

Accessibility of Subjacency Principle and Empty Category Principle to SLA

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Abstract. A foreign language is essential for promoting world exchanges. Chomsky's theory of universal grammar is one of the representative theories to reveal how language learners acquire their mother tongue. However, in recent years, more and more researchers have focused on the accessibility of UG to SLA. This study investigates the accessibility of UG to 50 native Chinese university students by investigating their acquisition of the two general grammar principles of WH word shift limit: Adjacency Principle and Empty Category Principle. Another 5 native English speakers are set up in the control group. Questionnaires and quantitative analysis are used in this study. The author tested the students' general performance both in the grammatical judgment and in the reading comprehension and their attitudes towards the questions, which violate either the Subjacency Principle or the Empty Category Principle. The author finds that by comparing the accuracy of the two groups, these native students are similarly sensitive to the two universal principles with English people; that is to say, the Universal Grammar is accessible to these Chinese university students' English acquisition.

Keywords: Universal Grammar; Subjacency Principle; Empty Category Principle; Second Language Acquisition.

1. Introduction

Chomsky's universal grammar (UG) theory is related to language acquisition. Chomsky criticizes Skinner's behaviorism learning theory, emphasizing the psychological aspects of language ability and the inner process of language acquisition; he believes that children have Language Acquisition Device from birth, which is the UG that includes human language commonality. Fundamentally UG is a universal set of linguistic principles applicable to all known grammatical systems. Chomsky even believes that the UG should be seen as a part of the human brain that can be explained from a physiological perspective [1]. Linguists found that children learned more mother tongue than their input; that is, the output is greater than the input in the children's mother tongue acquisition, which is a problem that cannot be explained by stimulus-response theory. Chomsky's UG can explain this problem. UG provides children with an innate universal knowledge of many abstract and complex languages. No matter how poor the external stimulation or language input is, they can finally successfully acquire their mother tongue.

The introduction of Chomsky UG aroused the interest among researchers in the field of SLA, who began to explore whether UG also works on SLA, that is, whether UG is accessible to SLA. Researchers now have three main views on this issue. Most researchers like Flynn support the first idea that UG is fully accessible to SLA (full access) [2]. They believe that, like native language acquisition, there are logic problems in SLA, where the output is greater than the input. With limited second language input, learners can output complex sentences that they have not seen before, making most researchers believe UG works on SLA. Researchers such as Schwartz, Yip, and Ellis support the second view that UG is partially or indirectly accessible to SLA (partial access) [3-5]; the initial state of the second language consists of some principles and parameters of the native language and parts of the UG. UG principles are fully accessible, while the parametric variables are not fully learned,

therefore, the adults cannot fully acquire a second language [2]. A small group of researchers such as Clashes, Muysken, and Meisel support the third view that UG is entirely inaccessible in SLA (no access), no component of the mother tongue can migrate into the second language [6,7]; second language learners cannot access or use UG, and they rely on general learning strategies and skills to learn the language [1].

This research mainly focuses on two principles of UG, the Subjacency Principle, and the Empty Category Principle. Subjacency Principle is a universal principle that defines the maximum distance that sentence components can move in sentence conversion from deep structure to surface structure [8]. According to this principle, “during movement, a component can only span one bounding node at a time.” The scope of boundary nodes varies from language to language. The boundary nodes in English are DP (Determiner Phrase) and AGRP (Agreement Phrase).

The Empty Category Principle is another restrictive principle of wh-movement. It can be used to explain the subject-object asymmetry and subject-object adjunct asymmetry that the Subjacency Principle cannot explain. Empty Category Principle requires that the traces left after wh-movement be strictly controlled. Subjacency Principle and Empty Category Principle are two UG principles concerning the limitation of wh-movement. Subjacency Principle specifies the distance of wh-movement, meaning that wh-movement can only cross one boundary node at a time; Empty Category Principle specifies the trace after wh-movement, namely that the trace after wh-movement must be subject to strict vocabulary or prior jurisdiction.

Cook & Newson argued that while UG principles are not always dominant in all languages, they are binding [9]. Parameters refer to the variation of certain principles in specific language usage, showing differences between languages so that different languages have different grammatical structures. The formation of the wh-movement sentence mentioned in this study is a good example.

