

# **The Critical Period Hypothesis: Is Younger Really Better?**

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## **Introduction**

Of intrinsic interest to any adult facing the prospect of learning a second language is the question: To what extent can I hope to succeed? What learning capacity, if any, have I lost over the passing years? Do children really learn foreign languages faster and better than I now can?

If such a person looks into research on this subject, he will soon find a rephrasing of his question: What is the status of the Critical Period Hypothesis (CPH) for second language acquisition (SLA)? This is the entry point to linguistic discussion of the significance of age in SLA.

The CPH has its roots in the work of embryologists on cell differentiation and specialization, which was later popularized by ethological investigation into the phenomenon of imprinting in fish, chicks, geese, and other animals. Penfield and Roberts (1959) went further and stated that for victims of certain types of brain disease or damage causing language loss, complete or nativelike mastery of either a first or second language is difficult or unlikely after some point between nine years of age and the conclusion of puberty. They based this statement on their observation of language recovery in such victims, in which they noted complete recoveries before the age period 9–12 but seldom afterwards. Why should this be so? Penfield and Roberts concluded that neural plasticity

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in the brain only obtains prior to these years. Later, people seem physically unable to transfer language functions from the impaired brain hemisphere to the healthy one. Thus, such people will suffer impairment of their language-learning ability for the rest of their lives.

The CPH was further and more famously developed by Lenneberg (1967) in his influential *Biological Foundations of Language*. The hypothesis was now stated as follows: "There exists a neurophysiologically determined critical period during which second language learning occurs easily. After, second language learning becomes impossible or at best difficult" (Genesee 1988). For Lenneberg, this critical period extended from age two to puberty because by age 12 in particular, language functions in a damaged left hemisphere seemed no longer able to pass to the right.

For nearly 30 years, the Critical Period Hypothesis has continued to attract concerted attack and stubborn defense. For the duration of this paper I would like to present some of this thrust-and-parry, intersperse some assessments of my own, and finally reach a conclusion consistent with the data considered.

## Discussion

First, let us survey the findings of some of the defenders of the CPH, as it is stated above and in a weaker form which posits not a critical but rather a sensitive or optimal period for learning a second language. Supporting the latter version is Edith Magiste (1987) who compared 77 13-19 year-olds with 74 6-11 year-olds, all of whom were native German speakers learning Swedish in Sweden. She measured their response times for the simple tasks of naming numbers and common objects in the two languages (in order to eliminate the advantage of increased cognitive development in the teen-age group) and found that the elementary school students could name objects at the same pace (1.4 seconds) in both languages after four years, whereas the high school students required six years (using 1.2 seconds)

to do so. Both groups needed about four years to name the numbers of the two languages at equal rates (in 1.2 and 0.8 seconds, respectively).

From these results, Magiste reached the following conclusion (p. 55): "This study shows that elementary school students in the 6-to-11 year range took some years less than did high school students to acquire an elementary vocabulary in the second language." She went on to make a more general judgment (p. 56):

There seems to be no *critical* age for second language learning, but rather there appears to be an *optimal* age. If the language task allows for the student's cognitive level, younger students will generally acquire that task with greater ease, because of their greater spontaneity, flexibility, and imitative ability. With increasing age the students become more conscious and reserved....

This judgment, however, appears questionable in light of the fact that (p. 52-53) "The individual times for naming pictures were computed from the number of objects the subjects were able to name, *which in most cases included all items* [italics added]...." In other words, both groups of students were able to name nearly all objects and numbers in Swedish from the shortest periods of their stays in Sweden tested (0.1 years) to the longest (10 years). Because *both* groups acquired an elementary vocabulary with equal speed, and in view of the fact that at every stage recall times of the Swedish terms were shorter for the high school students, it does not seem warranted to conclude that the elementary students held an advantage in acquiring an elementary vocabulary in a second language.

Continuing now in defense of the CPH itself--i.e., that changes in physical development work to the detriment of adults in language learning--Rosansky (1975) states that older individuals learning a second language become impeded, ironically, by their more mature cognitive systems. In other words, working to our detriment as we age is not only the loss of brain plasticity but also the gain of new mental

abilities. Rosansky holds that the ability to abstract, classify, generalize, and consciously attend to language *as* language (rather than only to the meaning it expresses) hinders natural language acquisition. Thus at about age 12, when Piaget's last stage of cognitive development, "Formal Operations," is complete, learners become predisposed to recognize differences in language patterns. In contrast, it's been said that younger children are not so interested in what language *is* (recurring patterns of structure) as in what it *does* (express meaning). They simply use it straightway for their immediate ends, and in this way rapidly become functional in a second language. We shall also see support, however, for the learning *utility* of metalanguage, or language about language, later on.

