

## **The Influence of Learners' Age on the Acquisition of Phonology and Syntax in Second Language: a Theoretical Overview**

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### **Abstract**

Whether there is a critical period for second language learning or not remains a mystery. Many researchers have attempted to investigate the effects of age on a second language acquisition, but they come up with different results (c.f. Lenneberg, 1967; e.g. Oyama, 1976; ; Snow & Hoefnagel-Hohle, 1978; O'grady, 1989; Long, 1990; Newport, 1989; Chiswick and Miller, 2008; Rothman, 2008). By reviewing a range of scientific studies in age effect on the acquisition of second language, the authors attempts to reveal whether younger learners acquire language better than their older counterparts and whether critical period in language learning affect all language modules. The studies indicate that, in terms of phonology, the younger the learners exposed to a second language the more likely they achieve native accent. In contrast, learners who are exposed to a second language at a later age would most likely speak a foreign accent. For the acquisition of syntax, the same circumstance applies.

**Keywords:** critical period hypothesis, phonology, syntax, L2acquisition

### **A. Introduction**

Among the common conceptions of second language learning is that children who live in the source language setting (naturalistic environment) tend to acquire a second language relatively more quickly and achieve more native-like proficiency compared to adults who learn a second language in the same setting (O'grady, 1989). These cases lead to the idea that there is a critical period for language learning. Using the measure of ultimate attainment and the rate of

learning of a second language, many researchers have been debating whether the age at which learners are exposed to a second language affects the second language learning or not. The human brain undergoes a process through a period of several years before it is perfectly developed (Long, 1990). There has been a strong proposition that language and other cognitive skills must be acquired before puberty (O'Grady, 1989: 263), which is generally known as critical period for language learning.

It is believed that younger people in the critical period, which is before puberty, learn a second language more easily than their older counterparts. Newport (1989) defined a critical period as a stretch of time for maturation process, and in this process some important experience would reach its uttermost effect on development of language acquisition. This brings about the expected behaviour, which is appropriate to the specific language environment the individual has been exposed to. Therefore, if the individual is exposed to this experience after the critical period, the effect would not be the same.

The concept of critical period in language learning was firstly introduced by Lenneberg (1967). He investigated a great number of brain alterations in young children and drew the correlation of these with maturational process in their development of speech and language. There have been a great number of empirical studies of age-related language acquisition, which come up with the idea of critical period for language learning. Children who learn a second language would likely achieve native-like language proficiency, while adults would not. The acquisition process of second language by children is simpler as they merely need exposure to a particular language instead of formal instructions (Chiswick and Miller, 2008).

Strong evidence of a critical period for language learning would constitute evidence for an innate language system. Researchers have been comparing the acquisition of second language by different group of learners, children and adults, to investigate the extent to which age affects the ultimate attainment. Traditional nativists consider that children are born with an innate language module. In the case of language module, Fodor (1983) defined a module as an encapsulated system that is characterized as unconscious. This module is localized in a particular neural system, in this case, exclusively related to language information (domain specificity).

Further, Birdsong (1999) proposed that linguistic competence is relatively independent from other forms of competence, and more specifically linguistic competence consists of various autonomous competences as well. That is to say, the competences collaborate to form an integrated knowledge of language, which he describes as 'a house with many mansions'. Therefore, it is assumed that not all language modules are likely to be affected by the age, but only some modules of language are related to the age when the learner is exposed to it. This

suggests that critical period in language learning does not necessarily affect all language modules.

Scovel (1969) encapsulated the views of Penfield (1963), and Lenneberg (1967) on the critical period hypothesis into three main points. First, adult native speakers can recognize non-native speakers by their accent precisely because of apparent difference. Second, after the critical period is over and children experience puberty, the brain plasticity disappears, which causes the emergence of non-native accents. Finally, the critical period only affects L2 learners' speech, and does not necessarily influence the final attainment of other areas of linguistic competence such as syntax.

A great number of studies have examined this question whether there is an age-related constraint on the acquisition of a second language. The studies have been focusing primarily on the acquisition of phonology and grammar. Interestingly, these researches seem to contradict one and another. Some have been proven to show an adult advantage, some a child advantage. For example, many studies have been done in the area of L2 phonological development and prove that children who learn a language in the second language setting are expected to acquire a near-native pronunciation, but adults are mostly not (e.g. Oyama, 1976). The phonological module is an area where a learner's first and second language noticeably interact (O'Grady, 1989: 305). This is interesting because, for example, some studies reveal that there is no critical period for the acquisition of syntax (Rothman, 2008; Snow & Hoefnagel-Hohle, 1978). Therefore, it appears to indicate that critical period for language learning partially exists as it does not affect all of the language modules. The present study is an overview of evidence and theoretical issues concerning age and second language acquisition, especially in phonology and syntax.