Since Chomsky's Lectures on Government and Binding in 1981, language acquisition researchers have looked to the study of universal grammar composed of principles and parameters. For researchers, there are two main approaches, starting with the principles of universal grammar that apply to all languages and beginning with the reset of parameters. Researchers from the first approach believe that UG is accessible to SLA, and Ellis thinks those with no dominant universal grammar principles in their native languages should be selected as subjects [5]. In this way, subjects could neither receive relevant knowledge of universal grammar principles from their native language nor limited second language input. If their performance coincides with the applicable principles of universal grammar, then the accessibility of universal grammar to SLA is illustrated. The investigation of this study's Subjacency Principle and Empty Category Principle followed this approach. Most researchers chose Chinese, Japanese, Korean, or Indonesian as subjects in the experimental group because the wh-movement was not involved in their native tongue. English native speakers are chosen as subjects in the control group. Grammar judgment is one of the most commonly used tests by researchers. They first analyze the experimental group's performance, compare it with the control group, and finally draw the research conclusions. Subjacency Principle and Empty Category Principle are the limiting principles of wh-movement in universal grammar, and tests about these principles often include grammatical and ungrammatical sentences.

Due to different native tongue backgrounds, study design, and statistical analysis, the researchers began to explore the problem differently, focusing on whether L2 learners without wh-movement could realize that these sentences were not grammatical. Although L2 learners are not entirely correct in judging sentences that are not grammatical, they can also have relevant knowledge of universal grammar if they are somewhat aware of whether the title violates UG principles. Since wh-movement is not involved in Chinese wh-questions, English learners whose native language is Chinese can neither acquire relevant UG principles from their native language nor learn these principles from their limited English input. If they can identify Subjacency Principle and Empty Category Principle sentences in English, we can say that UG is accessible in their English acquisition.

Based on the above literature, whether UG is accessible to Chinese students in SLA is still unclear to Chinese scholars. Therefore, this study aims to explore the accessibility of UG to college students

whose native language is Chinese by questionnaire through the study of the Subjacency Principle and Empty Category Principal knowledge of UG.

2. Research Method

2.1 Subjects

The subjects of this study are 50 naive Chinese university students who are not English majors. There are 20 women and 30 men in this group. And they are 21 ± 1.4 years old. Proved by the experiment, subjects' English level has little influence on the experimental results.

Before the experiment, we selected 150 qualified college students for the test and all Chinese subjects will take a pre-experiment quiz designed to assess their proficiency in English grammar structures. Subjects are divided into three levels according to their test scores: elementary, intermediate and advanced. Each class contains 50 people. Three levels of subjects were then subjected to experiment-related syntactic tests. The results show that when Chinese English learners reach a certain level of English, there is no significant relationship between their English proficiency and the restricted access to English question word movement. In order to minimize the influence of their English proficiency on the experimental results, only 50 subjects with intermediate grades were selected to participate in the experiment.

The subjects of this experiment are divided into the experimental group and the control group. In addition to the experimental group of 50 people, another 5 native English speakers are set up in the control group, which can help rule out the possibility that the subjects violated UG rules because the tasks are poorly set. Moreover, by comparing the performance of Chinese students and native English speakers, we can observe whether the two principles work in the interlanguage grammar of second language learners in the same way as they do in the grammar of native English speakers.

2.2 Materials

Questionnaires and quantitative analysis are used in this study. Borrowed from Gaodi, we designed two types of questions, grammar judgment and reading comprehension, to test subjects' acquisition of the adjacency principle and the empty category principle [10]. The focus is on the statistics of the control group and the experimental group of the overall response to the questionnaire questions and different sensitivity.

When testing the accessibility of universal grammar in second language acquisition, one of the standard practices is to select the native language and the second language to which the language parameters are set (White) [11,12]. In this study, the grammar judgment test is set to test subjects' sensitivity to the adjacency principle, including 8 sentences. There are four ungrammatical sentences that violate the four types of adjacency principle, namely WH- island structure, subject island structure, relative clause structure and appositive clause structure. Ungrammatical sentences prompt subjects to judge from the perspective of UG. If they reject such sentences, it shows that UG is within reach. In addition, we also set up four grammatical sentences to avoid subjects negating all sentences without judgment. There is also a declarative sentence to ensure that subjects learned the relevant clause structure.

The reading comprehension task which is partly borrowed from Villiers et al. is used to test the empty category principle [13,14]. The experiment tested subjects whether they obeyed the empty category principle by examining whether they allowed WH- elements to move long distances from embedded clauses.

The questions make up two simple stories and ask an ambiguous question after each story. The options are set to two possible answers and an answer 'both'. If the subject chooses 'Both' or the one that WH elements have a long-distance movement of the question, it is proved that the subject has allowed WH elements long-distance movement. In other words, they are following the empty category principle.

2.3 Statistics

In the statistical analysis of the results of grammatical judgment, the accuracy rate of subjects for different types of sentences that violate the adjacency principle is emphatically compared. The subjects' overall situation will be compared with the control group's overall situation to verify whether the sensitivity of Chinese students to sentences that violate the adjacency principle is similar to that of native speakers.

