English Grammar Learning Effect of Second Language Early Learners and Late Learners in Chinese High Schools: A Test of the Influence of the Critical Period Hypothesis（CPH）

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Abstract

The Critical Period Hypothesis (CPH) has sparked a long-running dispute in linguistics and language acquisition over how physiologically tied language learning is to age [1]. The Critical Period Hypothesis (CPH) states that the age of onset influences a learner's final achievement of a second/foreign language and the importance of age as a criterion for second language acquisition (SLA) [2]. In Second Language (SL) and Foreign Language (FL) contexts, under the hypothesis of Critical Period Hypothesis (CPH), age is the most important variable to investigate in many studies, especially in the aspect of grammar learning [3][4]. However, current studies still lack wider examinations of the reliability of CPH and discussions of potential factors, such as uncertain factors, individual differences, context, and accurate age. Therefore, this paper aims to investigate whether other factors will influence Chinese high school students' grammar learning and to arouse people's attention to what age is more appropriate to learn English grammar in the context of Chinese high school. Based on questionnaires and semi-structured interviews, the results show that age does not always influence grammar performance as predicted. There are internal and external disruptions, like learning interests, learning duration, and living environment. In terms of the suitable age for learning grammar, through data analysis, results manifested that there was no obvious polarization for those late learners (12 or more). However, early learners' score differences are up to 60 points unexpectedly. Thus, these imply that when teaching language learners, instructions should also take other factors into account not only age. Meanwhile, according to data feedback, the age for learning grammar can be later than 12 which may be more effective. This paper hoped to have practical significance, encourage future researchers to verify CPH from multiple perspectives, and supply conducive suggestions for future grammar curriculum settings.

Keywords: *Critical Period Hypothesis; Second Language Acquisition; Language Learning; Grammar; Curriculum Development*

1. Introduction

Every human is born with the potential to learn any language. There is an exactly a very distinct time frame early in life called the critical period[5][6]. As a result, during this critical period, humans possess the ability to discern subtle phonetic differences across languages, influenced by their linguistic environment. According to the Critical Period Hypothesis (CPH), the age at which language learning begins affects the ultimate proficiency attained in a second or foreign language, highlighting the significance of age in second language acquisition (SLA)[7][8][9]. The Critical Period Hypothesis (CPH) has ignited enduring debates in linguistics and language acquisition regarding the extent to which language learning is biologically linked to age[9][13]. To explore the potential influence of the critical period hypothesis on Chinese high school students' acquisition of English grammar, and to draw attention to the optimal age for learning English grammar among Chinese high school students. This paper adopted the approach orientation of Johnson & Newport (1989)[9] conducting questionnaires to examine these related research questions:

1. what age is more appropriate to learn English grammar in the context of Chinese high school?
2. whether there are other factors will influence Chinese high school students' grammar learning？

2. Literature Review

In SL and FL contexts, under the hypothesis of the Critical Period Hypothesis（CHP）has evaluated age as the most important variable to investigate in many studies particularly focusing on grammar acquisition[1][2][3][4]. Despite the use of a variety of methodologies, ideologies, and technologies, the framework is all focused on English learning, with a particular focus on grammar instruction, while their findings and resulting factors are existing discrepancies. Participants in the studies are divided between early and late learners based on their ages diversions in different studies become more obvious. To be distinguished, Qureshi, M.[2] investigates disparities in morphological and syntactic understanding among early and middle English learners at the micro level, with an emphasis on aspects of third and extra language learning. It reveals that later learners may acquire grammatical components of language greater than earlier learners in FL environments due to their problem-solving skills and contradicts the CPH's prediction that language acquisition becomes increasingly difficult after adolescence. While this analysis focused on a distinct component of morphosyntax in grammatical acquisition, the findings are relatively comparable and related to our study, and it still offers references to what we have examined and provided strong support. Other studies described above only looked at the macroscopic level to identify grammar learning when learning a second language. Reviewed studies are all exposures to the first and second acquisition, but there are still many gaps throughout these findings. Honestly speaking, the acquisition of a first and second language is totally statistical. Most studies have been examined and validated, and the results show that the two conclusions differ, and neither adequately examines the Critical period hypothesis (CPH) to provide conclusive answers for other researchers. Furthermore, certain inescapable elements are influenced, and the execution of the experiments could not completely exclude their effects. Uncertain factors, such as learning time and technique, may also have influenced the outcomes[10][11][12]. More importantly, few of the researchers have conducted a study to investigate the final output of L2 learners in grammar at almost the same time apparently, and the sort of investigation that we undertake could be very beneficial for researchers who are looking into the validity of the CPH and the effect of the CPH on L2 grammar learning.

