Results support the hypothesis that L2 learners are guided by a UG principle in dealing with the yes/no question formation. (JP)

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Structure-Dependence in Second Language Acquisition*

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1. Introduction

One of the central problems in a theory of language acquisition is how to fill the gap between the linguistic input children receive and the grammar they eventually attain, observed as adult grammar. While the linguistic competence of an adult is 'extremely intricate, complex, and subtle (White (in press)),' the input received by children is of rather poor quality and its nature is characterized in terms of 'poverty of the stimulus.' This question forms 'a logical problem of language acquisition,' summarized by White (*ibid.*) as follows:

> ... three problems with the input are often discussed: (i) input underdetermines the final grammar, (ii) it is often degenerate, (iii) it does not contain negative evidence. For such reasons, language acquisition is often described in terms of a projection problem, or a logical problem, or a learnability problem; that is, there is a mismatch between primary linguistic input and the system actually attained.

Given this problem, a theory of language acquisition must then account for how children are at all able to reach the target grammar, and why they do so the way they do. A solution offered by generative grammar states that children are endowed with Universal Grammar (UG) which constrains the form of grammar and that they eventually attain the adult grammar with the aid of UG and through interaction with the linguistic input.

The present study takes up structure-dependence as one such UG principle, and explores how and why children are able to attain the target grammar, in this case, the subject-auxiliary inversion rule.

What makes it particularly intriguing is the claim we make that learners of English as their second language (L2), as well as children acquiring it as their first language (L1) follow the same path; UG plays a role in acquiring the rule of grammar. This leads us to claim that there is virtually no difference between L1 and L2 as far as structure-dependency is concerned.

2. Structure-dependence and L1 acquisition

2.1. Structure-dependence

Structure-dependence (or -dependency) is sometimes referred to in the literature to account for the constraints of UG for mediating language acquisition (*e.g.* Chomsky (1986); Rutherford (1987); Cook (1988)).[1] Consider the following pairs of simple sentences and their corresponding questions (yes/no questions).

(1) John is happy.
(2) Is John happy?
(3) The girl can swim.
(4) Can the girl swim?

How can one state the rule that relates (1) to (2), and (3) to (4)? As

far as these pairs are concerned, we have three possibilities R1-3 apparently compatible with these examples.

[R(ule) 1] Interchange the first and second words of the sentence.
[R2] Prepose the first verbal element (elements like *is* , *can*) to the front of the sentence.
[R3] Prepose the first verbal element following the subject noun phrase to the front of the sentence.

How well do Rules 1-3 work with the examples above? R1, applied to (3), produces an ungrammatical sentence (5) and so fails to qualify as the rule governing this transformation.

(5) *Girl the can swim?[2]

Since the remaining two (R2 and R3) cannot be differentiated with the examples (1) to (4), let us take up somewhat more 'complex' examples. A 'complex' example here means one with an embedded clause. Consider

(6) The boy who is tall can swim fast.

where *who is tall* is an embedded clause, and one can find two occurrences of 'verbal elements (auxiliaries).' On (6), R2 produces (7), which is ungrammatical, and thus this tentative rule is judged to be a false generalization dealing with question formation.

(7) *Is the boy who tall can swim fast?

R3 on the other hand produces a grammatical question (8), and one is led to see that this rule consistently produces the correct questions whether the given sentence is simple or complex.

(8) Can the boy who is tall swim fast?

The question now to ask is: What differentiates R3 from the other foregoing rules? The crucial difference is that R3 alone refers to a syntactic concept, a subject noun phrase (a subject NP) or a main clause incorporating the subordinate relative clause, but that the other rules (R1 and R2) do not. Given (9) as the structural description of a sentence (8), one can conceive a subject as the NP immediately governed by sentence (S).

