

A review of the Critical Period Hypothesis and some reflections

1. What is the "Critical Period Hypothesis"?

The concept of critical period means a specific period, usually refers to a maturational window of time in biology, that allows individuals to experience peak conditions in learning or obtaining certain skills with relatively higher efficiency (Rothman, 2008).

The optimal age for learning foreign languages began to receive attention and discussion from scholars in the early 20th century. The famous neuropsychologist, Wilder Penfield, along with the co-writer Lamar Roberts, initially proposed the idea that there was a corresponding close relationship between foreign language learning and the learners' age, the prototype of the CPH. Their research suggested that language learning was administered by the left hemisphere of the brain and children were able to learn many languages before age 9 (Jaspal, 2009).

This idea was later developed by Eric Lenneberg in his book *Biological Foundations of Language* in 1967. He proposed that natural language learning can only occur in a critical period, that is, between the age of 2 and puberty. During this period, the whole brain is involved in language learning. Therefore, new language information can be received easily and naturally. After this period, the efficiency of language learning will be greatly reduced. It is of crucial importance to expose children to their native languages in the first several years so that they could acquire them. On the contrary, if this exposing environment of the native language is absent or deprived, a child can not achieve full language competence forever. The story of Amala and Kamala, the feral sisters found in India in 1920, can support this idea. These two girls were raised in the wolves' den and grew up away from human civilization. After receiving various treatment for a long time, these two girls still failed to obtain basic human language as well as human behaviours. It is an example that not only verified the CPH in linguistic but in other subjects like biology as well.

Plenty of research have verified that the CPH exist and is applicable in human's first/native language (L1). Due to the association with age, the CPH has been applied to research in biology, psychology, medicine, etc. The CPH started as a theory of first language acquisition, and then gradually extended to the research of second language acquisition (Jaspal, 2009).

In linguistic, there have been decades of debate and argument over its rationality and its relationship with the second language (L2) acquisition. Michael Long refers to the "critical period" as a "sensitive period" for children to develop each part of the whole language system.

Generally speaking, the CPH in linguistic means a crucial period that children have the highest efficiency and potential to learn a language in a full spectrum. After this period, the overall language learning ability declines and certain aspects of language learning would be impossible to achieve, like native-like pronunciation.

2. The Critical Period Hypothesis(CPH) and Second Language Acquisition (SLA)

Before discussing the correlation between CPH and SLA, it is necessary to distinguish the differences between language acquisition and language learning. Stephen D Krashen firstly noted the differences between "learning" and "acquisition" in L2. In his view, "learning" doesn't equal to and couldn't be transferred to "acquisition" (Tricomi, 1986). A learner's fluency in L2 is the work of "acquisition", so adults and children are acquiring L2 in totally distinct paths. Language learning is a process of conscious practice, recitation and memorization, in addition to scheduled lectures on

grammar and phonology, to conceptualize the language identity and grammar rules. Language acquisition is a natural and unconscious process that captures patterns and details by daily conversation, like mastering L1. Krashen also believes that only “acquisition” could fundamentally improve the development of L2 and contribute to learners’ goals of mastering the L2, while “learning” could only familiarize language structures and grammar rules which are only useful for the purpose of surveillance and amendment in L2 applications. Therefore, he emphasizes the importance of “acquisition” for adults in L2 studying (Tricomi, 1986). If an adult acquires the L2 in the same way that a child acquires the L1, the L2 will become part of the intelligence within and the L2 outputs will be greatly improved. That explains why he said that “People acquiring a second language have the best chance for success through reading.” And “Language acquisition does not require extensive use of grammatical rules, and does not require tedious drill.” (Schutz, 1998)

To support the CPH in SLA, several facts and conditions must be reached. First, there is an obvious decline in L2 proficiency after the critical period. Meanwhile, this decline is irreversible and negatively correlated with the age index. Second, the L2 should be equally exposed outside and inside the critical period. Third, the evaluations of L2 proficiencies shall be conducted in various methods to ensure the fairness of the outcomes. Fourth, a relatively higher learning effort within the critical period and a less learning effort outside the period to make a contrast (Colombo, 1982). Therefore, there are some arguments over whether the CPH really applies to SLA as several variations mentioned above are hard to control in research.

