The critical period hypothesis and differences in second language acquisition between children and adults

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Critical period hypothesis and debates

In order to explain the phenomenon that children are better than adults in second language acquisition, a new linguistic theory, the Critical Period Hypothesis (CPH), has been proposed. The critical period comes from biological theory, which the researchers have introduced and expanded to apply to proper second language acquisition. Since then, scholars have conducted a series of studies on whether a critical period exists, at what age, and what role it plays.

The critical period hypothesis (also referred to as the critical period) is derived from the biological studies, which refers to the period in which environmental influence can play the biggest role in individual development. The critical period is particularly easy to acquire individual behavior under appropriate environmental influence, and the development is particularly rapid. Lenneberg (1967) first proposed the concept of "critical period of language acquisition". Lenneberg believed that there is a period of time during language acquisition during this period language acquisition is easiest for them due to physiological factors. Beyond this time language acquisition is limited to some extent. Before puberty learners are young in physical and psychological development stage, and their brain plasticity is strong , so It is easier for them to learn the idiomatic second language. While adults are fully mature, the brain gradually loses its plasticity, passes the optimal age for learning a second language, so it is more difficult to learn a second language. The Lenneberg study also showed that damage to the left hemisphere of the brain caused more speech problems in children than in adults. Penfield and Roberts also believes that age is related to the ability to acquire language, and that the human brain is more plastic before puberty. After puberty, this plasticity gradually disappears, which is the result of the lateralization of language function in the left hemisphere of the brain. Thus he thinks the best age for language acquisition is before the age of 10.

Long(2007:72-73) believes that there is a critical period for second language learning and puts forward three reasons to support his view. First, children all over the world are basically at the same age when they acquire their own language. Second, children can successfully learn any language; finally, this language-learning ability diminishes or even disappears with age. Studies on various aspects of language acquisition provide evidence for the existence of critical periods. For example, in terms of phonological acquisition (speed or outcome) and age, Asher and Garcia(1969) and Oyama(1976) tested the oral English proficiency of immigrant students in the United States. They found that the younger immigrants spoke more closely to English speakers, scored better on tests and spoke with fewer native accents.

Johnson and New Port (1989, 1991) studied the relationship between syntactic acquisition and learning age. They tested Korean speakers between the ages of 3 and 39 who were learning a second

language. The study found that subjects performed well on syntactic tests before the age of 17, and their scores peaked between the ages of 3 and 7, when they began to decline. After the age of 17, subjects had poor grades and the result did not change significantly with age.

Also， many scholars oppose the critical period hypothesis. Through their researches, they refuted the existence of critical periods from three aspects. First, many abiotic factors play a key role in language learning, such as cognition, environment, emotion and motivation. These factors account for a very large proportion in learning, and even determine the difference in learning. Secondly, studies have shown that second language learners who miss the critical period can reach the level of native speakers, and the success of language learning is not entirely dependent on the critical period. Finally, language learners of different ages have their own advantages and disadvantages in language learning. As long as appropriate teaching methods can be selected according to these characteristics, students of any age can effectively learn a language, and no age period is more critical.

Phonological acquisition is generally regarded as an important evidence to prove the critical period hypothesis, but some scholars deny the existence of the critical period of phonological acquisition through research tests, and believe that other influences lead to the differences in phonological learning between adults and children. The test of Bongaerts(1999) provided three individual cases of adult second language learners who did not have accent in their second language English learning. The subjects were students major in English and French from Denmark, and they had excellent grades. Students were asked to read sentences in their second language that contained phrases that were difficult to pronounce. Native language examiners judge their pronunciation. From the results, the examiners thought their pronunciation was very good, up to and close to the level of native speakers. Therefore, researchers believe that there is no critical period for pronunciation, and other factors lead to the failure of adult learners in phonetic learning. Flege(1999) studied the relationship between foreign language accent and initial learning age of second language learners. He found that there was a linear relationship between age and accent, but this linear relationship was smooth. Like the critical period hypothesis, learning should decline sharply after a certain age, but the study found no tipping point at that age. Therefore, Flege believes that the reason why the level of second language phonological learning decreases with age is related to the level of native language use and the level of native language pronunciation control, rather than the result of the loss of phonological learning ability caused by missing the critical period with age. To explain this phenomenon, Flege also proposed the Speech Learning Model (SLM).