(9) S -> NP AUX VP, NP -> NP S'

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[ [the boy [who is tall]][{can}[swim fast]]]
S  NP       S'             AUX  VP
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On the other hand, Rules 1-2 refer to the linear order of the elements involved (as seen in 'the first or second words') or to a syntactic category (as observed in 'the verbal element'), and do not employ any syntactic concept. To always produce the right question from the declarative, whether simple or complex, it is thus necessary to know not only the syntactic category of the words involved, but also their structural relationships within the sentence.

R3 then is structure-dependent in the sense that the rule refers to the

structure of the sentence on which it operates, and the property of the rule is described as structure-dependence, whereas Rules 1-2 are characterized as being structure-independent.

2.2. Struture-dependence in L1 acquisition

Which rule do children acquire in the course of language acquisition? Do they go piecemeal from one rule to another among R1-3 above? Or do they employ only one specific rule to the exclusion of all others right from the outset? The theory of UG states that the property of structure-dependence need not be learned; it is innately given. After being exposed to data including a simple pair of examples such as (1) and (2), and after once thereby learning the correspondence between a declarative sentence and its question, children directly acquire R3, and not through R1 or R2. What matters in manipulating yes/no question formation with examples like (6) is whether or not children have acquired the relative clause structure. Once they have, they are now ready to deal unerringly with (6) turning it into (8); they assign to (6) the structure (9) thereby making an appropriate question (8) in just the same manner as they did with simple examples like (1-2) and (3-4). To summarize, given a UG principle (10 i), what children need to have is a simple set of data (10 ii) and knowledge of the relative clause structure (10 iii).[3]

(10) i. a UG principle: grammar formation be in systactic terms
ii. data on question formation: correspondence between a declarative and its question (*e.g.* (1) & (2))
iii. knowledge of the relative clause structure: NP -> NP S'

(10 i) guides children to select the correct rule R3 without ever attempting to apply R1 or R2 in dealing with (6), converting it to (8).

2.3. Crain and Nakayama (1987)

Crain and Nakayama (1987, C&N for reference, henceforth) put this issue to an empirical test in an experiment with English-speaking children and tested the acquisition scenario offered by generative grammar and the UG-based language acquisition theory.

Since their study is the closest in format and design to ours, we shall note the points made by C&N in some detail. They created a situation that made it natural to describe and ask about characters (dolls) and designed a way to elicit questions from the original declarative using a schema like (11) yielding an eliciting device (12).

(11) Ask Jabba if _____.
(12) Ask Jabba if *the boy who is watching Mickey Mouse is happy* .

The experiment included a pretest to ensure that children could handle the task of question formation itself with simple sentences (13a-c). Each of the test sentences (14a-f) had a relative clause, which made another occurrence of an auxiliary within each sentence.

(13) a. The girl is tall.
b. The man is tired.
c. The pig next to the tree is red.

(14) a. The dog that is sleeping is on the blue bench.

(14) b. The ball that the girl is sitting on is big.
c. The boy who is watching Mickey Mouse is happy.
d. The boy who is unhappy is watching Mickey Mouse.
e. The boy who is being kissed by his mother is happy.
f. The boy who was holding the plate is crying.

The subjects participating in the experiment were children of the mean age 4;7 divided into two age groups: Group I (mean age 4;3), and II (5;3). Tables 1-2 summarize their results.

		GRAMMATICAL	UNGRAMMATICAL
G(roup) I	81	31(38%)	50(62%)
G II	87	70(80%)	17(20%)
Total	168	101(60%)	67(40%)

TABLE 1. Correct and incorrect responses by group.
(C&N, *op.cit.* :529)

SENTENCE	GI	GII	TOTAL
(14)a.	.62	.93	.78
b.	.50	.73	.62
c.	.20	.87	.53
d.	.67	.93	.81
e.	.20	.73	.47
f.	.17	.64	.42

TABLE 2. Proportion correct by sentence.
(C&N, *op.cit.* :530)

From the results which showed that there were some sentences that children, especially in GI, found it difficult to process, Crain and Nakayama judged the subjects of this experiment 'appropriate subjects for investigating the prediction that grammar formation is limited to structure-dependent rules, by examining the nature of their errors (C&N:529).'