Perhaps the most powerful recent defense of the CPH is offered by Johnson and Newport (1994). Their subjects of analysis were 46 Korean or Chinese native speakers who arrived in the United States rather evenly over the spectrum of from three to 39 years of age. For comparison purposes, the researchers divided them into two groups: early and late arrivals. The first group came to the United States before the age of 15 and consisted of 12 males and 11 females; the second, 17 males and six females, arrived after age 17. All had been resident in the U.S. from three to 26 years at the time of the study, with a minimum exposure to English of at least five years overall. All were students or teachers at the University of Illinois, and thus exhibited a degree of homogeneity of social background. Exposure time to their primary languages relative to the time they spent coping with English once they were all resident in the U.S. was observed to be about equal for both the early and late arrivals. Another factor held constant for the two groups was lifetime exposure to English: 9.8 and 9.9 years, respectively. And last, formal English instruction time in the U.S. was found to be about equal as well. (No advantage whatsoever that the older people may have acquired through studying English in Korea or China before moving to the U.S. could be discovered.)

Johnson's and Newport's testing instrument utilized a wide variety of English grammar and employed a grammaticality judgment test. In other words, the subjects had to decide what was and was not grammatically correct in English. Their performances were evaluated against the average performance on the same test by a group of native speakers.

These researchers found that test performance correlated most strongly in a linear fashion with age of arrival in the U.S. on every grammar point. Those who had arrived in the country at age seven or earlier performed at the native-speaker level; later arrivals performed progressively less well; and a sharp drop in ability occurred at puberty. After that point, no linear relationships between age and ability obtained at all. Some adults of various ages performed rather well, and many others poorly. Johnson and Newport also note that although they found another correlation with attitudinal values as self-rated by the subjects--namely motivation, American identification, and self-consciousness--this secondary correspondence was much weaker.

Therefore, Johnson and Newport conclude that because only subject age at the outset of learning English in an English-speaking country strongly correlates with success in doing so, the effects experienced due to a Critical Period extend from first language acquisition to second language learning. In short, younger is better. The researchers find only one behavioral (as opposed to attitudinal) difference between the older and younger learners: the former had been maintaining their first language through close association with other first-language speakers over the years. Could such first--language maintenance impair second-language acquisition? To test this hypothesis, the researchers had undertaken studies of other language groups at the time of publication.

Johnson and Newport's study is persuasive save in one major respect. The virtual decade of "English exposure" common to both the younger and older learners suggests a misleading equivalence.

Individuals negotiating the years 8-18 are likely to share in a greater variety of formal and social linguistic experiences, and to fill a greater number of evening and weekend hours in a second language, than is a person living through the years, for example, 38-48. Also, the category "formal instruction time" takes no account of the relatively more emotionally important *informal* instruction time provided the young by their peers. Furthermore, youth is more likely to learn from television, music, and cinema. Fred Genesee touches on related points below.

Let us now turn to those who reject the CPH, or the idea that diminishment in SLA ability around puberty is due to physical factors (whether these lead either to the loss or gain of mental abilities). Such researchers fall into three main groups. The first accepts that children are faster and better learners in all language areas, but not for physical reasons; the second affirms better performance by children only in pronunciation; and the third denies any inevitable language-learning inferiority on the part of adults, including pronunciation. All three groups do concede that, statistically, younger second-language learners outstrip older ones over the long term. However, they hold that social and attitudinal rather than physical reasons account for this (with the exception of pronunciation for the first two groups of these researchers).

H.D. Brown is a major representative of the first group. For Brown, second-language acquisition is strongly related to the acculturation process that everyone goes through in a new community. This he breaks down into four stages. First comes the excitement, even the euphoria of superficial encounter with the attractive exotica of one's new setting. Next comes culture shock, estrangement, and even hostility, as one realizes that one's personal values are differently weighted in the new setting or displaced altogether by unfamiliar ones. There follows a period of culture stress and gradual vacillating recovery as a third phase, followed at last by assimilation--or at least adaptation--as the final step in the acculturation process. Brown argues

that children traverse these stages much more quickly than adults because they are less culture-bound. They have few or no prejudices about the new society to impede their rapidly joining it. Once they have done so, their social inclusion naturally leads to greater linguistic opportunity than their elders are likely to encounter.

