

Does Critical Period Play a Role in Second language acquisition?

Reviewed By: Indrani Chakravarty, Y0146

What is a critical period?:

It is a “maturational time period during which some crucial experience will have its peak effect on development or learning, resulting in normal behavior attuned to the particular environment to which the organism has been exposed.”[5]. This implies there are certain crucial experiences to which the organism must be exposed within a specific time period, else there will be a reduced effect or no effect at all of the experience if learnt outside the specific time period. The first example [1,3,5] which comes to our mind is the famous example of Professor Conrad being followed by a flock of geese, as if he was their “mother”. The reason behind this weird behavior is obvious. The flock of geese was isolated from their parents right after birth. So, they identified Professor Conrad as an attachment object instead of identifying a species member as the attachment object (‘imprinting’). Later, when the same flock was exposed to their original parents (after a specific time period had passed), the geese failed to recognize their parents. Another classic example [1,3,5] of the existence of critical period is the case of white crowned sparrows. When these sparrows were brought up in isolation, they sang a very crude song which had some structural similarities with the original sparrow song. However, when they were exposed to a tape recorded sparrow song within 10-50 days of their birth, they picked it up very nicely, but if they were exposed after this time period had passed, they continued singing the crude songs. All these examples show that the concept of critical period does exist among other species.

Concept of Critical Period among humans:

The concept of critical period among human beings was developed by analogy with the learning mechanisms in other species and was proposed by Penfield and Roberts (1959). One of his most prominent supporters Eric Lenneberg [1, 3, 4, 5] hypothesized in his book Biological Foundations of Language (1967) [1, 3, 5] that

- “Language acquisition is a Biologically constrained learning” [3]
- “Normally acquired during a critical period(early in life and puberty)”[3]
- “Outside this period, language acquired through a different learning process or with difficulty”[3].

His hypothesis was based on three groups of people—[1, 3, 5]

- People who had brain damage through accidents or disease before puberty had irreversible damage to their language functions, and were unable to pick up those functions when intensive speech therapy was given after puberty.
- Children with Down's syndrome, whose general body development was slower than any other normal children, had their language development slower too. To be noted, their language development halted at puberty.
- Isolated children who have not been spoken to during the crucial period of childhood; referred to as "**wild children**".

To prove that his hypothesis was correct, Lenneberg cited an example [1] of 13 yrs old mentally abused girl Genie who used to be kept isolated ever since she was just a few months old, and hence was not given any exposure to language environment. After her rescue, she received intensive speech therapy, but, was not able to construct grammatical sentences even after prolonged treatments. Lenneberg concluded that since the critical period during which she should have had the exposure to language environments had passed, she could not acquire the language later on too. But, there was confusion in the explanation given by Lenneberg--was it the critical period or the brain damage that resulted from the physical and mental abuse endured by Genie the cause that prevented her from acquiring the language?

Pinker on account of his support to Lenneberg's hypothesis cited another example [1] of a woman known in the literature as "Chelsea" whose deafness was only discovered at the age of 31. Unlike Genie, she was not abused mentally or physically, but her language acquisition pattern after hearing aids were fitted was quite similar to Genie's pattern of significant vocabulary acquisition but little grasp of syntax. Pinker suggested that Chelsea was given the hearing aids and speech therapy after her critical period had passed. But, even this citation met with a lot of controversies--why wasn't her deafness revealed before the age of 31?

Despite the controversies, the critical period hypothesis continued to exist, since it received support from the fact that language development of children with Down's syndrome halted at puberty. It was also found that abused children isolated from exposure to first language showed deficits in phonology, morphology, and syntax [1, 5]. General physical and cognitive status may be a concern for such children, which may not really be a matter of concern for normal children and adults [1, 5]. Normal adults during the first few months of learning have an advantage over children in case of higher acquisition of vocabulary and speed of learning, but people who start early produce lesser grammatical mistakes than those who start late. In fact, children have a "flawless control over the accent and rhythm of language and full productive control over syntax and morphology" [5] if they start early. With increasing ages of exposure, beginning from 4-6 yrs, there is a gradual decline in language proficiency until it plateaus for adult learners (Johnson and Newport, 1989; Newport 1990) [5]. That is learners exposed to the language in adulthood show lower performance than those who are exposed in early childhood. (Johnson and Newport, 1989) [5]. The effects have mainly been seen in degree of accent, morphology and syntax. Therefore, it was concluded that critical periods affect phonology, morphology and syntax, not the vocabulary and semantic processing (occurs relatively normally in late learners) of language acquisition, be it first or second.