It is not controversial that the CPH works for L1 acquisition, or whether an individual’s L2 success is related to age decline. What is controversial is whether these phenomena and patterns can be explained or concluded by the CPH and the way CPH predicts learning outcomes (Hakuta et al., 2003). Some researchers point out that these research results cannot support the conclusion that the potential or ability to master an L2 gradually fades after the critical period. Still, there are old learners who achieve sensational L2 outcomes. Karl Marx began his study of Russian in 1869, at the age of 51, and ended up communicating and writing in Russian. Besides, it is difficult to measure the changes or improvements of the L2 at the end of the critical period qualitatively. That is to say, research that support the authenticity of the CPH should provide pieces of evidence on prominent changes in learning outcomes before and after the critical period, as well as evidence that could strongly indicate these changes are associated with age (Hakuta et al., 2003). Harry Whitaker suggests that it is unnecessary and superfluous to associate the so-called perfect learning age with the lateralization of the human brain. The critical period only has an influence on children’s phonologies, not their overall language competencies (Whitaker, 1981). Seliger believes that age has an inevitable effect on children’s language abilities in various aspects, including syntax, phonology, vocabulary, pragmatics and semantics. Some of them would be difficult to be acquired after the critical period (Nunan, 1991). In 2012, Dekeyser pointed out that 25-30 research proved that age had impacts on learners’ phonology development, over 25 research verified that age affected syntax and semantics acquisition, and only 5 research were able to confirm vocabulary acquisition was associated with age. These research suggest that the critical period affects learners’ language acquisition more on the output processes such as phonology and syntax (Vanhove, 2013). Singleton questions the usefulness of the CPH, mentioned that as there is no strict definition or specific time range to testify the CPH, arguments or discussion concerning the CPH itself is meaningless. However, to discover what and how much age weighs in SLA would be worth discussing (Singleton, 2005).

3. “The Age” in the Critical Period Hypothesis

For decades, scientists have different opinions on the specific time of CPH. The following is a more representative critical period proposed by some famous scholars.

Wilder Penfield and Lamar Roberts claims that the working function of the brain begins to decline at the age of 9, psychologically making individuals difficult to master a language that first appears after this age.

Eric Lennerberg continues this research by adding that the critical period starts at age 2 and ends at puberty. He asserted that after puberty, random factors that potentially hinder SLA would increase, and an accent in L2 would take efforts to overcome. (Singleton, 2007).

While Pinker consider this critical period occurs around age 6, a time that children would peak in all aspects of language learning including vocabulary expanding, grammar learning, as well as comprehensive output (Hakuta et al. 2003).

Karl Diller states that phonological and phonetic acquisitions are developed between age 6 to 8, cognitive skills of L2s would be acquired in the following two or three decades.

Thomas Scovel specifically sets pronunciation apart from other figures in SLA. He believes that pronunciation is a “neuromuscular basis” and has a “physical reality”, which will make L2 learners who are exposed to the target language after age 12 impossible to achieve a native-like one.

Jacqueline Johnson and Elissa Newport propose that there are two significant stages for language study. Stage one is from birth to age 7, a period that is perfect for language study in various methods. Stage two is from age seven to puberty, a period that language study sees its gradual fall yet still capable to achieve favourable learning outcomes. After puberty, the efforts put into language study fails to compete the plunge of the language study capacity.

Michael Long further supports this theory, adding another view that exposures of L2 should start before age 15 to acquire native-like morphology and syntax, relatively lengthen the previous theory.

Robert J. Ruben provides more details, indicating that the critical period for phonetics and phonology falls on the first year of birth. Meanwhile, critical periods for syntax and semantics end in age 4 and age 16 respectively.

4. Previous Research of The Critical Period Hypothesis and Second Language Acquisition

4.1 The CPH and L2 proficiency

Mark Patkowski checked the English speaking among 67 highly-educated immigrants who had lived in the United States for over 5 years. Their interviews were recorded and rated by native speakers who had been trained for rating English levels. This initial research indicated that children who began learning English before age 15 were most likely to achieve success in SLA. He later dug into other factors and found out that age was associated with all aspects of L2 performances.

Studies that require a large number of participants always draw attention and present persuasive data and conclusions. Kenji Hakuta, Ellen Bialystok and Edward Wiley conducted a research with over 2.3 million immigrants whose native language was either Spanish or Chinese. Besides, these participants had at least lived in the United States for 10 years. Participants were asked to self-evaluate their English proficiency and their age, education level, year of arrival (in the United States) were also obtained from census data. Age 15 and age 20 were used to testify the critical period, corresponding to the onset of puberty (Johnson & Newport, 1989) and later of puberty (Bialystok & Hakuta, 1994). The research found no difference in L2 learning potentials

between age 15 and 20. In the end, there was no significant decline or discontinuity even at any age that could support the CPH's existence. However, the research confirmed the idea that the chance of successfully learning L2 was gradually decreasing with age growing.