3. Methodology

3.1 Participant

To carry out this research and to authentically test this hypothesis , we invited nine participants to take part in this test. They are from China high school and English is their second language. Aged between 17 and 19 years old. There are all third-year students. These participants are grouped into two categories. Based on the critical period hypothesis regarding the age limit, participants are categorized into two groups. One is in adolescence, around the age of 12, he or she has received a more systematic knowledge of English grammar, and the other is a more systematic learning of English grammar after adolescence. Based on this criterion, participants who received systematic English grammar instruction before the age of 12 are classified as early learners, while those who received it after are classified as late learners. The detailed information is shown in Table 1. In addition, participants came from schools recognized by the Chinese Ministry of Education as having educational qualifications to ensure the reliability and validity of our data. Participants taking this test will sign a consent form and all their information will be kept confidential.

Participants	Age	Grade	Category
NO.8	18	Senior	Late
NO.3	17	Senior	Late
NO.5	17	Senior	Early
NO.4	18	Senior	Late
NO.9	17	Senior	Early
NO.2	18	Senior	Late
NO.1	18	Senior	Late
NO.7	19	Senior	Early
NO.6	18	Senior	Early

Table 1. Participants' Information

3.2 Instruments
This study carried out mixed method to collect our data. Firstly, the study conducted by Johnson & Newport (1989)[9] provides a comprehensive methodological framework for our experiment. Using

their experience for reference, to test our assumption, we designed grammar testing to collect our data. The grammar test consisted of 20 multiple-choice items. The items cover various aspects of grammar, including tenses, nominal clauses, attributive clauses, subjunctive mood, and adverbial clauses. These four parts are frequently used in English exams in China. This testing will be held online way. We utilized the 'Wenjuanxing (问卷星)' platform, a reputable online survey platform widely used for conducting questionnaires, tests, and polls in China. The whole testing will last for 30 minutes. The full mark of this testing is 100, each knowledge point has four questions. So, there are 20 multiple-choice questions, each scoring 5 points. In total, we collected testing results from nine participants. Here are the final scores of these participants. The testing content is in the appendix part.

Participants	Age	Total Mark	Tense mark	Attributive mark	Nominal mark	Subjunctive mark	Adverbial mark
NO.8	18	65	10	15	10	15	15
NO.3	17	65	15	15	10	15	10
NO.5	17	65	15	10	10	15	15
NO.4	18	60	10	20	10	10	10
NO.9	17	60	15	15	15	5	10
NO.2	18	45	5	20	10	5	5
NO.1	18	45	15	15	5	5	5
NO.7	19	40	5	10	5	15	5
NO.6	18	5	0	0	0	0	5

Table 2. Participants' Testing Scores
* The order of this table shows their rank in testing

To answer question two, are there extra factors that influence their grammar performance, participants need to finish the semi-structured online interview. The interview contains 5 opening questions such as do you think there are still other factors that impact your grammar learning? Why? The time for the interview lasts 15 minutes and the all process is recorded. Similarly, participants' information is well protected.