Errors predicted and/or observed were classified into three types (15-17).

(15) *Is the boy who is being kissed by his mother is happy?
(16) *Is the boy that is watching Mickey Mouse, is he happy?
(17) *Is the boy that watching Mickey Mouse is happy?

(15) contains an extra occurrence of an auxiliary, referred to as a TYPE I or 'prefix' error. (16) is begun with a well-formed fragment of a question followed by another question with a PRO form, and this is termed a TYPE II or 'restarting' error. A TYPE II error has 'a look of a typical performance error by adults (C&N:530).' And (17), termed TYPE III, is predicted if children adopt a structure-independent rule R2 above. The distribution of the errors made by the children is shown in TABLE 3.

	TOTAL	TYPE I	TYPE II	TYPE III
G I	50(62%)	30(60%)	10(20%)	0
G II	17(20%)	9(53%)	5(29%)	0
TOTAL	67(40%)	39(58%)	15(22%)	0

TABLE 3. Types of errors by group.
(C&N, *op. cit.* : 530)

The absence of TYPE III errors strongly suggests that children did not adopt R1 or R2 in forming yes/no questions, but rather that they invariably adopted R3 which refers to the structural relationship of the elements within the sentence.[4]

3. Otsu and Naoi (1986): Structure-dependence in L2 acquisition

3.1. Hypothesis of the present study

As we have seen, the yes/no question formation rule is acquired by children with a UG constraint to the effect that grammar be learned with reference to syntactic knowledge of any sentences under analysis. Children are guided by principles of UG in acquiring rules of grammar, and the rules of grammar they adopt must be dependent on the structure of language. Faced with 'the logical problem of language acquisition,' children must attain grammars of a language, and in so doing, they have to choose one grammar to the exclusion of other possible grammars. The foregoing sections saw the children's adherence to the structure-dependent rule R3, right from the outset. Structure-independent candidates R1-2, do not have a place even though they appear computationally simpler.

Is this also the case with L2 learners? Do they also adopt the rule dependent on structure of language as in L1 acquisition? Or do they have their own learning strategies, such that deal specifically with the facts about English yes/no question formation?[5] This question leads to a specific hypothesis (18).

(18) **HYPOTHESIS**
L2 acquisition is guided by UG, *i.e.*, L2 learners also adopt the structure-dependent yes/no question formation rule as is the case with L1 acquisition.

3.2. Logic at work in the hypothesis

The hypothesis stated above involves three aspects of logic. The first assumption is that L2 acquisition does not differ from L1 acquisition. Second, L1 acquisition is mediated by a principle of UG, sturture-dependence (as shown by C&N). It follows as the third that L2 acquisition is also guided by structure-dependence as is the case with L1 acquisition. We could summarize these three aspects in (19 i-iii).

(19) i. L2 acquisition eqaul to L1 acquisition
ii. L1 acquisition guided by a UG principle, sturucture-dependence
iii. L2 acquisition also guided by a UG principle, sturucture-dependence as in L1

3.3. Experimental design

3.3.1. The training session and two kinds of Tests

An experiment was designed to see the empirical consequences of our hypothesis (18). Three steps were prepared. Step 1 was a training session intended to give the L2 learners knowledge of the relative clause structure itself. Step 2 was designed to test if the subjects were actually able to recognize and make use of the relative clause they were just introduced to. Step 3 was to see whether the subjects adopt structure-dependent version of the question formation rule (R3) or they adopt structure-independent versions (R1-R2). The design is represented as (20 i-iii).

(20) i. Step 1: Training session to introduce the subjects to the

relative clause structure

ii. Step 2: Test 1 (Syntax Test) to see if the subjects have gained knowledge of the relative clause structure

iii. Step 3: Test 2 (Question Formation Test) to see whether the subjects adopt R1-2 or R3 in dealing with question formation

As one can conceive from (10 i-iii) above, this experiment should include the data on a declarative and its corresponding question, and knowledge of the relative clause structure; the rest (the principle of structure-dependence) is innately given by UG. With those L2 learners as subjects who have some knowledge of English yes/no question formation rule but no knowledge of the relative clause structure, we could test the hypothesis above by first giving the subjects knowledge of the relative clause structure (Steps 1-2), and then testing which rule they adopt in dealing with the task of making questions from the original declarative sentences (Step 3).