In terms of the acquisition of initial speed, the results of Snow(1978) also deny the existence of critical periods. He conducted longitudinal age-specific studies on the acquisition of Dutch by native English speakers in natural settings. The subjects were 3 to 5 years old, 8 to 10 years old, and 12 to 15 years old. The results showed that the 8- to 10-year-olds performed best in the first few months of learning, while the 8- to 10-year-olds and the 12- to 15-year-olds mastered Dutch well a year later, but the 3- to 5-year-olds did not perform well in all tests.

In terms of the final results of acquisition, Birdsong et al. (1999) found that the degree of similarity between mother tongue and second language and the proficiency of second language are very related to second language acquisition. They repeated the study of Johnson and New Port. Different from the

results of Johnson and New Port's Korean speakers, even if they miss the critical period, their second language learning performance still declines with age without a significant turning point, which is not in line with the critical period hypothesis. Later, Birdsong and Molis(2001) used the grammatical judgment task to test whether bilingual learners could reach the syntactic level of native speakers. They tested bilinguals who started learning a second language after the age of 12. They found that between 5% and 31% of the bilingual subjects achieved the same level of performance as the target native speaker, falling within the latter's score range of plus or minus two standard deviations, suggesting that individuals who begin to learn a second language after adolescence are still likely to achieve the same syntactic performance as the target native speaker. Ellen Bialystok and Kenji Hakuta(1999) studied whether there is a critical period in syntactic acquisition, and the research conclusion showed that it has nothing to do with age.

In terms of brain activation patterns in second language processing, Chee et al. (1999) 's FMRI study matched the age of acquisition of the subjects and found no difference in brain activation patterns between late acquisition of second language but highly proficient bilinguals in processing second language and first language in both word processing and sentence generation tasks. These results suggest that even if the age of acquisition is later than the critical period, subjects can still achieve a native-like level in their second language with sufficient practice.

From the above discussion, it can be found that learners of different ages have different advantages in second language acquisition. To explain why the critical period mainly affects pronunciation and not other aspects of language, we need to refine our assumptions.One hypothesis is that there may be multiple critical periods for different aspects of language. Lateralization and localization are gradual processes that occur over several years in the learning process, in which different aspects of language are affected at different times ¨ this also explains why adolescents are better at grammar acquisition -- about age 16 reach the critical period of grammar acquisition.

But a classroom setting is different and more complicated. On the whole adults often learn better and faster than children because adults have good inductive and deductive abilities and more importantly they know "how to be a good student". They can concentrate for long periods of time in class ¨ pay close attention to what teachers say and teach which undoubtedly makes adults more successful.

Different parts of a language probably do not have a uniform critical period, and there are differences in acquisition difficulty, language environment, similarity degree of mother tongue and other factors. It's possible that phonological, semantic, syntactic parts have their own critical periods, or that some of these systems of language have critical periods and some do not. There is no accepted research or evidence on the subject.

In our view, the critical period hypothesis oversimplifies and generalizes, focusing too much on the learning aspect of phonology. Different aspects of language learning are difficult to learn, and different learning methods are adopted. The critical learning period of each part is probably not concentrated in the same period, but has its own advantage period. Second language learning at all ages has its own advantages and disadvantages. The differences between adults and children in second language acquisition do not necessarily result from or are not only caused by the critical period, but are the result

of various factors (such as physiology, cognition and emotion).

Advantages of children learning a second language

Steinberg (1993) believes that in order to make clear that children have an advantage over adults in second language acquisition we must consider the acquisition environment of the target language and all the factors that affect the acquisition. Steinberg says there are several reasons why children outperform adults in a natural speech environment: First of all, in terms of quantity and quality, children have access to more and better natural language input (e.g. the situation when they have fun or debate with native children) Adults, on the other hand, may feel frustrated in the target language society, excluded or even hostile and marginalized. All of these can hinder adults from acquiring a new language. Second, as we get older the vocal organs are not as flexible as they used to be it is more difficult to adapt to the new language. This is why children are better than adults in pronunciation and intonation and overall communication proficiency especially in speaking accent.

According to Lenneberg, the critical period for any language to be acquired naturally through exposure is between the ages of 2 and 12. Between the ages of 2 and 12, children's brains are active and malleable, giving them an innate talent for learning language, and language acquisition during this period is simple and effortless.

The reason children do not acquire language before the age of two is because the brain is not fully developed, it doesn't have the ability of acquisition yet; while language input becomes difficult after puberty because the brain loses its flexibility after this period. As is often mentioned in studies, the reason why wolf child can't have the same language ability as ordinary people is because they miss the critical period of language acquisition and lose the ability of language input.