Neufeld (1978) makes a similar point in a different way. He emphasizes children's relatively much greater psychological need for social inclusion than that felt by adults. All ages have the innate ability to acquire a primary level of language, or a reasonably large functional vocabulary and a basic mastery of pronunciation and grammar. Children, however, are much more likely than adults to master complex grammar and different language styles (the secondary level) because of their anxiety to belong. The pain of ridicule about, for example, a foreign accent, is often nearly unendurable to a child. Adults, on the other hand, typically neither receive nor care about such peer pressure to any significant extent, and often feel no need to upgrade their skills beyond basic communicative utility.

Rod Ellis, Fred Genesee, and Barry McLaughlin are representative of our second group of anti-CPH authors. These hold that pre-adolescents demonstrate superior second language learning ability to older learners only in pronunciation. Even in this area, Ellis (1985) finds that young children improve more slowly than teenagers, who in turn outstrip adults. In fact he believes the data show that the onset of the adolescent years helps rather than hinders overall success in learning a second language, placing him in direct disagreement with Rosansky and turning the Critical Period Hypothesis upside down. Meta-awareness (simultaneous awareness of both the meaning and the rules of language) assists rather than impedes SLA: "Only where pronunciation is concerned is an early start an advantage, and even then only in terms of eventual success, not rate of acquisition. The Critical Period Hypothesis needs to be recast to account for why loss of plasticity affects pronunciation but not other levels of language" (Ellis 1985, p. 110).

Ellis speculates that if lateralization and localization of language functions in the brain is a gradual process taking many years, then possibly different aspects of language reach their peak developmental periods at different times of life. Only by reason of their greater motivation to become part of the second language population and because of more years' exposure to the second language do young children eventually emerge as the best language learners.

Fred Genesee (1988) mounts a more comprehensive attack on the Critical Period Hypothesis. He distinguishes between conceptual issues and empirical short- and long-term language learning issues. Conceptually, Genesee first cautions that conclusions about first language loss and recovery do not necessarily hold for second languages. Learning a first language for the second time may not be the same thing cognitively as learning a second language for the first time. Difficulty experienced by brain-damaged or pathology-afflicted adults recovering language functions cannot be assumed *a priori* to be like the learning difficulty experienced by healthy adults.

Next, the assumption that complete lateralization of language functions in the left hemisphere is complete at puberty has been challenged by counter-claims of five years of age, and even that lateralization is complete by birth (we will examine these contentions in more detail below). Whenever it is that lateralization occurs, unconsidered entirely, Genesee states, is the effect that the probable further localization of language functions *within* each hemisphere may have on learning capacity.

Doubts about the precise course of brain development as it relates to language-learning functions has led, as we have already seen, to a weak version of the Critical Period Hypothesis, which speaks rather of "*sensitive* periods" rather than a "*critical* period." This approach holds, once again, that certain language skills are acquired more easily at certain times. Supporting this idea, Walsh and Diller (1981) have posited two types of neuron in human development. The first to appear, the macroneurons, serve to handle "lower-order language



processes" such as basic speech analysis. Meanwhile local-circuit neurons are developing more slowly, perhaps even into adulthood, and handle "higher-level language processes."

Genesee, however, finds the distinction between the two insufficiently clear and the sensitive-period hypothesis untestable from the beginning. These seem reasonable judgments.

Genesee formulates an empirical anti-CPH case through reference to a Krashen, Scarcella, and Long (1982) review of studies comparing adult-child and adolescent-child differences in second language achievement. A number of those studies, Genesee says, show that the older learners were superior in short-term second-language learning ability, even sometimes when the younger ones had more previous second-language instruction and social exposure. For example, Genesee (1981) himself found that English students in Montreal attending two-year late immersion programs in grades 7 and 8 achieved the same level of proficiency (as tested at the ends of grades 8-11) as students who had attended total immersion programs beginning in kindergarten, afterwards continuing with classes in English as a Second Language. Thus 5,000 versus 1,400 hours of exposure to the second language were seen to result in the same level of proficiency! At least in the initial stages of learning a second language, this study and others (Burstall 1974; Olsen and Samuels, 1973) show, according to Genesee, the superior efficiency of older learners. This claim is strengthened by the finding (Genesee 1981) that older learners perform better over all areas of language. It is strengthened still more by Genesee's additional finding that older learner superiority obtains not just in schools but in unstructured, naturalistic settings as well.

Concerning second-language proficiency over the long term in those who started late, there is a general impression that few nativelike older learners exist. But do we know this for sure, Genesee asks? If highly proficient post-pubertal learners were specifically sought out, they might appear, although they are not likely to in random samples. Even if such nativelike older learners do not exist at all, this could

very well be for cognitive, affective, and social reasons having nothing to do with the Critical Period Hypothesis (to reiterate a point we have seen above). Being raised in a mixed-language family, for example, is an enriching and advantageous experience for young bilingual persons quite unavailable to older ones, Genesee notes.