## **B. Methodology**

### *Research methods*

In this study, the authors adopted a library research method, in which written data from both primary and secondary sources was collected to be analyzed. Hadi (1990) mentions that a library research is a research that involves the process of data collection deriving from library resources such as books, encyclopedia, dictionaries, journal articles, magazines, formal documents, etc. IN

### *Data source*

There were a total of 20 research studies involved in the analysis. For the effects of critical period on the acquisition of L2 phonology, 10 studies were reviewed; they were: Fromkin *et al*, 1974; Curtis 1981; Lenneberg, 1967; Birdsong, 1999; Oyama, 1976; Asher and Price, 1967; Asher and Garcia, 1969; Long, 1990; Krashen, 1973; Flege, 1999. To review the effects of critical period

on the acquisition of L2 syntax, a total of 10 studies were reviewed; they were: Snow & Hoefnagel-Hohle, 1978; Fathman, 1975; Patkowski, 1980; Lenneberg, 1967; Johnson and Newport, 1989; Patkowski, 1980; Johnson and Newport, 1991; Johnson, 1992; Bialystok, 1997; DeKeyser, 2000; Birdsong, 2006. These studies were reviewed thoroughly using a content analysis method to reveal the influence of learners' age on the acquisition of phonology and syntax.

#### *Research question*

The research questions in this study are formulated as follows:

1. Does learners' age have an influence in the acquisition of L2 phonology?
2. Does learners' age have an influence in the acquisition of L2 syntax?

### **C. Findings and Discussion**

#### ***1) The Effects of Critical Period on the Acquisition of L2 Phonology***

Very strong evidence that critical period affects phonology is the case of Genie (Fromkin *et al*, 1974). Genie was kept alone in a room from the age of 20 months to 13 years, 7 months. During this time she was never exposed to any sufficient amount of language, and this hindered her first language acquisition during childhood. In term of phonological development, at the age of 13, when she was firstly found, like normal children, Genie's started her speech with one word utterances comprising Consonant-Vowel monosyllables, and these soon developed two and three word syllables with appropriate words stress. Moreover, Genie finally could use all of Standard American English consonants in her utterances including the inter-dental fricatives (only in reproduction attempts) and the affricates (with inconsistent use).

Genie's phonological constraint lies in the frequent deletions of final consonants, though she sometimes produces the correct forms. Dealing with the pronunciation of consonant clusters, Genie made them simpler by the deleting the initial sound /s/ such as in /sp/, /sk/, /st/ consonant clusters. Another apparent Genie's phonological problem was her earlier stage development when she replaced /k/, /n/, /s/ with /t/ in any word positions.

An interesting fact about Genie is that she can imitate any English sounds, even though these sounds are not found in her speech. This indicates that the age at which she began to learn language hinders her to acquire the language normally, especially for phonology. This phenomenon supports the existence of critical period both for first and second language learning. Curtis (1981) elucidated that this finding imply that language-specific acquisition mechanisms may be functional only during critical period.

Lenneberg (1967) proposed that because of the disappearance of neural plasticity, language cannot be perfectly acquired after the critical period, and this is not only restricted to the acquisition of accent. This appear to be true as the

very apparent area of language ability that can be influenced by the age is the pronunciation (Scovel, 1988: 10, quoted in Birdsong, 1999). This appears to be plausible as it is the only feature of language which relies on “neuromuscular” status, involves “neuromotor” activities, and has “physical reality.” Therefore, it is predicted that the L2 acquirers who begin the language learning after age 12 would never possible be able to achieve native performance, and they will remain non-native speakers.

The research on the acquisition of L2 phonology may be done in either two ways, examining the early stages of learning and eventual attainment. Oyama (1976) investigated the morphological acquisition by Immigrants who had been exposed to English from different ages. The degree of English accent of the participants who had been living in the United States for different periods of time is examined. She hypothesized that there is some age-related phonological development approximately from 18 months to puberty. In this period, L2 children are possible to achieve at least a non-native language phonology, but after this period is completed the full phonological acquisition is unlikely to happen.

