

Unlikely Bedfellows: The Critical Period Hypothesis and its Effects on Second Language Acquisition

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Researchers have generally come to a consensus on the effects of a critical period in the development and acquisition of a first language. Beyond the ages of adolescence, young adults who have never been exposed to a language seem unable to ever attain complete proficiency. For these late learners, no amount of additional input or instruction can improve their language competence. In regard to second language acquisition (SLA), the research is still inconclusive on whether language learning is affected by a critical period. This article provides an overview of critical period research in SLA and how the accumulating studies seem to indicate that second language learners may not necessarily be constrained by this maturational factor. Particularly, evidence collected from census data and from exceptional language learners seem to contradict the expected effects of a critical period. The article is concluded with implications for future research and the suggestion that more fruitful insights may be gleaned by investigating the factors that contribute to the success of language learning instead of to its failure.

“Given that maturation has the strong influence on second language outcomes that our review has indicated, it should come as no surprise that nativelike proficiency is unattainable [for adults]” (Hyltenstam & Abrahamsson, 2003, p. 578).

“The misconception that adults cannot master foreign languages is as widespread as it is erroneous” (Marinova-Todd, Marshall, & Snow, 2000, p. 27).

INTRODUCTION

The two quotes above demonstrate how language learning research can often be concluded in quite contrary and opposed ways. Specifically, as we survey the literature on the Critical Period Hypothesis (CPH) and its relationship with Second Language Acquisition (SLA), we find a wide range of opinions and positions. There is a general consensus among researchers that there is in fact a window of opportunity, or critical period, for children and first language (L1) learning. When exposure to a language takes place past this time frame, it has been demonstrated that language learning is significantly compromised. However, researchers are still divided about the effects the CPH may have on second language (L2) learning.

As seen from the first quote above, some researchers believe that once a critical period ends, whether in L1 or L2 learning, native-like proficiency can never be attained. The second quote echoes the sentiments of other researchers who believe that L2 learning is not affected by

age or a critical period. Yet many researchers seem to believe that age is intimately connected with SLA:

Age has often been considered a major, if not the primary, factor determining success in learning a second or foreign language. Children are generally considered capable of acquiring a new language rapidly and with little effort, whereas adults are believed to be doomed to failure. (Marinova-Todd, Marshall, & Snow, 2000, p. 9)

Young children appear to have minds that are more adept and capable, allowing for languages to be learned implicitly. Adults on the other hand struggle with language learning and usually require explicit teaching to learn a new language. No consensus exists among researchers on whether these differences between children and adults are the result of a critical period or some other factor:

[T]he concept of a critical period for language acquisition entails that age effects operate within a circumscribed period of time, bounded by an onset which marks the beginning and a terminus which marks the end of a period of heightened sensitivity to ambient language input. (Bongaerts, 2005, p. 259)

Whether the CPH has an effect on SLA has by no means been confirmed by any of the current literature and research. In fact, many of the studies cited below provide evidence that actually contradict this proposition. The goal of this paper is to broadly survey the current literature pertaining to the CPH. Although L1 learning appears to be affected by a critical period, based on the cited research below, it will be argued that L2 learning is not affected by any critical period. The literature surveyed will show: (1) that the sudden decline or discontinuity in language learning expected at the end of the critical period does not exist, and (2) achieving native-like proficiency for late L2 learners is possible and not precluded by any critical period. The gradual decline in L2 proficiency found among older speakers may be explained by other factors such as a lack of motivation or inadequate input and practice. In summary, this paper will propose the need for more research to explore these other factors and to differentiate them from the effects that age may have on SLA.

WHAT IS THE CPH?

The notion of a critical period was first observed in the biology of animals (Herschensohn, 2007). Biologists noted that certain behaviors such as the imprinting of ducklings or song learning by birds needed to take place in a certain window of time (Bialystok & Hakuta, 1994). Thus a critical period, "...can be characterized as being of limited duration within well-defined and predictable termini and as being related to very specific capacities or behaviours" (Singleton, 2005, p. 270).