Barry R. Chiswick and Paul W. Miller again conducted a research using microdata from the 2000 US Census to test whether there was a relationship between the CPH and the L2 (English) proficiency among immigrants in the United States. Similar to Hakuta's previous research, there was no clear evidence to support the CPH in any age period. Meanwhile, L2 proficiency declines with age growing, which approved previous studies. In addition, this research proposed that both genders tended to show similar patterns in L2 proficiency after immigration.

These studies listed shreds of evidence that disapproved the CPH, yet they still did prove that age was a crucial factor that would affect SLA. Self-assessed L2 proficiency was used in these studies, which was neither accurate nor justice to evaluate other language aspects like pronunciation and grammar.

4.2 the CPH and native-like attainment

A great number of studies have tried to find out the relationship between the CPH and the final L2 outcomes. In 1989, Jacqueline Johnson and Elissa Newport launched a research that aimed to test grammaticality in L2. English morphology and syntax were tested among 46 Chinese and Korean speakers who had lived in the United States for more than 3 years, along with 23 native speakers. The research revealed that the arrival age in the United States was closely linked to the final success of the L2 performance. Those who started after age 15, especially after 10, were less likely to achieve satisfying ultimate attainment (Johnson & Newport, 1989). The research also proposed the notion of the strong CPH. It means that the negative correlation between age of acquisition and L2 ultimate attainment is strong in the early learners, while the correlation would be weaker among the late learners because there is a prematurational decline (age 7 to 15) at the closing stage of the critical period.

This research (JN1989) offers a model for later research to continue testifying the CPH and its relationship with L2 ultimate attainment.

Robert M. Dekeyser followed the JN1989 model and conducted a research with 57 adults whose native language was Hungarian. The research aimed to test whether adults and children were distinguishably different in L2 grammaticality. He also suggested that participants from the same language background would be more persuasive to testify the CPH as well as the JN1989. Surprisingly, Dekeyser's research did not find any significant correlation between the age of acquisition and the ultimate attainment in either the early learners or the late learners (Dekeyser, 2000).

David Birdsong and Michelle Molis replicate this research in 2001, using 61 native Spanish speakers who had resided in the United States for over a decade. The research suggested that the L2 ultimate attainment negatively correlates with the age of L2 learning. Evidence of those who had started L2 learning after the critical period yet achieved fruitful L2 outcomes were discovered (Birdsong, Molis, 2001). This study divided the participants into the same groups as the JN1989 did, the young learners presented the same results while the late learners offered a different one.

Heekyung Seol partially replicated the JN1989 in 2005 with 34 Korean speakers living in the United States for over 5 years and receiving formal education. Age of acquisition and the grammaticality performance still had a negative correlation in accordance with previous studies. To be more specific, age 10 marked the watershed in L2 learning. The JN1989 suggested that the peak period for L2 learning is from age 7, while this research indicated this figure to be age 3 to age 10. Meanwhile, no prematurational decline was found in this research as the JN1989 did (Seol, 2005).

All these research have supported the critical period to a little degree as they proved that age matters a lot in SLA throughout the life span. However, the strong CPH that the JN1989 suggested have not been testified, especially in Birdsong and Molis's study (2001) and Seol's study (2005) that discovered a total contrary correlation in late learner groups, which also hints that late learners also have the possibility to reach gratifying L2 ultimate attainment.

These studies have used grammar attainment to evaluate the native-like attainment in L2. All the evidence in these studies has proved that a general slide in L2 native-like attainment with late age of acquisition in L2 community, age of exposure to L2, and age of L2 onset.

Previous studies have suggested that children and adults each have their own strength in SLA. Children have a faster pace acquiring pronunciation while adults have a more organised method to grasp grammar rules. This idea has been proved by another research which set other factors apart and only focuses on these two groups initial reaction to L2. In this study, both children and adults basically had no knowledge of English. After 36 sessions of lecture, participants were tested by LTTC General English Proficiency Test. The obtained data revealed that children did do better in pronunciation than adults and adults did perform better in grammar, which somehow indirectly proved that age of L2 onset, at least in this study, was proved to have a significant impact on pronunciation and grammar of SLA (Valipour & Davatgari, 2014).