Returning to Krashen, Scarcella, and Long (1982), Genesee recognizes that five studies reviewed there do show that second-language ability was greater and tended towards the nativelike the younger the learner was at the time of immigration. These five suffer, however, from small samples. More substantially, Genesee points out that in order to prove the Critical Period Hypothesis correct one must show *not* that pre-pubertal learners become nativelike language users more often than older ones, but rather that older learners *never* achieve this level. How many older-learner success stories does it take to disprove the CPH? The studies show that older learners did indeed attain nativelike performance in small numbers.

This finding is buttressed by Neufeld and Schneiderman (1980), who tested the acquisition of phonology (the supposed Achilles' Heel of the older learner) through providing 18 hours of intensive instruction in Japanese, Chinese, or Eskimo phonology to 20 adult English speakers. Evaluation was performed by native speakers of these languages. They found that fully 50% of the learners achieved nativelike accents--one of the strongest anti-Critical Period Hypothesis pieces of evidence in the literature, since it also attacks the notion of childhood superiority in pronunciation. Neufeld would go even further in a 1987 study (see below).

Genesee (1988) does hold that overall, younger learners indeed enjoy an advantage over older ones, citing a study by J.B. Carroll (1975). That researcher, through studying the teaching of French in eight countries, concluded that length of instruction was the most important predictor of success in second-language achievement. Genesee explains that when school instruction begins early, exposure time becomes compounded by social activities in the second language

outside of school. Therefore the extracurricular use of the second language by younger students is greatly enhanced over time in comparison with older learners. The younger individual will eventually receive the benefits of cognitive maturity (e.g. abstracting, classifying, and generalizing about language as language--considered positive by Ellis) just as do the older starters. But by starting earlier and having pleasant early life experiences in the second language, they are likely to be more emotionally receptive to its formal study. This is yet another way to explain early-starter success rather than by the Critical Period Hypothesis with its emphasis on brain hemisphere lateralization.

Barry McLaughlin mounts an even more variegated attack on the CPH, from drastically reducing its span to challenging the commonly held belief that children acquire language faster than all other age groups. He calls attention to Krashen's (1973) reanalysis of Bassier's data (used by Lenneberg to conclude that language function transfer occurs between ages 2-13), in which Krashen noticed that all of the non-recovering unilaterally brain-damaged victims Bassier studied were under the age of five. Therefore, is it not just as logical, if not more so, to conclude that brain lateralization is complete by age five, not 13?

Or can its completion be reduced to age four? Dichotic listening purports to measure which brain hemisphere is dominating when competing stimuli are provided simultaneously and at equal volume to each ear. Such data show, e, g., that in general for everyone, the right ear/left brain is stronger for verbal material and the left ear/right brain for musical material. They also show, interestingly, that children age 4-9 and adults all evince the *same degree* of left brain dominance for verbal input. Perhaps, then, lateralization is already complete by age four?

Let us say that if lateralization is the basis for the Critical Period Hypothesis, age 2-4 or age 5 very plausibly marks its conclusion. However, reasons McLaughlin, to say that language learning is mostly

accomplished before the physiological milestone of lateralization is reached is surely too strong a claim in view of the vast amount of syntactic, semantic, and even phonological development that we know takes place after this early period of life.

Noam Chomsky (1959) argued famously that a child of immigrant parents learns language mostly independently of environmental conditioning—in fact, almost effortlessly—and far better than his parents do. But McLaughlin argues that childhood foreign language acquisition is in reality full of effort, with lots of false starts and mistakes (Weir 1962; Cukovsky 1965). Even three-year-olds still need lots of exposure and practice (Valette 1964).

The linguistic progress of young children nevertheless does seem extraordinary at first sight. However, continues McLaughlin, it is incorrect to say they learn better and faster than adults because children have much more intensive and continuous exposure to the target language than an adult could ever have opportunity to experience (Lee 1973). If we calculate conservatively that young children average just five hours a day interacting in their linguistic environments, then from age one to age six they have experienced over 9,000 hours of exposure. By contrast, the U.S. Army Language School in the State of California has regarded only 1,300 hours as sufficient for an adult to achieve near-fluency in Vietnamese (Brake 1974). Therefore is younger better, or is older better?