A girl named Genie is a typical example. She lived in Los Angeles in 1970 and completely cut off from speech until the age of 12, when she was discovered. The researchers found that she was slowly learning to speak short sentences by the age of 18, but her vocabulary, phrases and grammar were very simple and limited. She had no syntax, which means she didnt use auxiliary verbs, question words, pronouns, and inversion. But in other respects, such as recognition and behaviour, she is no less than any normal child. It can be seen that some functions of language acquisition in the brain can exert their functions to the maximum extent only in a certain stage. It is difficult to gain native-like proficiency when we missed critical period. The initial age of second language acquisition is an important factor to determine the success of second language acquisition. A large number of similar facts and researches have enabled some linguists to face up to and attach importance to the existence and significance of the critical period of second language acquisition. The period from age 2 to adolescence is widely regarded as the golden period for foreign language learning.

Why children have advantage in second language acquisition over adults? We can demonstrate that from four aspects, namely, physiological, motivational, cognitive and emotional advantages.

1. Physiological advantages

Chomsky argues that people are born with an inherited mechanism for language learning, which he

calls the universal grammar hypothesis. In the view of universal grammar, language acquisition is a priori and universal. Language, on the other hand, originates in the brain, so the ability to speak is constrained by physiological mechanisms. The generation and development of language ability are related to human physiology.

To systematically explain the physiology of the critical period of language acquisition, Lenneberg drew on neurophysiological and medical experience. He believed that lateralization, also known as marginalization, begins at age two. The left hemisphere of the brain is responsible for language, while the right hemisphere perceives non-verbal sounds and musical melodies, as well as visual and spatial skills. The location of cognitive and perceptual functions in one hemisphere of the brain is called lateralization. Since each hemisphere of the brain has unique functional advantages, the two hemispheres' expertise is mutually beneficial. Lateralization is considered to be a developmental process, that is, brain lateralization is programmed in the genes, but it takes time to achieve lateralization. Until lateralization is complete, language is learned with the whole brain. Lateralization is completed around the age of 11 to 19. From then on, language learning is mainly done by the left side of the brain. Language learning in lateralized brain is not as good as in whole-brain learning. Therefore, language learning is best done before the brain completes lateralization, which is known as the "critical period of language learning."

The superior performance of children and adolescents in second language acquisition is closely related to brain development. Younger people are thought to have sharper hearing, better ability to imitate, fewer distractions and fewer obstacles than older people. The younger the child is, the more unconscious he is in the process of second language acquisition, and the more he can achieve the effect of natural acquisition like mother tongue. Children's nature determines their strong curiosity and exploration of everything. In the process of natural contact with the second language, they are often more impressed by the target language, which is hard to forget. On the contrary， after puberty, the brain's completed lateralization makes it no longer plastic and its response to language stimuli is weakened. During this period, the brain is no longer as sensitive to language as it used to be. Besides, adults do not have the curiosity and creativity of children, and the mother tongue has been solidified, making it difficult to input a second language and learning less smoothly than before.

2. Motivation advantage

Motivation is an inner drive, an emotion or desire that motivates people to take a particular action. Motivation is conditioned by environment and task. There are mainly two kinds of motivations for learning a second language: one is instrumental motivation, This motivation mainly comes from the motivation to use language intermediaries to achieve certain goals to learn a language, such as translation, finding a job, reading literature, etc., focusing on "the practical value and benefits of learning a new language. Integrated motivation learners hope to integrate themselves into the culture of the second language and show a "sincere personal interest in the culture and people of the language". The former is passive motivation, the latter is active motivation.

It turns out that associative motivation tends to be more positive and get better results than instrumental motivation. Because most adults study for the needs of the exam or career promotion and the purpose of learning, this kind of learning is to master another language to bring benefits to themselves, known

as instrumental motivation, is external cause; On the contrary, children and adolescents are often driven by the need for communicative use, the need for better communication with target language users, or even integration into them, which is called binding motivation and is the internal cause. As we know, internal factors play a stronger role than external factors in influencing people. Only with internal motivation, that is, combined motivation, can we maintain lasting interest in contact with the target language.

3. Cognitive advantage

Children's cognitive abilities are immature, adults' cognitive abilities are mature. According to Newport, it is cognitive immaturity that is conducive to second language acquisition.

First of all, the short-term memory capacity of children is far inferior to that of adults. Compared with adults, children can only process a small amount of information and then output language, while adults can choose more information processing to output language. However, processing too much information at the same time can be a disadvantage in language acquisition, especially in second language acquisition. Children's small short-term memory is more beneficial to second language acquisition.