Johnson and Newport's Study [3, 5]:

Johnson's and Newport's wanted to find out whether this applies to both the first and second language acquisition. They conducted a survey on a sample consisting of native speakers of Korean and Chinese who had immigrated to the US at different ages. [1,3,4,5]. The subjects were asked to make grammaticality judgments about 276 English sentences. Half the sentences were rendered ungrammatical by violating rules about articles, gender agreement and verb structures. The seven subjects who had arrived

between ages 3 and 7 performed indistinguishably from native speakers of English. A strongly negative correlation between age of arrival (especially before 15) and ability to judge grammaticality was observed for children, but for the adult learners there was no significant correlation between age of arrival and grammaticality judgment ability.

They concluded that [1, 3, 4, and 5]

- A critical period does exist for the acquisition of grammar and the effects are seen for both first and 2nd languages.
- They reported that prior to age 15, there was a very strong negative correlation with age but after age 15, there was no correlation with age. Therefore age 15 was considered to be the end point of the critical period.

Pinker supported this conclusion heavily and summed it up as “acquisition of a normal language is guaranteed for children up to the age of six, is steadily compromised from then until shortly after puberty, and is rare thereafter” [3].

The questions [5] that arose

- Does the L1 acquisition affect the L2 acquisition?
- Does it reduce the effects of later stage learning?

As an answer to these questions, it was found that late first language acquisition results in lower performance than does the 2nd language acquisition, regardless of signed or spoken languages. [Newport]. So, does it imply that L1 has no effect on L2?

There were also two challenging evidences that the critical period hypothesis had to account for—

- The identification of older learners who achieve native- like competence in the second language (Birdsong, 1992)
- Behavioral evidence that fails to reveal a qualitative change in learning outcomes at the close of a critical period (Bialystok & Hakuta, 1999).

If the critical hypothesis is to be true then these evidences should not be correct; on the other hand if they are taken correct, then the hypothesis should be wrong.

Two Hypotheses on how L1 acquisition affects L2 acquisition:

- Does L2 acquisition recapitulate the L1 acquisition? [3]. If L2=L1 Hypothesis is to be correct, then the critical period of L1 acquisition relevant to L2 acquisition.
- Is L2 acquisition a cumulative process that builds on the competence already developed in L1? [3] If yes, then critical period of L1 acquisition irrelevant to L2 acquisition.

Let us take an example of two native Chinese and Spanish speakers who are trying to learn English. The speaker of Spanish will acquire English more rapidly than would a

native speaker of Chinese, all other things being equal, because of the linguistic similarity between Spanish and English. This evidence would imply that the cumulative model is correct.

However, there is a remarkable similarity across speakers of different languages learning a given L2, indicating that “there is much more than simple transfer from L1 to L2 going on (Bialystok & Hakuta, 1994) and that indeed there is some sort of reenactment of the L1 acquisition process at work”[3].

To solve the conflict between the two hypotheses, Lenneberg, the originator of the critical period hypothesis, said [3] “we may assume that the cerebral organization for language learning as such has taken place during childhood, and since natural languages tend to resemble one another in many fundamental aspects, the matrix of language skills is present” (p. 176), which indicates he favored the cumulative model.

Characteristics of a Critical Period:

A critical period must have two characteristics (Bornstein, 1989; Columbo, 1982) [5]-- “High level of preparedness for learning within a specified developmental period to assure the domain is mastered by the species”, and “lack of preparedness outside of this period”.

If the critical period hypothesis is to be correct, then the following conditions must be satisfied--

Condition 1 [3]: “There should be clearly specified beginning and end points for the period”. To this, Lenneberg suggested puberty, Johnson and Newport suggested age 15, Pinker suggested between age 6 and end of puberty.

Condition 2 [3]: “There should be a well-defined decline in L2 acquisition at the end of the period, not a monotonic decline with age”. This will be true if there is a drastic change decline in gradient or mean around the end of the critical period, rather than a general monotonic decline with age that continues throughout the life span.