4.3 the CPH and pronunciation

Pronunciation in L2 is often assessed as a way of looking into L2 native-like attainment. Several studies have been conducted to see whether there is a correlation between age and the native-like pronunciation or there is a critical period to achieve native-like phonology and phonetics.

James Emil Flege and other scholars held a research in 2006 to testify the influence of age of acquisition and length of residence in the foreign accents of children and adults after living in the L2 country for 3-5 years. Along with native speakers of the same ages, these immigrants were required to take speech record on a yearly basis to make comparisons. The study findings were shocking. Even child learners who arrived in the United States very young and received formal education for 4 years still have noticeable accents, yet less strong than adults. Lengths of residence were not significant with immigrants' yearly change. This study did not approve the previous assumption that adult learners had stronger accents because their ages of L2 onset had passed the critical period. Instead, the authors claimed that this phenomenon was due to the quality of L2 input that young immigrants had more chances to receive than adults (Flege et al. 2006).

Using spontaneous speech data, Sebastian M. Rasinger launched a research in 2007, indicating

that immigrants' residence durations in the community of the target language outweighed their age of L2 onsets in affecting their L2 proficiency. A negative correlation between age of acquisition and foreign accent was found. However, age of acquisition did not have a strong impact on the final L2 performance. Rasinger later proposed that in a natural L2 acquisition environment (not the learning environment) where there were more informal communication and interaction going on, length of residence and the extent of L2 exposure play more significant roles than age on any aspects (Rasinger, 2007).

In 2009, along with 333 bilinguals (Spanish / Swedish) with different ages of L2 onsets (age 1-47), Niclas Abrahamsson and Kenneth Hyltenstam operated a study aiming to examine the relation between L2 native-likeness and age of L2 onset. Study results demonstrated that nearly none of the participants (a few learners began before age 10 and zero late learners) were qualified as native-like linguistic competence. Not surprisingly, the score of native-like pronunciation and age of acquisition was also negatively correlated. The study later interpreted the data as an idea that the chances for adult learners to achieve native-like L2 attainments was nought and for children was infinitesimal, contrary to previous assumptions (Abrahamsson & Hyltenstam, 2009).

These studies used native speakers to evaluate participants' L2 native-likeness. They all provided evidence that was inconsistent with the strong CPH, especially Flege's study, the decline that ought to appear at the end of the critical period could not be detected until the critical period had passed. However, this also supports the fact, as other studies also do, that age of acquisition seriously affects the native-like attainment in general, and it is an irreversible downward trend.

4.4 Summary - Similarities and differences between L2 children and L2 adults

To sum up from previous studies concerning the CPH and age as a crucial factor in SLA. Children and adults are the two main study groups and these two groups share more differences than similarities in SLA. If both children and adults' expose to L2 after obtaining their native languages, foreign accents could all be detected throughout their life spans. Children's accents are just weaker than adults'. In the acquisition process, children and adults who share the same L1 background tend to build up their L2 syntax and morphology under the same path.

According to the CPH, the human brain's functions gradually decline with individuals' age growth, correspondingly brings more barriers for language learning, which have been proved to be the pattern of neurological changes. Though there are endless arguments on the best age for language acquisition, it is no doubt that children's absorbing efficiency of language inputs far outweighs adults', especially in phonology. In all, children's L2 acquisition process is more automatic and unconscious, like acquiring L1. Studies have proved that children learn L2 in the same way as they learn L1 because the same area in the brain, a "deep motor area" which is claimed to control human's unconscious behaviours like blinking and breathing, has been used. Adults meet more difficulties in L2 acquisition because they have to apply their own volitions and comprehensions into the L2 for better understandings. Meanwhile, due to the shift of the "deep motor area", adults are strictly restricted within the common learning rules and are mostly unable to develop their own methods and skills to explore their learning strategies as children do by applying their "innate language learning strategies" (Pachina, 2020). Generally speaking, SLA for children is a process of hearing, imitating, and constant practice. SLA for adults is a construction of

comprehension, analysis, and utilization. These paths which rarely share resemblances naturally result in different emphases in L2 outcomes, pronunciation and grammar for children and adults respectively.