Secondly, Halliday, a contemporary British linguist, emphasizes the "function" of language, that is, when using language, we should pay more attention to "what language can do" rather than "what language is". Children regard language as a communication tool, which requires only the expression of the required meaning. The brain is not solidified by rules, which is a kind of "unconscious" and "open" natural acquisition. Adults perceive language as a system and unconsciously learn it with purpose and consciousness. Children's natural acquisition enables them to immerse themselves in the target language and eliminate the interference of mother tongue. However, the systematic cognitive habits of adults make it difficult for them to grasp the target language easily and quickly during second language acquisition.

Moreover, the mastering of mother tongue of adults lead to their second language acquisition in cognition to the second language associated with native language, which is not completely equivalent language if comparedin a simple rough parallel way. The process of second language acquisition interfered by mother tongue influences many aspects, leading to the difficulty to grasp the original target language and to become native-like.

4. Emotional advantage

Human beings are emotional animals. With the growth of age, the richer and more complex the emotional state of human beings is, the more unfavorable it is to the second language acquisition.

First, according to Alexander Guiora's research on personality variation in second Language acquisition, the concept of "Language Ego", namely Language Identity. It can be seen from this concept that before second language acquisition, adults have the psychological protection of language, and even the learning difficulties and resistance due to the difference between second language and mother tongue. So if you want to master a new language, you need to build a new language pattern. Children, whose mother tongue is not deeply rooted, tend to be more receptive to a second language and to be

creative to make new patterns. In terms of pronunciation, children are less affected by the accents and dialects of their mother tongue. In grammar, children's mastery of their mother tongue grammar is not systematic; In terms of syntax, children have not developed a complete system of syntax,their pattern of sentence formation is not solidified.Thus, it is easier for children to reach the level of native speaker in second language acquisition.

Second, children's interest in second language acquisition is high. Therefore, compared with adults, children have more resources for second language acquisition. Children can perceive various forms of language more vividly through games, fairy tales, songs, animations and other multimedia materials, while adults tend to face dry books more than children. In this cycle, children become more active in natural contact with second language, while adults become more and more afraid and passive. Children's endless intake is inseparable from the emotional advantage of learning through multiple channels.

Third, in second language acquisition, adults are afraid of making mistakes, shy to speak, lack confidence, lack courage to face mistakes, and are reluctant to express their opinions easily. What they learn is "dumb English", which is not conducive to timely finding and correcting mistakes, but also unable to cultivate the habit of speaking a foreign language. Adults also lack children's innate flexibility and creativity, let alone children's ability to integrate learning in the form of games and transform second language learning into a natural second language acquisition process combining learning with fun.

Advantages of children learning a second language

Adults second language acquisition is much more complex than children's second language acquisition, but the important theories of adult second language acquisition are mainly derived from the development theories of children's second language acquisition, such as the error analysis theory from behaviorism claimed by Gass and Selinker. Interlanguage theory derived from apriori theory (Selinker 1972, quoted from Ellis, 1997) and language monitoring model derived from cognitive theory elaborated by Gass and Selinker. Gass and Selinker (2008, p.95) believe that second language learning is the formation of a set of new habits based on behaviorism. However, adult second language learning habits coexist with mother tongue acquisition, and second language learning may be affected by mother tongue, such as language transfer under normal circumstances. For example, Chinese people say 'sank, sink' instead of 'thank, think' because of the pronunciation in Chinese, there is an 's' but no 'θ'. Or they express English sentences according to Chinese grammar, such as "Our family have four people", "My mother do teacher work" and so on. It is this kind of situation that leads to a lot of language errors, and most of the time students can't find them by themselves. In the theory of error analysis, Gass and Selinker show that error analysis is the key point, but the error here is different from mistake. As Corder[10] said, mistakes are easy to be found and corrected by learners, while errors are not easy to be detected, only from the perspective of teachers or researchers, many errors can be found. For example, Chinese people do not express many things properly in English, which can only be discovered by researchers or native speakers, and sometimes not even by teachers, because many English teachers are not native speakers. Gass and Selinker emphasize that error analysis theory not only shows the deficiency of l2 knowledge of learners, but also shows the language learning rules and state of l2

learners. Error analysis shows that second language learners need to go through a long process of language error correction before they can acquire second language.