Condition 3 [3]: “There should be evidence of qualitative differences in learning between acquisition within and outside the critical period”. That is, there should be distinct differences between the patterns of acquisition between child and adult second language learners. This component of the hypothesis will be true if certain grammatical errors could be found among adult learners that are never found in child learners or if child learners were able to learn specific aspects of the language that no adults could learn.

Condition 4[3]: “There should be robustness to environmental variation inside the critical period”. It is true if “within the critical period, even with considerable environmental variation, the outcomes are uniform, but beyond that period, the outcomes are variable”.

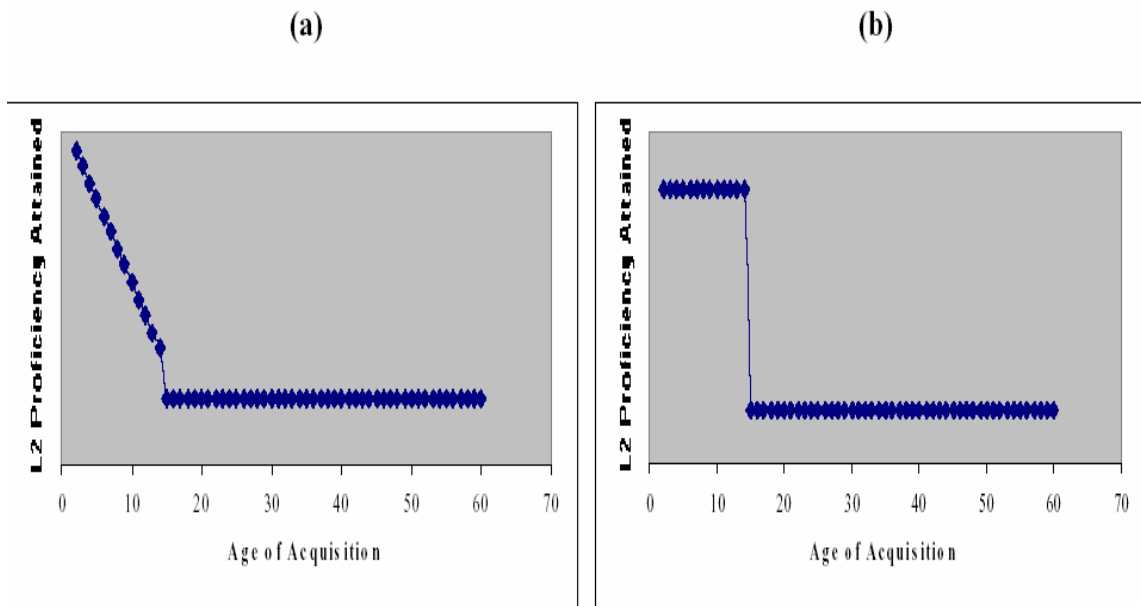


Figure 1: Theoretical Predictions [3]

Figure 1 is the theoretical predictions of the critical period hypothesis. In both the figures, specific end points exist with a sharp drop (qualitative and quantitative) in the language proficiency at the end of the critical period. Also there is a robustness to the environmental conditions is displayed within the critical period (uniformity inside).

Re-analysis of Johnson's and Newport's Study by Bialystok and Hakuta in 1994[3,4]:

Johnsons and Newport had concluded from their experimental survey that age 15 was the end point of the critical period. When the same data was reanalyzed by Bialystok and Hakuta, it was found that there was a discontinuity at age 20 and not at age 15(Figure 2).

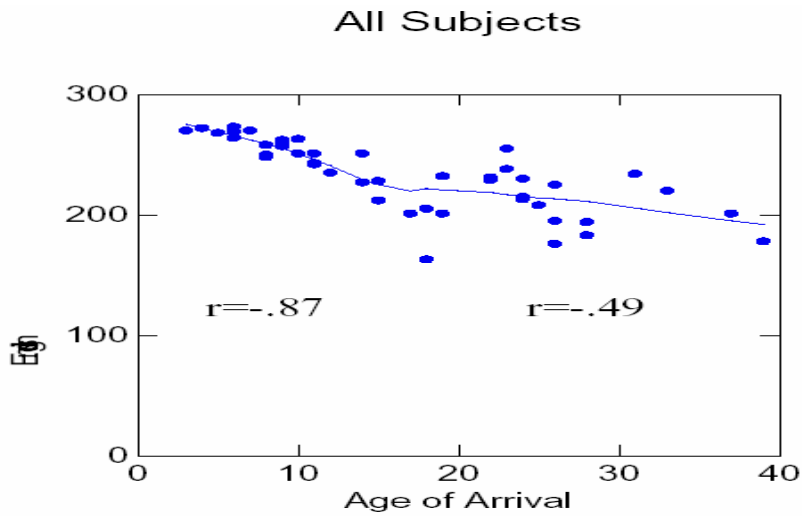


Figure 2: Reanalysis of Johnsons and Newports Study [3]