In the statistical analysis of the reading comprehension section, we focus on the proportion of choice 'Both' and the choice that WH elements have a long-distance movement of the question. As mentioned above, this experiment analyzes whether Chinese students abide by the empty category principle by counting the responses of Chinese students to the long-distance movement of question words in interrogative questions.

3. Results and discussion

3.1 Subjacency Principle

As mentioned before, the correct sentence is divided into two categories. One is the declarative sentence parallel to the structures of the subjacency principle. This sentence was used to confirm whether the subjects had acquired knowledge of the relevant grammatical structures. If the subject can't judge this sentence correctly, it will show that they haven't acquired relevant grammar knowledge. Therefore, they are forbidden to join the test. The other is grammatical WH questions whose WH- elements are removed from clauses. These sentences were used to ensure that the subject did not negate all WH questions without thinking. At the same time, these sentences can also demonstrate that subjects haven't chosen ungrammatical sentences because of their sensitivity to the subjacency principle.

According to the test results, in the judgment of declarative sentences, Chinese college students in the experimental group had a correct rate of 72%. In comparison, native English speakers in the control group had a correct rate of 100%. For those grammatically correct WH questions, the experimental group got them right on average 62% of the time, while the control group got them right on average 80%. There was a slight difference in the two groups' judgment of syntactic sentences, but it did not affect the results. This indicates that the subject has relevant knowledge of English grammar and is sensitive to the subjacency principle.

According to the early paragraph, we know that four types of ungrammatical sentences violate the subjacency principle in the grammar judgment test, namely WH- island structure, subject island structure, relative clause structure, and appositive clause structure.

We refer to the calculation method of Ni and make some modifications on this basis to calculate the test score. In order to facilitate statistics, we assigned subjects to gain one point for each ungrammatical test sentence they correctly judged [15]. And the test is scored out of four points. Calculate each person's total score. Then the average score of the experimental and control groups was then calculated, respectively. At last, calculate the average scoring rate of each group. The results are shown in Table 1.

Table 1. The average score of the two groups for judging sentences that violate the Subjacency Principle

Sentence category	Test the sentence	The average scoring rate of the experimental group	The average scoring rate of the control group
wh- island structure	Whom did Rose explain when Tom could come to help?	60%	100%
subject island structure	What does your interest in surprising your parents?	74%	80%
relative clause structure	What did the police catch the woman who was carrying?	68%	80%
appositive clause structure	What did Mary make the claim that someone had stolen?	58%	80%

According to the table 1, it can be clearly seen that the average scoring rate of the control group was higher than that of the experimental group when judging a sentence that violates the subjacency principle. But it still has a gap from what we expected. However, according to Cook's research, native speakers also produce from 10% to 27% inaccuracies in grammatical judgment tests during the study of the subjacency principle [16]. Our experimental results are of reference value in this range.

However, the judgment accuracy of sentences violating the subjacency principle in the experimental group is lower than in the control group. The results show that subjects have more errors in judgment of WH- island and appositive clauses but are more accurate in the structure of subject clauses and relative clauses. The phenomenon is referred to as "strong violation" and "weak violation" in the study of Martohardjono [17]. According to Martohardjono, removing the WH- element from the relative clause is a "strong violation," while removing WH - island structure is a "weak violation," and subjects generally judge the "strong violation" more accurately [17]. In relative clauses structure, the WH- element violates the subjacency principle by directly crossing three boundaries with a single movement, the most apparent ungrammatical movement compared to other constructions. Therefore, the subjects were more sensitive and more accurate.

According to the test results above, although the accuracy rate of the experimental group was lower than that of the control group, they still judged 65% of ungrammatical sentences that violated the subjacency principle. This proves that the experimental subjects know the subjacency principle. At the same time, the accuracy rate of WH- island structure and relative clauses in the experimental group is 64%. It also reached 71% in subject-island structure and appositive clause structure judgment, both exceeding the chance level.

The research results of Martohardjono showed that the correct recognition rate of Chinese sentences violating the question word movement principle reached 65%, and thus inferred that universal grammar was accessible [17]. Combining the previous research conclusions, such as White, Flynn, and Uziel, it can be concluded that Chinese second language learners possess grammatical knowledge related to the subjacency principle [18-20]. And the subjacency principle in UG is accessible to Chinese second language acquisition learners.

3.2 Empty Category Principle

As mentioned earlier, the test of the empty categorical principle borrows part of the research done by Villiers et al. on wh shifts in children's acquisition [13,14]. Take item 1, for example.