By investigating 60 Italian male immigrants and using Analyses of Variance and correlational methods, the participants were categorized into two independent variables: age of arrival (6-20 years) and the length of stay (5-18 years). The participants’ pronunciation was judged from a reading of a short paragraph and a brief anecdote told by the participants from a scaring part in the subject’s life. The taped participant’s pronunciation was then judged by two American-born graduate students in linguistics. This study reveals that the ages at which the participants were exposed to English influence the level of accent they speak. Unpredictably, the length of the period they had stayed had very little influence to their accent.

In contrast, a study by Asher and Price (1967) suggests that when adults and children acquire a second language within the same methods and environments, the adults would prevail over children’s performance. They attempt to test this hypothesis in a controlled setting in which children and adults tried to understand Russian instructions synchronized with play activities. The result shows that when adults and 7, 11, and 14 year-old children learned to understand Russian utterances which were synchronized with play activities, the adults unexpectedly outperformed the children of any age group with  $p < .0005$  using two-tailed t tests. Similarly, the older children performed better than their younger counterparts. The fact found in this study is certainly against the critical period hypothesis because there is an unexpected inverse relationship between age and learning listening comprehension of Russian.

However, this study cannot be generalized to all language modules as the tested performance was the listening fluency. Furthermore, Asher and Garcia (1969) proposed that the superiority of children phonology over adults is only

because children use the language in play setting. That is to say, children only learn language better because it is synchronized with physical movement. The fact that the children acquire language relatively faster than the adults is not surprising because they learn the language in the different settings, play and non-play, action and non-action, physical involvement and non-physical involvement.

To find out the maximum age for language acquisition, Asher and Garcia (1969) examined 71 Cuban immigrants whose ages are between seven and nineteen (26 boys and 45 girls) who mostly had lived in the US for about five years. Thirty American children 13 boys and (17 girls) were treated as control group. The Cuban children's and the American children's pronunciation of English sentences are compared. The results of this study showed that not any single Cuban child achieved a native English pronunciation. That is to say, the early ages at which the children were exposed to English in the native environment and the lengthy duration of time they had lived there do not necessarily make them acquire native pronunciation. Nevertheless, many of them acquire native-like accent. Sixty eight (out of 19 children) percent of the children who came to the US at the age of 1 to 6 achieve near native pronunciation, while only 41 (out of 37 children) of those who came to the US at the age of 7 to 12 achieve this level of competence. For the older children aged from 13 to 19, only 7 percent of them (out of 15 children) who attained native-like pronunciation. This imply that the younger the children who were exposed to English in the US between the higher the probability to achieve near-native pronunciation. Meanwhile, viewed from the length of their stay in the US, there are more children with native-like accent from the group of children who had lived in the US for five to eight years than those who lived there for one to four years.

Another implication of this research is that there seems to be a converse relationship between the age of arrival and the acquisition of a near-native pronunciation. In other words, the younger the children have more chance to acquire near-native performance in pronunciation compared to their older counterparts. Also, the longer the children live in the US, the more likely they achieve native-like pronunciation. The result shows that 71 % of the one to six year-old children living in the US from 5 to 8 years achieved a native-like pronunciation. It means that there are more children with this competence compared to those who had lived there from one to four years (only 50%). Meanwhile, out of 9 teenagers aged from 13 to 19 living there from 1 to 4 years no one of them had a near-native pronunciation, and out of 6 children of these ages living there between 5 and 8 years only 17% of them had a near-native pronunciation.

This finding is in line with the results of the study conducted by Long (1990). Reviewing second language and second language phonology, he concluded that phonological acquisition is strongly constrained by learners' age. To be precise, a near-native accent is unachievable unless the exposure to second

language is done early, for example approximately before the age of 6 in general or L2 in some cases. This is in line with Krashen's (1973) proposal that the maximum age for second language learning is much earlier than puberty. In his study, It was evident that the language lateralization development is completed earlier than puberty, which is approximately at the age of five. Therefore, native accent cannot be fully acquired if the second language is exposed after this period. This is because foreign accents of second language learners are the indirect result of earlier development of phonetic ability, not the consequence of the disappearance of speech learning capabilities (Flege, 1999).