Re-analysis using 1990 Census Data by Bialystok and Hakuta in 1999[3,4]:

From the 1990 Census Analysis of the same by Bialystok and Hakuta in 1999, the following two graphs were obtained which contradicted their previous claim. No specific breakpoint was found, and there was a monotonic decline of language proficiency in adulthood, which implies that **Conditions 1 and 2 fail**.

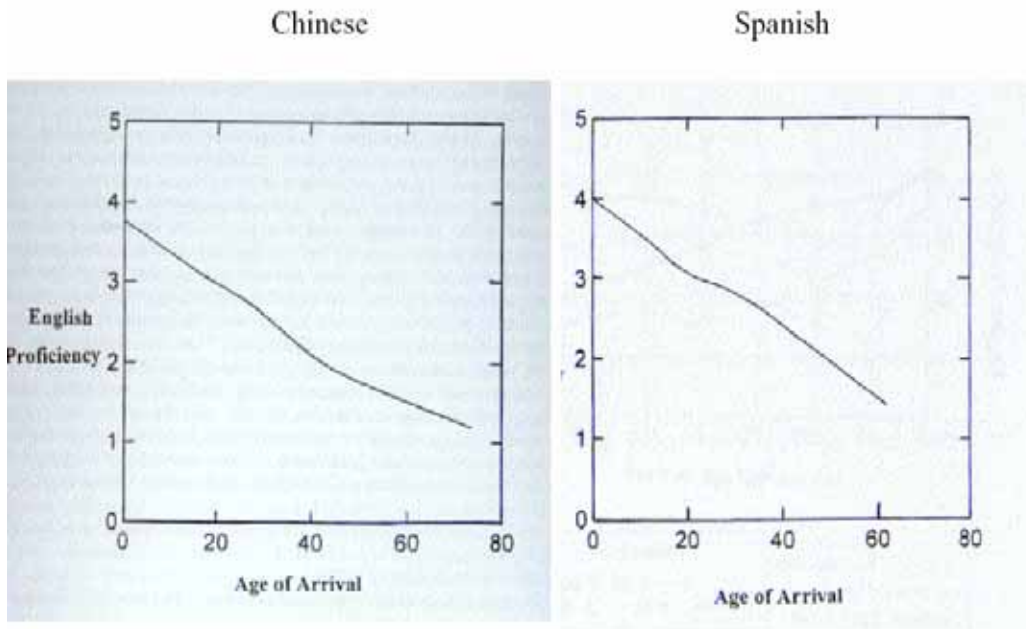


Figure 3: Reanalysis Using Census Data [3]

Analysis of Condition 3:

Condition 3 demands a qualitative difference in learning between acquisition within and outside the critical period, especially in the patterns of acquisition between child and adult second language learners. This holds true if certain grammatical errors could be found among adult learners that are never found in child learners or if child learners were able to learn specific aspects of the language that no adults could learn.

Condition 3 is supported by the Language Transfer view, which states “The points of contrast between the native language and the target language can determine the course of learning”. So, a positive transfer happened where the two languages are similar and negative transfer where they are different. For example, Japanese people have difficulty with the English determiner system (e.g., a, the, some), but Spanish speaking people don’t since the Spanish language has a similar determiner system. Therefore, adult learners show more evidence of transfer errors than do children because, according to the critical period hypothesis, children directly access the target language whereas adults must go through their native language.

However, the **White and Genesee’s test (1996) [2, 3]** shows that this view is wrong leading to the failure of Condition 3.

White and Genesee’s test (1996) [2, 3]:

The sample of the test conducted by White and Genesee consisted of adults who had learnt English at various stages of life. They were provided with some grammatically correct and incorrect sentences along with some abstract concepts.