3.3 Procedure

Design the test grammar questions, it contains the four most common knowledge points in the China English test. Tense, attributive clause, nominal clause, the subjunctive clause, and adverbial clause. Recruit suitable test subjects. A total of nine volunteers were recruited from a qualified high school in China to take the test. Conduct tests online. Test papers are issued through online testing, and teachers at the school supervise the data offline to ensure the authenticity of the data. Collect test data and analyze it. Then, invite participants to engage in online interview meetings to finish the semi-structured interview. Finally, the collected data are analyzed automatically through the analysis method of the questionnaire star platform. Participants' personal information, such as age, grade, and whether they had received systematic English grammar knowledge before the age of 12, were included. It also includes the correct rate and error rate analysis for each test question. All data can be presented through charts with visual features. Confidentiality is observed to protect the personal privacy of participants, and each participant is required to sign a consent form.

3.4 Data Analysis

According to the automatic data statistics and analysis report of the platform, there are nine participants in total, with an average score of 50 points, of which 1 person is in the 0-9.9 score segment, 3 people are in the 40-49.9 score segment, and 5 people are in the 60-69.9 score segment subsection. Five of the contestants did not receive systematic English grammar knowledge before the

age of 12. Here are the detailed information, in Fig. 1. Through analysis, it was found that a total of three late learners were in the 60-69.9 sub-segment, accounting for 60% of the total number of students in this sub-segment. Early learners, on the other hand, make up only 40% of the total number of students in this segment, like the proportion in Fig. 2. This data did not show the prediction of CPH that early learners exposed to language knowledge before puberty showed stronger learning outcomes.
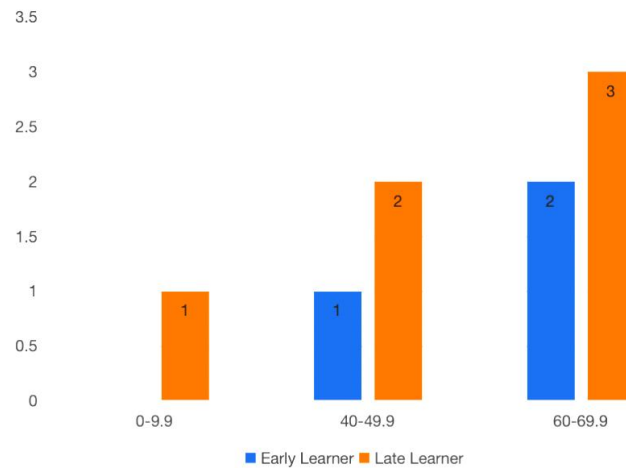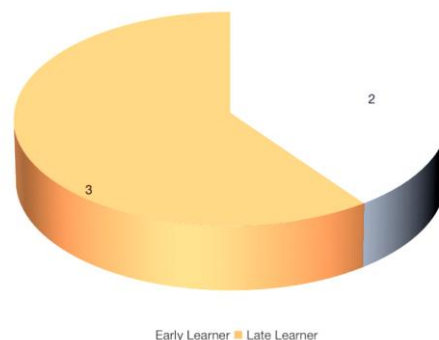

Fig. 1 Proportion of Testing Score Segment

Fig. 2 Proportion of Early and Late Learners in 60-69.9 Score Segment

From the analysis of the results of the four parts of grammar knowledge points, firstly, whether it is early or late learners, the mistakes presented by them are relatively similar. For example, in the tenses section, everyone made mistakes in question number 4 - that is a question related to the present perfect tense. According to our interview with participants, all of them emphasized the difficulty of this knowledge point. In terms of previous teaching experience, this difficulty is associated with the language discrepancy between English and Chinese. In Chinese, some characters are added to mean something has been done, like 已经，过，了, while English is changing the verb forms to achieve that. The remaining knowledge points also show the same trend. Overall, the error rate of the four grammar knowledge points is the highest in the noun clause and subjunctive mood, followed by the tense, adverbial clause, and finally attributive clause. In addition, comparing the correct rates of early learners and late learners, we found that early learners' grammatical errors were scattered across the knowledge points in the four parts, while late learners showed better mastery of attributive clauses. By analyzing interview recordings, there are three factors mentioned highly frequently, almost accounting for 85% of the total. One is about individual learning efficiency, another is about personal interests. These are concluded into internal factors. Some of the interviewees complained that they had already learned English since they were five years old but the learning efficiency is not as ideal as others. Then, they explained this may caused by their poor language ability and memory. Those late learners said the reason why they get good performance is internal motivation, like their interests, dream job, decent salary, and more chances to contact foreigners. The third factor is the lasting learning time that

learners start their learning early and continue it without any interruption. Those participants stated their moods were not so enjoyable when learning compared to those with internal motivations. They said that they are just experienced with grammar under time contribution, which only master the fixed rules rather than understand them completely.