The training session was intended to give knowledge of relatives to the subjects who are assumed not to have learned it before. Two specific points should be noted here. First, we tried to avoid any use of 'grammatical terms' such as 'noun phrase' or 'subject of sentence' *etc.*, in our introduction of relative clauses; using it could mean to enhance subjects' conscious working on the grammatical manipulation. Second, the type of sentences used in the introduction was different from that used in Test 2. Sentences were limited to the type (21-22) in which the relative clause was attached to the NP within VP, in contrast to the structure (23)(=(6)). In other words, the subjects did not encounter sentences of type (23) until Test 2.

(21) Can you see the boy that is standing on the stool?
(22) I know the girl that is skating over there.
(23) The boy who is tall can swim fast.

The double test (Steps 2 and 3) are necessary because each complex sentence at issue in the question formation has a relative clause as the subordinate clause attached to the subject NP. At the particular task of forming questions from complex declaratives, the subjects are assumed to beable to understand and make some use of the relative clause structure itself. If they do not, it does not make sense for them to work on question formation tasks involving relatives. Thus we need two separate kinds of tests. We call this first test (Step 2) Syntax Test, and the second (Step 3) Question Formation Test.

Our hypothesis predicts that once L2 learners have acquired knowledge of the relative clause structure they will unerringly give a correct response to each of the complex sentence stimuli; if they haven't they will not. Logic of our experiment is represented in Table 4.

		Syntax Test: Pass	Syntax Test: Fail
Q.F. Test	Pass	X	
	Fail		X

TABLE 4. Schematic representation of predicted results.

Thus the hypothesis predicts that subjects will fall into X in this schema should there be no noise caused by external factors.[6]

3.3.2. **Subjects**

Japanese learners of Enlgish as L2 were chosen for this experiment. As discussed in Linguistic background below, the rule of making questions from the declarative sentences differs considerably from that of Enlgish. This point motivates having the experiment on Japanese speakers in that rules governing L1 question formation does not affect the rule manipulation in L2, in this case, English. Another reason for choosing Japanese learners of English was that it was relatively easy for the experimentors to have access to them.

The subjects' experience in learning English is of importance in this experiment. We chose the students at the nineth grade as our subjects. At the time of this experiment (May, 1986), the subjects were assumed not to have learned the relative clause structure before. It was all possible because of the specification of learning items as shown in the official guideline of syllabus by the Ministry of Education, Culture, and Science. See Educational setting below.

3.4. **Linguistic background**

It is necessary to see how a question is formed in Japanese, the L1 of the subjects in our experiment. Question formation in Japanese differs from that of English in that in Japanese movement is not involved in making a question from the declarative sentence. The particle *-ka* attached to the end of a given declarative makes it a question. Thus, a declarative (24) is transformed into a question (25).

(24) Taro - wa eigo - wo hanashi-masu
Taro sub. part. English obj. part. speak polite suffix
(= Taro speaks English.)

(25) Taro - wa eigo - wo hanashi-masu ka
Taro sub. part. English obj. part. speak polite suff. ques. part.
(=Does Taro speak English?)

The Japanese question formation rule hence cannot invoke the English question formation rule at all, which is quite important in our investigation since the Japanese learners of English do not have access to relevant rules that could provide them with any hints or analogies in dealing with the English yes/no question formation.

3.5. **Educational setting**

Japanese learners of English formally start to learn English at 13 years of age. The syllabus adopted more or less depends on a grammatical basis as shown in the *Course Of Study* issued by the Ministry of Education, Science and Culture. According to this guideline, the learners begin with simple sentence patterns, gradually shifting to the more complicated ones. The question formation rule is one of the items learned at early stages, while the relative clause is supposed to be studied in the third grade of junior high school, when the learners are 14-15 years old. It is generally thought that the relative clause is a difficult structure to learn, and often given focus to and discussed by

school practitioners. Given that the learners do not begin to learn the relative clause until they are in the third grade, then it is expected that this experiment gives the subjects the very first encounter with this grammatical item.