Samples Sentences—

1. Who do you want to see?
2. Who do you want to feed the dog?
3. Who do you wanna see?
4. *Who do you wanna feed the dog? (Incorrect sentence)

The underlying structure for the sentences can be hypothesized as:

“You want to see who?” and “You want who to feed the dog?”

Abstract concepts provided—

According to the theoretical model of Universal Grammar, these underlying forms of who are moved to the front of the sentence, leaving behind a trace, t in the original location. So the sentences become –

- Who_i do you want to see t_i?
- Who_i do you want t_i to feed the dog?

So, when want to is to be reduced to wanna the first sentence allows, but the the rule that reduces “want to” to “wanna” for is blocked by the trace between “want” and “to” in

case of the second sentence, resulting in the sentence “Who do you wanna feed the dog?” to be incorrect.

Surprisingly it was found “although more adult learners had difficulty in distinguishing between with these sentences than did child learners, about one-third of the adults had acquired these rules showed equivalently high performance to child learners and native speakers of English” [3, 4].

Therefore, even adults are capable of learning abstract rules that theory assumes would be available to the children only. Since there are no demonstrated differences between the process of second language acquisition in child and adults, it can be inferred that **Condition 3 fails** in case of second language acquisition.

The Effects of Environmental Variation:

Condition 4 of critical period hypothesis assumes “There should be robustness to environmental variation inside the critical period” [3]. This will be true if within the critical period, even with considerable environmental variation, the outcomes are uniform. Outcomes might be variable outside the critical period. An important variant in the environment is socioeconomic status of the learner. Data obtained from experiments conducted to test on the effect of socioeconomic status on oral proficiency data for immigrant students from a school district in Northern California show students belonging to “socio-economically poorer schools (>50% free lunch) to be attaining English proficiency at a rate of about a full year slower than those in less poor schools” [3].

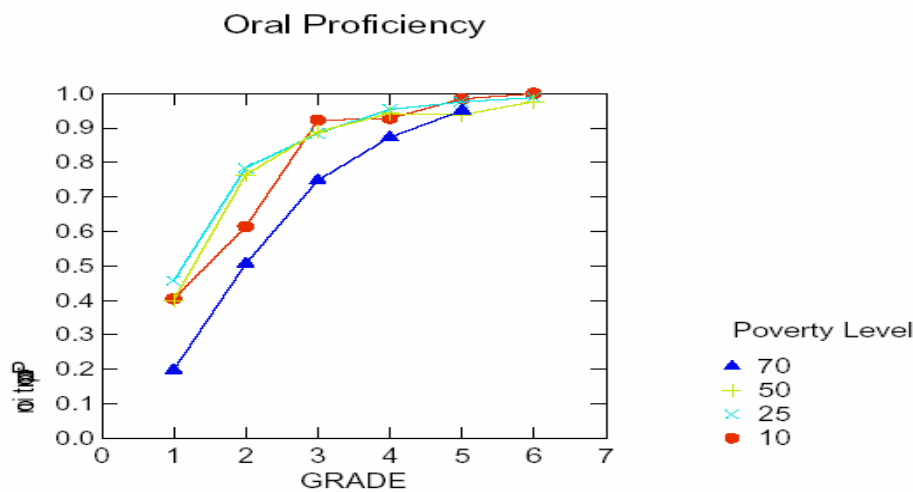


Figure 4: Effects of socioeconomic status on Oral proficiency [3]

Self-reported English proficiency for native Chinese immigrants as a function of age of arrival, separated by educational attainment. Data from 1990 Census. Analysis reported in