## **2) *The Effects of Critical Period on the Acquisition of L2 Syntax***

In the acquisition of grammar by children and adults, some studies have been conducted to prove whether or it is constrained by maturational condition. Examining the early stages, some studies have proven that critical period does not affect the acquisition of syntax. For example, the study conducted by Snow & Hoefnagel-Hohle (1978) tends to demonstrate that the acquisition of syntax is not age-constrained. To test the critical period hypothesis, which believes that the acquisition of second language will be relatively quick, effective, and similar to first language only if it happens before the adolescence, Snow and Hoefnagel-Hohle conducted a longitudinal study using the naturalistic data of the acquisition of L2 Dutch by L1 English speakers of various ages. Two groups of subjects were tested three times in their first year in Netherland. The test was grammaticality judgment test with 14 pairs of sentences. The subjects were to judge which one of the two sentences (rendering the same meaning) in each pair was correct or incorrect.

The result shows that the older subjects performed better than their younger counterparts. Those who are aged 12 to 15 and older made the fastest improvement during the first several months of learning Dutch. In addition, the 8 to 10 and 12 to 15 year old subjects had achieved Dutch very well compared to the younger age subjects aged 3 to 5 who scored the lowest on all the tests. These results undermine the existence of the effects of critical period hypothesis for second language acquisition on syntax.

Similar result was obtained by Fathman (1975), who investigated the correlation between the acquisition of certain English morphology and syntax and age of non-native English speaking children. Two hundred children, aged between 6 and 15, who were learning English as a second language in American public schools, were tested with an oral production to measure their ability. This study also attempts to examine the relationship between the order of acquisition of certain grammatical structures and age. From the results, it is evident that there is some relationship between age and speed of learning. Among the children who were exposed to English for the same period of time, the older children outperformed their younger counterparts. In terms of the sequence of

acquisition of the structures used in the test by learners of different ages, no apparent difference was found. These findings imply that there is a difference in the rate of language learning and age, but there is no certain sequence of acquisition of grammar related to age.

However, another study focusing on the eventual attainment in the second language acquisition supports the critical period hypothesis for the acquisition of syntax in second language. Patkowski (1980) conducted a study to investigate whether learners who are exposed to a second language before the age of puberty (<15 years old) would achieve better grammatical ability in the target language than those who are exposed later. The subjects were 67 immigrants who moved to the United States at different ages and non-natives who had lived there for different periods of time.

The test was aimed at knowing the subjects' knowledge of English grammatical structure. The results suggest that age at arrival becomes the main cause of the various subjects' syntactic proficiency. Meanwhile, the other variables, which are the length of time spent in the US, exposure to English in formal and informal situations had very minimum effects to the subjects' English grammar. Therefore, it can be inferred that the results of this study provide supporting argument for the critical period in second language learning, especially in syntax.

The effects of critical period to the acquisition of syntax remain debatable, especially in the field of second language acquisition, as this hypothesis was originally proposed for first language acquisition (Lenneberg, 1967). To know whether or not this hypothesis extends to the field of second language acquisition, Johnson and Newport (1989) investigated the effects of maturational period to the acquisition of syntax by L2 learners. Johnson and Newport examined Koreans' or Chinese's proficiency of English. The 46 subjects had been in the US since the ages of 3 to 39, and those who had dwelled there for 3 to 26 years. A grammaticality judgment test was used to investigate the subjects' understanding on English grammatical rules.

The results of this study suggest that there is an evident and robust correlation between the subjects' ages of exposure to English in the target language environment and their performance. Similar to the result of the previous study by Patkowski (1980), subjects who started to learn the second language at their young age outperformed those who started the learning at older age ( $r = -.77$ ,  $p < .01$ ). Interestingly, the results exactly demonstrate linear correlation between ages of exposure to English (arrival) and proficiency. For example, those who arrived at the age of 3 to 7 only made only 4 to 12 errors. This number of errors is very small compared to those who arrived at the age of 17 to 39 who made 22 to 113 errors. This implies that critical period for language acquisition not only does affect first language acquisition, but also second language acquisition.



In their follow up study, Johnson and Newport (1991) revealed very much similar results supporting critical period in their study using oral grammaticality judgments about subjacency in L2 English. The subjects were 21 native speakers of Chinese who were firstly exposed to English between ages 4 and 38 years. They had been exposed to English for at least 5 years, and at the time of the study they were adults. The results show that there was a negative correlation between the performance and the age of arrival for those who immigrated before adulthood with  $r = -.63$ , and then decreased to slightly above chance when exposure happened in adulthood.

Further evidence was obtained when Johnson (1992) conducted a replica of the prior study with the same subjects in the following year, but it was replicated in the written format. Basically, the results were very similar to the one with the oral grammaticality judgment despite the slightly lower correlation between age and test score compared to the previous study with  $r = -.54$  for all tested subjects, and  $r = -.73$  for the subjects arriving before adulthood.