4. Findings

Through the testing, it found that the English grammar test scores of early learners and late learners did not show better scores for early learners as predicted, but on the contrary, late learners accounted for more high scores. This has shaken our previous presupposition, the sooner one is exposed to a certain knowledge point, the better the acquisition effect will be. This leads us to think about other variables that affect learning outcomes. For example, the duration of continuous learning, the absorption effect of individual learning, learning interest, etc. To take an example from the interview, two learners, one of them began to learn grammar in elementary school, but it did not last for a long time, maybe only one or two years, and the individual was not interested in grammar learning. However, another learner only started to contact and learn English grammar at the junior high school level but has continued to this day and is very interested in grammar knowledge with strong learning ability. Under the influence of these variables, the final acquired effect will be quite different. In addition to discovering the differences in their grammatical judgments, we also further analyze their characteristics in different grammatical knowledge points. First, the same thing is that both the early learners and late learners make mistakes in the four parts of the knowledge points are relatively concentrated, and there is no particularly big difference. The specific embodiment is mainly concentrated on the noun clause and the subjunctive mood. Noun clauses belong to many sentence patterns, strong expressive functions, many applicable conjunctions, and strong contextual colors. This flexible sentence pattern also brings difficulties to students' learning and use. In addition, the subjunctive mood structure changes a lot, and the concept is more complex, such as the subjunctive is contrary to the present fact, the past fact, and the future fact. Therefore, the learners showed obvious difficulties in the knowledge points of these two parts. The difference is that through the test of these four knowledge points, we found that the performance of early learners is very unstable, and the differentiation is more serious. For example, among the early learners, contestant No. 5 in a high score of 60-69.9, and contestant No. 6 in the lowest grade. The difference between the two scores is 60 points. However, although late learners started later, their performance was more stable and there was no obvious polarization. Their highest and lowest scores were only 20 points apart.

5. Implications

Through this investigation, we once again discussed whether the critical period hypothesis influences second language learners' English learning. For a long time, the critical period hypothesis has been subject to great controversy in language acquisition, and many scholars have launched experiments and investigations to test its authenticity. Although there are many deficiencies in our research, this study still has the following implications. First, we discussed the critical period hypothesis again based on the previous studies. Our research focuses on the grammar acquisition of Chinese high school second language learners, and to some extent, our research content has practical significance. Secondly, through this study, we also realized that many variables other than age affect the learning effect of learners, such as duration, personal interest, etc. Future research can focus on these variables to verify the critical period hypothesis from multiple perspectives. Finally, it arouses the thinking of English grammar teaching in Chinese high schools in the future. How should Chinese high school English teachers view the critical period hypothesis rationally and apply it to grammar teaching? What age stage should the English grammar teaching curriculum be set up?

6. Limitations

In the investigation, there are still some limitations that need to be fulfilled in the future. To begin with, the data acquired from a small number of samples, as well as the respondents who completed the questionnaire, can only be used as reference samples to offer reference value, and the results cannot be widely circulated. Secondly, although the difficulty of the testing item is moderate, respondents' psychological and physical uncertainties, like nervousness, headache, or tiredness, may disrupt their testing performance and lead to unstable results which may influence the reliability and validity of the findings. Thirdly, for future research, instructors, even parents, can be invited to be research subjects.

From multi-angle to explore more possibilities about whether the influence of the critical period hypothesis is practical. It is intended that future research will pay more attention to the current restrictions and anticipated that this research will serve as a reference and resource foundation among researchers investigating pertinent theories.

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