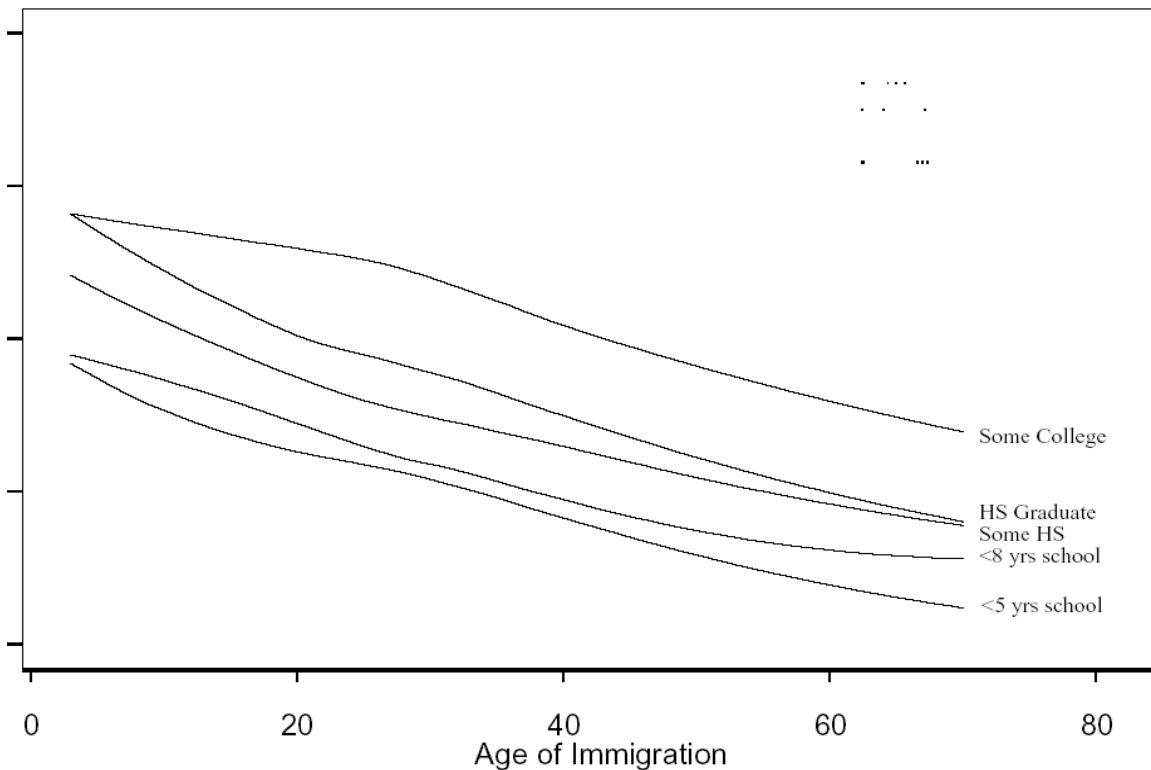


Figure 5: Effects of years of education as a proxy for socioeconomic status [3]

Strong socioeconomic effects can be found in the Census data as well. Enormous effects for years of education are seen (figure 4) when years of education acts as a proxy for socioeconomic status. There is however no indication for whether it works differently in child and adult learners. Therefore **Condition 4 fails**.

Conclusion:

If there had been a critical period, points (in the figures shown) outside this period should have had either a drop in English proficiency, or a change in slope between age of immigration and English proficiency, or both a mean drop and a slope change. Since there is no definable end point (condition 1 fails), no well defined decline (monotonic decline), no demonstrated qualitative differences between the process of second language acquisition in child and adults (condition 3 fails), and finally no robustness to environmental variation inside the critical period (condition 4 fails), we can conclude that there is no evidence of Critical Period in second language acquisition. This in turn implies that the view of “a biologically constrained and specialized language acquisition device that is turned off at puberty” is not correct for second language acquisition. The gradual decline over age can be attributed to multiple factors at work – physiological, cognitive, and social. A reduction in cognitive resources (working- memory limitations,

cognitive slowing, or attention deficits), means older learners will find 2nd language acquisition cognitively difficult than the young learners. Therefore, it can be inferred that critical period may exist for the first language acquisition, but, there is no evidence of it playing a role in second language acquisition.

Reference:

1. http://pages.slc.edu/~ebj/IM_97/Lecture16/L16.html
2. White, L. & Genesee, F. (1996). How native is near-native? The issue of ultimate attainment in adult second language acquisition. *Second Language Research*, 12, 233-265.
3. DRAFT 9/7/99, A Critical Period for Second Language Acquisition? A Status Review, By Kenji Hakuta, Stanford University
4. CRITICAL PERIOD IN SECOND LANGUAGE ACQUISITION, Critical Evidence: A Test of the Critical Period Hypothesis for Second Language Acquisition Kenji Hakuta, Stanford University, Ellen Bialystok, York University, and Edward Wiley, Stanford University
5. Language Development, Critical Periods in, EL Newport, University of Rochester, Rochester, New York, USA.