A boy loves climbing trees. One afternoon, he fell to the ground from a tree and hurt his arm. When he went home that night, he said to his mum, 'I have hurt my arm when I fell this afternoon'. The question is when did the boy say he hurt himself? There are 24% of subjects chose 'Both' and 28% of subjects chose 'In the afternoon'. In this passage, 'afternoon' is when the boy hurt his arm, and

'evening' is when the boy tells his mother he hurt his arm. Therefore, both of these answers are correct. 'afternoon' is an adverbial that modifies 'hurt', belonging to the distant qualifier, which means WH-elements complete a long-distance movement.

The second example is about Villiers' experiment [13, 14]. A boy looked at his calendar and found out that it was his grandmother's birthday. He had forgotten to send her a card. He decided to call her on the phone, but he didn't know how. Therefore, he ran to ask his mother, 'Can you call grandma with me? It's her birthday!' The question is who did the boy ask to call? There are 18% of subjects chose 'Both' and 56% of subjects chose 'His grandmother'. According to the story, there are two possible answers to the question. One is 'mother', as the object of ask. The other is 'grandmother', as the object of call. Both answers are acceptable because both possible signs are strictly governed by the empty category principle. Those who answered 'grandmother' assumed that the question word 'who' in the question originated in the infinitive phrase rather than the main sentence. It moved to the tag position at the beginning of the sentence in a continuous fashion, and they allowed such a long WH- shift.

Table 2. The average percentage of the two groups' subject for questions' options

Question	Percentage of subjects who chose language track 'a'	Percentage of subjects who chose language track 'b'	Percentage of subjects who chose language track 'a' and 'b'
1. When did the boy say(a) he hurt(b) himself?	C: 48% N: 40%	C: 28% N: 0%	C: 24% N: 60%
2. Who did the boy ask(a) to call(b)?	C: 26% N: 20%	C: 56% N: 40%	C: 18% N: 40%
Average	C: 37% N: 30%	C: 42% N: 20%	C: 21% N: 50%

PS: In the table, C represents the experimental group and N represents the control group.

As shown in Table 2, the number of samples that allow WH question words to move over a long distance all exceeds 50%. In other words, the number of samples conforming to the empty category principle exceeded 50%. And native English speakers were slightly more accurate than Chinese subjects.

In conclusion, these native students are similarly sensitive to the Empty Category Principle with English people, that is to say, the Universal Grammar is accessible to these students and universal grammar is accessible to second language acquisition.

4. Conclusion

This study investigates whether Chinese college students can recognize wh-movement in English particular questions according to the Subjacency Principle and Empty Category Principle of universal grammar utilizing a questionnaire, and then analyzes the results and discusses whether universal grammar is accessible to Chinese college students' second language acquisition. As the experimental subjects are Chinese students, their mother tongue is Chinese. Chinese sentences do not involve wh-movement, nor are they restricted by the two principles of universal grammar. However, particular question words in English are restricted by the Subjacency Principle and Empty Category Principle. Furthermore, mainly through the class, Chinese college students learn some basic knowledge of English. The English study is minimal. It is difficult for them to learn UG principles related to wh-movement. Therefore, if the test group of college students answered the questions in the questionnaire correctly, we can say that universal grammar is accessible to their second language acquisition.

By designing the questionnaire on college students' acquisition of the Subjacency Principle and Empty Category Principle, analyzing their overall reaction conditions and their sensitive degree to

the questions related to the principles. We found that the general test results of the subjects are higher than average, and the students can correctly choose the options against the two principles. This indicates that they are sensitive to the Subjacency Principle and Empty Category Principle of universal grammar. That is, universal grammar is accessible in the second language acquisition of Chinese college students. The experimental results do not support the second and third views of UG's accessibility to SLA.

However, for the study of the accessibility of universal grammar to second language acquisition, this paper still has limitations and deficiencies. First of all, this study is a small-scale experimental study. The tested Chinese college students have received English education to some extent. Although we have tried our best to eliminate the interference of this factor before, this factor would inevitably affect the experimental results to some extent. In addition, the questions in the questionnaire only tested the two principles of UG. Whether these questions can reflect the second language acquisition situation of the subjects and whether there are the same test results in other age groups to prove the accessibility of universal grammar to second language acquisition need further research.

At present, researchers worldwide are still exploring the final answer to whether UG plays a role in second language acquisition. In exploring the truth, researchers or foreign language educators should closely follow the development trend of international second language acquisition research. They can also draw lessons from this research and other studies to provide more evidence for the accessibility of UG to second language acquisition.

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