3.6. Syntax Test

Four test sentences (26-29) were designed to test the subjects' mastery of the relative clause structure. The task itself is a translation exercise. The subjects were asked to give a written English equivalent for each Japanese sentence, using the relative clause. It is important that none of the relative clauses was attached to the subject NP in each sentence but rather to the NP within the VP.

(26) boku-wa niwa - de ason-deiru on'na-no-ko wo shitte-iru
I(male) sub. par. garden in play -ing girl obj. par. know
(= I know the girl that is playing in the garden.)

(27) watashi-wa steeji-de utat-teru otoko-no-ko wa suki-ja-nai
I(neut) sub. par. stage on sing -ing boy top. par. like not
(= I don't like the boy that is singing on the stage.)

(28) boku - niwa chuugoku-go wo hanase-ru tomodachi ga i-masu
I(male) top. par. China lang. obj. par. speak can friend top. part have polite
(= I have a friend that can speak Chinese.)

(29) tegami - wo kaite-iru otoko-no-ko wo shitte-imasu ka
letter obj. par. write-ing boy obj. par. know (polite) question part.
(= Do you know the boy that is writing a letter?)

A test of this sort is quite familiar to the subjects due to its frequent use at school. Any local errors or mistakes were not counted. The focus was on the relative clause itself, and the errors that would not seriously affect the content conveyed were taken as correct (*e.g.* errors in inflection or tense).

3.7. Question Formation Test

Twelve declarative sentences (30-41) were prepared. Four were simple sentences (31), (34), (37), (40), and all the rest complex sentences with relative clauses attached to the subject NP's.

The relative introduced in the training session and test sentences was *that* only. This is because it had been found in a pilot test that the use of *which* and *who* could cause the subject's confusion with interrogative *which* and *who* . The relative that of the subject case was used in order not to cause extra difficulties due to case differences.

(30) The girl that is smiling can jump high. (c)
(31) The boy can swim fast. (filler)
(32) The boy that can skate is running now. (c)
(33) The boy that can swim can jump high. (b)
(34) The girl in this picture is smiling. (filler)
(35) The girl that is cooking is smiling. (a)

(36) The boy that is skating is smiling. (a)
(37) The girl is skating now. (filler)
(38) The girl that can skate well is singing now. (c)
(39) The girl that is singing can swim fast. (c)
(40) The boy at the door is crying. (filler)
(41) The boy that can skate can swim fast. (b)

The auxiliaries included in the test sentences were carefully arranged. First, *is* and *can* are the two auxiliaries in focus. Second, three patterns were made, (a) the *is-is* pattern that has identical auxiliaries in a single sentence, (b) the *can-can* pattern in which two occurrences of *can* are included in a single sentence, and (c) *is-can* or *can-is* pattern where two different auxiliaries are found. The patterns (a) and (b) are also found in Experiment 1 of C&N. However, both of these patterns have a serious flaw; one cannot tell which *is* or *can* is moved as in the TYPE I error above. It could be either copied from the relative clause or from the main clause. This is why pattern (c) is necessary. The sentences and sentence types were randomized in order.

The directions for the test were given with two simple sentences: **"Make a question from each sentence as in the examples: John can swim. -> Can John swim?, Mary is singing. -> Is Mary singing? "** There was no explicit use of grammatical terms nor reference to the nature of the task. The test lasted for 15 minutes.

3.8. Procedure

A group of 11 middle school students (all female) participated in this experiment. First, a 50-minute training session was held, in which the instructor introduced to the participants the sentence that had a relative clause within it. A printed copy of a picture was given to each student. The instructor began to describe and ask about the characters through questions and answers using English. The students are called on to respond in English at times simply saying 'yes' or 'no,' and at other times repeating what the experimenter said. In so doing it was aimed to familiarize the learner with the relative clause structure. After a fair amount of practice, some of the sentences were written on the board so that the learners could see what they heard or said. The medium of instruction was English with some use of Japanese where necessary.