Although the evidence from empirical research discussed above has been very robust, surprisingly, some empirical studies have reported the counter evidence to critical period for language learning. Bialystok (1997) critically reviewed the study conducted by Johnson and Newport (1989) on the age-related language learning. She elucidated that there are some questionable aspects in the results of the study. The three aspects are the subjects participating, the 12 grammatical structures tested, and the method of testing.

The first issue Bialystok questioning is the difference of learning experience of the two groups, the younger learners who are undergraduates and the older learners who are mostly postdoctoral researchers. It is not quite startling if the younger group outperformed their older counterpart because they had received more explicit language instruction. The second one, it is surprising that the only some structures are affected by the critical period. The test results show that plurals, determiners and subcategorization of verbs are age-related, while features such as present progressive, auxiliary, pronominalization and word order, to name a few, are not. Unexplainable question arising is why maturational condition only effects the learning outcome of some specific language structures but not the others. Finally, regarding the testing method used, the subjects performed better when they did the written test. Bialystok believed that if the study really supported the critical period hypothesis, it would not make any difference in any testing conditions (in written or orally) because it is related to biological development (critical period), even though DeKeyser (2000: 501) argued that 'the Fundamental Difference Hypothesis' envisages that the adult learners who is likely to perform well in learning L2 will inevitably acquire very good speaking ability.

In addition, from her two researches on critical language learning, Bialystok (1997) also suggested that the age at which learners are exposed to

second language is not a determining factor for the L2 learners' competence. Instead of the age, the time that the L2 learners spend in the target language environment contributes significantly to the L2 learners' competence. Bialystok conducted two studies on the age-related acquisition of second language. The first study was investigating college students who are native speakers of English or German. The subjects are of different ages, and had begun studying French as a second language. The subjects for the other study were L1 speakers of Chinese from different ages who had dwelled in Canada, and they learned English as a second language. The both studies prove that the learners who started to learn a second language after the age of puberty could acquire the language better than their younger counterparts. Thus, the research arrives at the conclusion that the evidence to agree with the premise of maturational constraints in the acquisition of second language is far too insufficient.

DeKeyser (2000) considered Bialystok's evidence against the Critical Period Hypothesis is invalid because, from the results of the study which reveal that the adult learners outperformed the younger ones, what was investigated was the speed of learning, instead of eventual attainment of second language. Also, because in Bialystok's study there was no limitation of minimal period of stay, it is likely that many learners had not reached their ultimate level of attainment yet. Therefore, because the subjects had not reached the final attainment yet, their performance is considered as the result of the second language learning process. Birdsong (2006) postulated the importance of examining second language proficiency by looking at the ultimate attainment because it is considered that evidence from the ultimate attainment that demonstrate the higher levels of L2 acquisition. DeKeyser also argued that because the subjects learning French as a second language did not live in target language setting, they were most likely learning the language merely with explicit instruction, so that the findings do not necessarily undermine the Critical Period Hypothesis.

#### **D. Conclusion**

Based on the results of various studies, it appears that the effects of critical period for language learning are inevitable. Most of the studies investigating the age effects on phonology suggest that the younger learners master L2 phonology better than their older counterparts (Oyama, 1976; Asher and Gracia, 1967; Long, 1990). It is evident that children who are exposed to a second language at a younger age would most likely achieve native or near-native accent, while adults who are exposed to a second language at a later age would most likely end up with a foreign accent. This phenomenon is claimed to be the effect of the loss of brain plasticity after the puberty period.

Similarly, for the acquisition of syntax, stronger evidence shows that there is a critical period for language learning because children who are exposed to a

second language at a younger age appear to achieve better grammatical ability (Patkowski, 1980; Johnson and Newport, 1989, 1991; Johnson, 1992). These studies show children who are exposed to a second language at a younger age would most likely acquire better grammar than those who are exposed to a second language at a later age. However, some studies which prove that older learners perform better in grammar cannot be taken for granted. Even though they cannot be generally accepted because the learners have not reached the end state (e.g. Bialystok, 1997) or the result actually reflects the rate of learning, not the ultimate attainment (e.g. Fathman 1975; Snow & Hoefnagel-Hohle, 1978), these results can be a strong indication that adult learners can possibly achieve native competence in grammar. If this is true, further research needs to be conducted to answer the question that remains unresolved, which is why the loss of brain plasticity only affects phonology, not syntax.

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