An accurate language outcome has a close and inseparable connection to the comprehension of the culture within the language. In SLA, culture engagement is another factor that could set children's and adults' acquisitions apart. Overall, children perform better in this area. First, children are mentally less independent and more accepting towards social sentiments, they rarely hold against L2 initially. For adults, they are more likely to have a prejudice or collision towards the L2 itself because of their own experiences or views. Second, adults are more astricted by L1 than children, cultures and thinkings in L1 would interfere with the recognition of these in L2, which in turn impact L2 acquisition. Third, children are more motivated in L2 acquisitions for they are eager for a sense of belonging when they are surrounded by L2 speakers. For adults, their aims of learning L2 are more likely to be career demands or self-promotion, it would take extreme self-discipline and practice to master an L2. Previous research has proved that immigrants children who arrived in the L2 country at the same time showed different attitudes towards L2. Children under age 9 turned to show acceptance towards L2 and made friends who were native L2 speakers, offering themselves more efficient L2 inputs. Children over age 9 stayed in their L1 community for as long as 3 years, directly decreasing their L2 exposure compared with younger children (Jia & Aaronson, 2003).

The Snow and Hoefnagel study in 1978 compared the L2 studies in children, teenagers and adults. In general, these three groups differ like this. Children (age 3-10): During this period, children have the strongest resilience in learning, and there is basically no huge difference between individuals in the capacity of language acquisition. Children in this period have the most advantage in learning pronunciation because they have stronger imitating skills and better hearing, and at the same time they are not afraid of making mistakes, and the psychological pressure of learning language is less. On the whole, children in this period also have the strongest memory ability. Teenagers (age 11-17): During this period, cognitive ability has developed to a higher level, and long-term memory ability has been enhanced. The habit of using the native language has been formed and will not be disturbed by L2. They are better at using language communication strategies than children and have a stronger ability to understand language and the culture within it. Therefore, they can get more effective language input, and at the same time use the acquired language rules to monitor language input more effectively. In addition, teenagers have lower emotional barriers than adults, so their learning speed can exceed that of children and adults. Adults (over 18 years old): Adults have fully established brain nerves and operate as a whole. They can easily process complex language content and have absolute advantages in reading and writing. Adults have superior logical thinking ability, cognitive ability and self-control. They have clear learning goals, sufficient motivation, strong comprehension and associative memory abilities. Therefore, adults can use the relevant knowledge of their native languages and their own learning experience in the initial stage of L2 learning, so that they can learn faster than children.

5. Reflection – What teacher should do in L2 teaching

Regarding the impact and effect of the CPH on SLA, scholars have various opinions. However, there is no doubt that with age growing, the overall language learning ability shows a downward trend. Therefore, there is no objection to the initiative of L2 learning from childhood. Children have more advantages in learning pronunciation. Children have relatively stronger imitative ability and

keen hearing. It is more in line with the nature of language acquisition order to establish more listening and speaking courses during this period.

However, not all aspects of language learning are suitable for children, which is also the negative impact of the CPH that we can see in SLA. In China, most parents are negatively affected by the CPH, showing an overall trend of younger children in English learning. Private language learning institutions preach the benefits of learning English in advance and comprehensive English courses can be seen in kindergartens and pre-school education. In fact, the CPH's theoretical support for SLA is not sufficient. It has relatively high persuasiveness only at phonology. At the same time, the CPH cannot explain why the loss of brain plasticity only affects phonology and does not affect other aspects of L2. Therefore, in view of the existing theoretical research, in China where English is used as L2, the teaching of L2 should follow the existing scientific theories and research outcomes.

Teachers with different strengths should be allocated in different schools. In kindergartens or primary schools where children have their initial contact with English, teachers with better pronunciations and speaking skills ought to lead these students to cultivate their phonation articulations. Meanwhile, since children's learning process is mostly imitating and practising, teachers should be patient and prepared to repeat the knowledge over and over. While teachers of advanced writing and grammar skills should be encouraged to instruct in high schools where students' abilities for language analysis and pragmatics are developed. Middle school students are mostly teenagers. At this time, they are in the golden age of rising from imitation to summarizing, and the abilities shown by each student are also inconsistent. Teachers who teach at this stage better have strong comprehensive qualities and give different answers and suggestions to the questions raised by students of different ability levels. Adult L2 learning mostly relies on self-discipline and induction. The teaching progress in adult classrooms can be moderately accelerated, and the important and difficult parts can be elaborated intensively. However, it must be more difficult for adults to acquire L2 pronunciation than for children to acquire L2 grammar. Because compared with children, the process of learning L2 for adults is reversed. Therefore, in the L2 classroom for high-level adults, teachers should also appropriately emphasize and improve pronunciation, and strengthen adults' practice in phonology. In the children's L2 classroom, the teaching of grammar and syntax can be appropriately delayed. After all, children have the privilege of going through this stage in the end, and adults may not have the luck to step back in time.