We then moved on to Syntax Test as an exercise on the relative they were just introduced to. This concluded the training session and a short break of 10 minutes and then the test session for Question Formation Test followed. All the participants showed interest in the task despite the foregoing regular classes and the training session.

3.9. Results

All the responses to Syntax Test were judged to be correct, although some mistakes were found in spelling, tense, inflection and so forth supposedly due to little attention paid to the items. The high rate of success in this task is probably due to the practice effect in the training session. The results of this test suggest that the subjects were now thought to have mastered the new structure.

The results of Question Formation Test are summarized in TABLE 5 below.

74

Subjects	A	B	C	D	E	F	G	H	I	J	K
Q.No.											
(30)	o	o	+	o	o	o	o	+	+	+	−
(31)	o	o	o	o	o	o	o	o	o	o	o
(32)	o	x	+	o	o	o	o	+	+	+	+
(33)	o	o	+	o	o	o	o	+	+	+	+
(34)	o	o	o	o	o	o	o	+	o	o	o
(35)	o	x	+	o	o	o	o	I	+	+	+
(36)	o	x	+	o	o	o	o	+	+	+	+
(37)	o	o	o	o	o	o	o	+	o	o	o
(38)	o	x	+	o	o	o	o	+	+	+	+
(39)	o	o	+	o	o	o	o	+	+	+	+
(40)	o	o	o	o	o	o	o	o	o	o	o
(41)	o	x	+	o	o	o	o	+	+	+	+

o:correct, x:incorrect, +:not as expected but grammatical
−:no answer, I:TYPE I error, the test sentences with underlined numbers are simple sentences as fillers

TABLE 5. Individual results for the Question Formation Test.

3.10. **Observation**

Five subjects (A, D, E, F, and G) made the required questions out of the original sentences. One subject (C) gave the following question (42) to (30) and did likewise to the rest of the complex sentences.

(42) Can the girl jump that is smiling?

In this response, the relative clause is extraposed. This is by no means ungrammatical, and because there is no movement of auxiliaries from within the relative clause this subject should be added to the five who made perfect questions. Responses to (30) by H (43) also qualify as grammatical in the sense that the auxiliary within the VP is moved to the front of the sentence despite the absence of the relative clause itself in each question.

(43) Can the girl jump high?

Another response type is shown by one subject I, *i.e.*, conjoined questions (44) to (30).

(44) Is the girl smiling and can she jump high?

Two subjects (J and K) showed a similar pattern making juxtaposed questions as in (45), also a response to (30).

(45) Is the girl smiling? Can the girl jump high?

All the subjects above showed a consistent pattern of responding, whereas the subject B showed inconsistency in her responses. The result of structure-independent rule application was brought to (32), (35), (36), (38), and (41). To the rest of the complex sentence stimuli, (30), (33), (39) she made correct responses. TABLES 6-7 show the results of our tests.

	GRAMMATICAL	UNGRAMMATICAL	TOTAL
SIMPLE	44(100%)	0(0%)	44
COMPLEX	81(92%)	7(8%)	88
TOTAL	125(95%)	7(5%)	132

TABLE 6. Frequency of correct and incorrect response.

		Syntax Test: Pass	Syntax Test: Fail
Q.F. Test	Pass	10	0
	Fail	1	0

TABLE 7. Results

To summarize, five subjects of the eleven made correct responses to all the sentence stimuli. One subject deployed her own solution by extraposing the relative clause to the end of the question and this should be counted as correct. Thus six subjects were counted as making correct responses. Another subject gave her responses by only asking about the main clause. It is striking, however, that the rest (three subjects) did not move the auxiliary out of the relative clause in each complex sentence. They rather seemed to seek for some other solutions of their own to the given problem: conjoining the two questions, a pattern shown by one subject and juxtaposing two separate questions as shown by two subjects. One showed an inconsistent way of responding to the stimuli, and made five incorrect responses out of eight stimuli.