Second language error correction promotes the process of second language acquisition to a great extent, that is, the second language level of second language learners may gradually approach the target language, but in this process, the second language of learners is neither mother tongue nor pure target language, but interlanguage close to the target language. Interlanguage (Selinker 1972, quoted from Ellis, 1997) emerged because researchers found the deficiencies of behaviorism research in second language acquisition. They tried to study second language acquisition from the perspective of the innate theory of children's mother tongue acquisition. In adult second language acquisition, Selinker (1972, quoted from Ellis, 1997) believes that adults' second language acquisition must go through a long-term interlanguage period. Interlanguage is an independent existence between mother tongue and second language, and adults are mainly exposed to interlanguage in most of their second language acquisition.

In conclusion, adult second language acquisition has the following main characteristics: acquisition occurs in adulthood, most acquisition needs monitoring mode and is affected by emotion, second language acquisition is affected by mother tongue interference, and the learning environment is mostly unreal language environment (mainly classroom teaching or training).

Krashen(1982:43) pointed out that adults can also learn a second language well, and if the time for acquiring and using a second language is fixed, adults will make progress faster than children. Ellis (1994) believes that both children and adults have their own advantages in second language acquisition. Stern(1983) believes that people of every age have their advantages and disadvantages in language learning, and that no period is more critical and there is no critical period. Children prefer to communicate in natural Settings for language acquisition, while older children tend to learn a second language in a unified and systematic way in the classroom, using a variety of learning strategies. In other words, a language can be acquired at any age. Experts believe that the acquisition of semantic and pragmatic knowledge is closely related to the development of human cognitive level. This shows that adults have an advantage over children in understanding.

At the same time, the survey of the starting age of second language acquisition of well-known experts in the second language field also shows that although adults acquire second language later, the same effect will be very good.

Ellis(1994:68) questioned the critical period hypothesis by using the case of a woman from England who did not learn Arabic until she was 21 years old, but who had lived in Cairo for 26 years and had achieved the level of a native speaker through various tests.

These successful examples show that adults also have objective advantages in second language learning. Adults have strong cognitive ability and logical thinking. Meanwhile, adults can consciously choose to use learning strategies， have self-control and self-monitoring and error correction ability.

The advantage of the adults in second language learning is also reflected in the choice of acquisition

strategy, adults become more aware of their own ability and the characteristic, can consciously choose to adjust learning strategies, improve the efficiency of second language acquisition, according to the actual situation, adults can according to different language aspects at the same time, using different learning strategies, or switch learning strategies according to the learning process and master situation, This kind of self-cognition and active strategy adjustment is not possessed by children. Adults' second language acquisition is more proactive and strategic, while children's second language acquisition is more passive.

In 1928, Thorndike, an American psychologist, conducted an experiment in which he divided people aged eight to 35 into groups to teach Esperanto in the same way and from the same textbook. The results showed that the youngest group took twice as long and learned half as much as the adults. In 1932, Cheudleur had also conducted experiments in language learning teaching for middle school students and adults. He taught French to secondary school students aged 12-18 and adults over 20 (up to 60)， using the same textbooks and teaching methods. The result showed only 25% of secondary school students achieved the level of 64% of adults. The above examples indicate that adults can achieve a better learning effect than children by applying their logical thinking ability, metalinguistic cognition and learning strategies.

Another advantage of second language acquisition for adults is their strong self-monitoring ability. They can analyze their own language mistakes and try to solve the difficulties and problems encountered in second language acquisition. For their lack of aspects will consciously increase investment. In addition, the attitude and initiative of adult learners are conducive to second language acquisition. When encountering difficulties, adult learners will carry out self-psychological adjustment, such as telling themselves to keep on. Adult students will also give play to their own subjective initiative, and continue to actively summarize the learned experience and test the knowledge structure. These psychological characteristics are not acquired by children.

Summary

So far, there is insufficient evidence to absolutely deny or affirm the existence of critical periods in Ssencd language acquisition. The main reasons are as follows: First， the definition of some key concepts is not consistent enough. Second, there are few tests that fit the target, and the test standards are not unified enough. Third, it is difficult to control variables perfectly. Fourth, different studies have different target languages and test criteria.

For the differences between children and adults in second language acquisition, children have advantages over adults in physiology, cognition, motivation and emotion, and are easier to reach the level of native speakers than adults. But the advantage is relative, and children are likely to be less advantaged than adults in learning different languages. Compared with children, adults have strong logical thinking, perfect self-cognition, strong self-monitoring, flexible use of learning strategies and other advantages in second language learning. As long as they devote time and appropriate methods, adults can also reach the level of native speakers. However, adults' motivation for second language learning is mostly instrumental motivation, coupled with the interference of mother tongue, learning environment and emotional factors, they usually can not reach the level of native speakers.

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