In addition, as children and adolescents are relatively mentally immature, their learning goals in L2 are not clear and their motivation is insufficient. Teachers should be encouraged to interact and communicate more with students in children and adolescents L2 classrooms. In this way, teachers can not only tap the interests of students, so as to provide a clear direction to stimulate their learning motivation but also duly obtain learning feedback which could be utilized for improving teaching focus and strategies. The motivation of adults in L2 learning is mostly spontaneous. In adult L2 classrooms, there is no need for too many enlightening and guiding interactions to cultivate their interests.

Common misunderstandings of the CPH include a paranoid belief that children will learn L2 faster than adults and children would acquire a satisfying L2 outcome if extensive language learning is given during the critical period. However, research have proved that adults master an L2 quicker than children because adults are more organized and acquired more comprehensive skills to apply to their studies. However, children always perform better than adults in the ultimate attainment of the L2, the final result after years of practice and accumulation. People pay too much attention to the age factor proposed in the CPH, yet they forget that it is a period. Language acquisition also

takes time. Without continuous sufficient L2 exposure and quality L2 inputs, along with formal and informal communication as practices, successful SLA could not be achieved. Interestingly, the general view is that the unsatisfactory final result of adult L2 is due to the age factor, and ignores possibilities that adults may give up halfway through or in short of motivation. This is also the misunderstanding that the CPH brings to the public's perception of SLA. Adults can also get very good L2 results and high-quality L2 pronunciation after putting in enough endeavour. Parents, teachers and researchers should not misplace the focus of SLA because of the emergence of the CPH (Marinova-Todd et al. 2000).

Eventually, in L2 teaching, any teacher should not blindly exaggerate the influence of age on the final results of L2. Age is only one of the factors that affect SLA. Learning a language at different ages has different characteristics. Under certain conditions, the learner's effort, emotional and social factors, learning conditions and length of learning time, and preference for teacher's lectures are as important as age. Also, in the process of L2 teaching, teachers should pay attention to the positive effects proposed by the CPH, formulate corresponding teaching goals according to the staged advantages of students' ages, and combine the characteristics of each stage to use different teaching methods to maximize strengths and avoid weaknesses. Only by combining various factors to enable students to gain lasting motivation and interest can the best SLA outcomes be achieved.

References

- Abrahamsson, N. & Hyltenstam, K. (2009). Age of onset and nativelikeness in a second language: listening perception versus linguistic scrutiny. *Language Learning* 59 (2), p249-306.
- Birdsong, D. & Molis, M. (2001). On the evidence for maturational constraints in second-language acquisition. *Journal of Memory and Language*. 44, p235- 249.
- Bongaerts, T. (2005). Introduction: Ultimate attainment and the critical period hypothesis for second language acquisition. *International Review of Applied Linguistics in Language Teaching*; 2005,Vol.43(4). p259-267
- Chiswick, B. & Miller, P. (2007) A Test of the Critical Period Hypothesis for Language Learning. *Journal of Multilingual and Multicultural Development*, 29 (1), p16-29.
- Colombo, J. (1982). The critical period concept: Research, methodological, and theoretical issues. *Psychological Bulletin*, 91, p260–275.
6. DeKeyser, R. M. (2000) The robustness of critical period effects in second language acquisition. *Studies in Second Language Acquisition*, 22, p499-533
- Flege, J.E., Birdsong, D., Bialystok, E., Mack, M., Sung, H., & Tsukada, K. (2006). Degree of foreign accent in English sentences produced by Korean children and adults. *Journal of Phonetics* 34, p153-175.
- Hakuta, K., Bialystok, E. & Wiley, E. (2003) Critical Evidence: A test of the critical period hypothesis for second-language acquisition. *Psychological Science* 14 (1), p31-38.
- Jia, G., & Aaronson, D. (2003). A longitudinal study of Chinese children and adolescents learning English in the United States. *Applied Psycholinguistics*, 24(1), p131–161.
- Johnson, J. and Newport, E. (1989) Critical period effects in second language learning: The influence of maturational state on the acquisition of English as a second language. *Cognitive Psychology* 21: p60-99.
- Liu,X. Tu,L., Wang, J., Jiang, B., Gao, W., Pan,X., Li,M., Zhong ,M, Zhu,Z., Niu,M., Li,Y. Zhao,L., Chen, X., Liu,C., Lu,Z., Huang,R. (2017). Onset age of L2 acquisition influences language network in early and late Cantonese-Mandarin bilinguals. *Brain & Language*. 174 (2017) p16–28
- Marinova-Todd, Stefka & Marshall, D. & Snow, Catherine. (2000). Three Misconceptions about Age and L2 Learning. *TESOL Quarterly*. Vol.34. p9–34.