4. Discussion

More than half of the subjects (7 out of 11) are taken to have employed the structure-dependent rule. The three other subjects could also be put in the same category in that they did not make any strucure-independent errors. Thus the majority of our subjects (10 out of 11) employed the structure-dependent rule in forming yes/no questions from the original declarative.

The results strongly support the hypothesis that L2 learners are guided by a UG principle in dealing with the yes/no question formation. However, some response patterns pose problems in generalizing the results of this experiment. First, H's response pattern is to ask only about the main clause in each complex sentence. One reason for this pattern may be that she recognized two clauses in each complex sentences, namely, the main and the subordinate clause, and focused only on the former in asking about what is being said in each sentence. Her responses to the simple sentences are processed in the same fashion. To (46)(=(34)) she made (47), which is correct as it is but does not attach the prepositional

(46) The girl in this picture is smiling.
(47) Is the girl smiling?

phrase **in this picture** to the subject NP. The reason for this kind of omission cannot be deduced from this experiment alone. Taking this pattern as acceptable, we can say she made correct responses to all the sentence stimuli, except to (35), to which she made the TYPE I error (48) as decribed by C&N.

(48) *Is the girl that is cooking is smiling?

She did not make further TYPE I errors except (48). (48) could perhaps be an accidental mistake, and should be disregarded from consideration.

Second, the response pattern shown by the subject I could mean that the function and structural factors represented by the relative clause are

not yet fully comprehended by this subject. Although her Syntax Test did not show any problem in translation from Japanese into English, it could be that she was not yet able to use the relative clause yet. Incomplete mastery of the relative clause might have caused her to manipulate the given structure in terms of what she was well capable of. This might as well be the case with the subjects J and K, who did not conjoin two questions, but gave two separate questions to each sentence stimulus.

5. Conclusion

Children's acquisition of the English yes/no question formation rule is faced with a problem that is called 'a logical problem of language acquisition.' It cannot be deduced simply from data presented to the children alone. The theory of UG holds that the children acquiring language need not learn all the rules relevant to a certain structural manipulation, in this case, the question formation rule. The structure-dependence in gramnar formation and manipulation given to the children as innate knowledge guides them to rule out all the impossible grammars and turn them to select one possible grammar, in this case the rule R3 referring to the structural relationship among the elements of a given sentence.

Crain and Nakayama (1987) was the first attempt that put this issue to an empirical test, giving support to the account for the UG-based theory of language acquisition. Based on this study we also investigated L2 learners' learning of the question formation rule, and concluded that with some exception they are also guided by UG in acquiring and manipulating the question formation rule.

NOTES

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1. Chomsky (1986:7-8) states:

   > A great many examples have been given over the years to illustrate what clearly is the fundamental problem: the problem of poverty of evidence. A familiar example is the structure-dependence of rules, the fact that without instruction or direct evidence, children unerringly use computationally complex structure-dependent rules rather than computationally simple rules that involve only the predicate "leftmost" in a linear sequence of words.

2. An asterisk placed before a sentence means that the sentence is ungrammatical.

3. Logic in this explanation is from Otsu (1989b).

4. Crain and Nakayama went on to examine an alternative theory for acquisition of the English yes/no question formation rule. They tested a semantically-based acquisition theory put forward by Stemmer (1981). The evidence disconfirmed Stemmer's theory and gave support to developmental autonomy of syntax. I have elsewhere argued inadequacy of Stemmer and another similar approach by Schlesinger(1982). For details, see C&N (*ibid.*) and Naoi (in press).

5. See for example Flynn and O'Neil(1988) and Gass and Schachter(1989) for the impetus that linguistic theory has given to the field ofsecond language acquisition over the last few years.

6. See Otsu (1981, 1989) for logic of the experiment made two-fold as in this present investigation.

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