McLaughlin repeats the argument we've seen that not only are children more exposed to the language to be learned, they are usually more motivated than are their parents to learn it. Classroom and playground activities are practically a matter of life and death for children striving for social inclusion and academic survival, but their parents are more likely to learn just enough of the new language to get by, meanwhile socializing with their fellow immigrants. Thus, considerations other than brain development explain youthful superiority where it does exist.

McLaughlin also reminds us that linguistic competence is a lesser

burden of proof for a child. Simple constructions and a relatively small vocabulary are considered acceptable for a child, but never an adult. This is a very important and often overlooked point.

Finally, McLaughlin makes a direct challenge to the idea that "younger is better" in language learning. True, Ramsay and Wright (1974) tested immigrants to Canada and found that the older the individual when introduced to English, the lower the score on tests of language ability. But Politzer and Weiss (1969) found that auditory discrimination of French vowel sounds was superior in older as opposed to younger English-speaking children. Ervin-Tripp (1974) found that between the ages of four and nine, older children outperformed the younger in acquiring a second language in both natural, communication-emphasized settings and classroom work (held constant procedurally for all). Ervin-Tripp attributed this enhanced performance to improving memory heuristics, problem-solving skills, and rule-learning with increasing age. Buhler (1974) found that among 1,500 Swiss learning French as a second language, fifth-graders (usually 11 years of age) significantly outperformed fourth-graders (10).

McLaughlin concludes (p. 59):

Possibly there is a critical period for the neuromuscular patterns involved in speech, after which time it becomes much more difficult to acquire a new language without an accent. But whether this is the case, whether there are other critical periods for other language skills, what the length of the critical period is in each case, and how it relates to the process of lateralization cannot be answered with any certainty.

Thomas Scovel (1988), in the most exhaustive critique of the Critical Period Hypothesis to date, concludes as follows (p. 66):

The acquisition of nativelike speech appears to be very similar to the types of imprinting behaviour found in the so-called lower animals, and thus the idea that Lenneberg so firmly propounded, that human language has biological foundations, is strongly affirmed. But in contrast, I find no evidence for a critical period for vocabulary or syntax, and consequently, I do not see the existence of a critical period for accentless speech providing any proof either for or against the efficacy of early foreign language teaching in the schools.

Thus he maintains the point of view he held as early as 1969, as recalled in his 1988 work (p. 66):

...Biological constraints on language learning do not impede ultimate achievement in any linguistic skill except nativelike phonological fluency. Other than this relatively insignificant aspect of language acquisition...age is not really that important a factor.

Despite these judgments, it is still far from clear that nativelike pronunciation is impossible for an adult. We now turn to the third position taken by CPH opponents. Berta Chela-Flores (1994), citing a 1987 study by Neufeld (who in 1980 demonstrated impressive adult phonological capacity--see above), writes as follows (p. 233-34):

It is often suggested that after acquiring the sound pattern of the native language, the nerves of the tongue and mouth region and even some neural functions in the central nervous system become atrophied, so far as to prohibit accurate pronunciation of a second language. This suggestion, however, would have to be refuted in light of studies such as by Neufeld (1987)... [which] demonstrated that... adult learners could imitate utterances up to sixteen syllables in length so well that they were judged as native speakers

by native speakers.

The underlying assumption in Neufeld's study is that adults do retain the potential for acquiring nativelike proficiency in a new language and that the problem lies in finding adequate means to access that potential. If this is so, and the organs of speech do not become atrophied with age, then the poor achievements of adult foreign language learners in pronunciation might be partly due to insufficient and perhaps inadequate training of the muscles of the mouth and tongue region. Since the muscles and nerves of tongue and mouth have been practicing the same set of sounds from the native language for years, it seems to follow that a great amount of muscular training would be needed to accustom the organs of speech to new sounds.

"A great amount" of work--but no innate adult incapacity even in the area of pronunciation!

## Conclusion

In the end, what are we to make of this welter of sometimes contradictory studies? Should adults take heart or take flight at the prospect of learning a second language?

They should take heart. The whole question of how the physical development of the brain affects language learning whether for good or ill remains almost entirely unresolved, for we remain humbled even on the eve of the 21st Century by the complexity of the human brain.

On the other hand, alternative explanations of language acquisition based on social environment, attitudes, and needs of the learners, whether emotional or practical, seem sufficient to explain the linguistic performances of everyone, young and old. Adults with compelling reason to succeed who are committed to hard work, who are unencumbered by prejudice towards their new language culture, and who feel a strong desire for social inclusion, should embark on their second (or

third, or fourth) language with a strong and fully justified feeling of optimism.

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