- Marinis,T., Chondrogianni,V. (2010). Comprehension of reflexives and pronouns in sequential bilingual children: Do they pattern similarly to L1 children, L2 adults, or children with specific language impairment? *Journal of Neurolinguistics* 24 (2011). p202-212
- Nelson, K,L. "Is it really all downhill after puberty?: The Critical Period Hypothesis in Second Language Acquisition - A review of the literature. " Master's Thesis, University of Tennessee, 2012.
- Nunan, D. (1991) "Methods in Second Language Classroom-Oriented Research: A Critical Review," *Studies in Second Language Acquisition. Cambridge University Press*, 13(2), p249–274.
- Pachina,E. (2020) *Second Language Acquisition: Young Learners vs. Adults* [Online]. Accessed from: <https://www.teflcourse.net/blog/second-language-acquisition-young-learners-vs-adults/> [Accessed 06 April 2021]
- Patkowski, M. (1980) 'The sensitive period for the acquisition of syntax in a second language', *Language Learning* 30/2: p449-72.
- Rasinger, S. (2007). Revisiting the critical period: age of onset or length of exposure. *Proceedings of the Annual Boston University Conference on Language Development* 31 (2), p532-542.
- Rothman,J. (2008). Why All Counter-Evidence to the Critical Period Hypothesis in Second Language Acquisition Is not Equal or Problematic. *Language and Linguistics Compass*. 2/6 (2008): p1063–1088,
- Samara,A., Smith,K., Brown,H., Wonnacott,E. (2017). Acquiring variation in an artificial language: Children and adults are sensitive to socially conditioned linguistic variation. *Cognitive Psychology*. 94 (2017) p85–114
- Schutz,R. (1998) *Stephen Krashen's Theory of Second Language Acquisition* [online] Accessed from: [https://www.sk.com.br/sk-krash-english.html#:~:text=The%20'acquirac%20system'%20or%20',they%20acqui%20their%20first%20language.&text=According%20to%20Krashen%2C%20tht%20acquisition,'%20or%20the%20'ededit'](https://www.sk.com.br/sk-krash-english.html#:~:text=The%20'acquirac%20system'%20or%20',they%20acqui%20their%20first%20language.&text=According%20to%20Krashen%2C%20tht%20acquisition,'%20or%20the%20'ededit'.). [Accessed 28 March 2021]
- Seol, H. (2005). The critical period in the acquisition of L2 syntax: a partial replication of Johnson and Newport (1989). *Teachers College, Columbia University Working Papers in TESOL & Applied Linguistics*. 5(2), p1-30.
- Singleton,D. (2007). The Critical Period Hypothesis: some problems. *Interlinguistica*. ISSN 1134-8941. No.17. p48-56
- Snow, C. and Hoefnagel-Höhle, M. (1978) 'The critical period for language acquisition: evidence from second language learning', *Child Development* 49/4: p1114-1128.
- Tricomi,E. (1986). Krashen'S Second-Language Acquisition Theory and the Teaching of Edited American English. *Journal of Basic Writing*, Vol. 5, No. 2, 1986. p59-69
- Valipour, V., Davatgari, H. (2014). Differences between Children and Adults in Foreign Language Pronunciation and Grammatical Rules Learning. *Indian Journal of Fundamental and Applied Life Sciences*. 2014 Vol. 4 (S3), p195-198.
- Vanhove, J. (2013). The Critical Period Hypothesis in Second Language Acquisition: A Statistical Critique and a Reanalysis. *PLoS ONE* 8(7): e69172.
- Whitaker, H & Bub, D. (1981). Neurolinguistic aspects of language acquisition and bilingualism. *Annals of the New York Academy of Sciences*. 379. p59-74.