Penfield and Roberts (1959) are generally credited for first recognizing the existence of a critical period in language learning (see, e.g., Birdsong, 1999; Herschensohn, 2007; Singleton, 2001). They argued that, "...for the purposes of learning languages, the human brain becomes progressively stiff and rigid after the age of nine" (Penfield & Roberts, 1959, p. 236).

Lenneberg (1967) is considered to be the first researcher to bring full scholarship to the CPH (see, e.g., Scovel, 2000; Singleton & Ryan, 2004). Lenneberg investigated language recovery among aphasic patients (people who have their language ability compromised due to

injury or sickness). If the aphasia occurred before puberty, a recovery of speech was likely. If it occurred in adulthood, the chances of a full recovery were slim. From this observation Lenneberg (1967) concluded that, “[t]he primary acquisition of language is predicated upon a certain developmental stage which is quickly outgrown at the age of puberty” (p. 142). Penfield, Roberts, and Lenneberg believed that language learning ability is significantly diminished beyond late childhood.

To demonstrate the existence of a critical period, other researchers cite the examples of feral children and others who failed to receive language input before young childhood. For these children, beyond a certain age, “...they are permanently incapable of mastering the full grammar of language” (Pinker, 1994, p. 292). Pinker concludes, “[i]n sum, the 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” (p. 293).

Therefore, the CPH states that there is a window of opportunity for language learning. This critical period roughly spans from birth to around puberty. Within this time frame, children have a remarkable ability to learn language. Beyond this period, the hypothesis states that there is a marked decline in the capacity to learn languages.

Possible Causes for a Critical Period

At first glance, children seem to learn languages faster and more easily than adults. This seems to suggest that the minds of children are somehow more adept at language learning. Different researchers have suspected that the existence of a critical period is caused by neurological changes in the brain. “Lenneberg argued that the reason language couldn’t be recovered after puberty was that lateralization (specialization of the left hemisphere for language) was by then complete” (Clark, 2003, p. 392). It has been argued that past the ages of puberty, there is not only a decline in language learning ability, but also a physical change in the brain in how languages are acquired. Birdsong (2006) argues that:

From the cognitive literature, we learn that the associative memory and incremental learning elements of language learning are steadily compromised by age, as are the working memory and processing speed components of language processing and production. (p. 34)

Hurford (1991) attempts to give further explanation on this neurological change: “[t]he end of the critical period at around puberty is thus not so much a marked ‘switching off’ point of language acquisition capacity, but rather a point where the selection pressure in favour of facilitating factors ceases to operate, because of success at earlier lifestages” (p. 193). Thus, the diminished need for language acquisition in adulthood may result in these specific faculties being reduced or even closed. The human body may cease to expend the metabolic energy needed to continue to acquire language.

More recent research has shown that the brain may in fact acquire and utilize language differently based on age. Weber-Fox and Neville (1999) used functional magnetic resonance imaging (fMRI) to compare the brain patterns of Chinese immigrants in their L2 use of English. Their results showed that there were differences in brain patterns between early learners of English and late learners. They concluded that, “...converging evidence from behavioral, electrophysiological, and fMRI studies suggest that specialized systems that mediate different

aspects of language may be distinct in their susceptibilities to alterations in the timing of second language learning” (p. 35). The way in which the brain acquires language may be divergent between young learners and old learners.

Current research sheds some light on this issue of the CPH, but it may still be premature to attribute these discrepancies in L2 proficiency wholly on neurological factors. “Researchers in neuroscience have admitted that the exact connection between learning and the state of the neural network is unknown” (Marinova-Todd et al., 2000, p. 18).

Implications of the CPH in L2

Whether it be L1 or L2, children exhibit a remarkable ability to acquire language. Adults on the other hand find learning a second language much more difficult:

At ages below the critical period language learning can lead to native-like proficiency, or language acquisition can occur simply through exposure rather than through tutoring, or language skill acquisition is simply easier. At ages above the critical period learning a second language is much more difficult. (Chiswick & Miller, 2008 p. 16)

The question that many researchers have asked is why L2 learning for older learners proves to be so difficult. For some, “...[t]he critical period hypothesis (CPH) is widely viewed as providing an explanation for why many individuals speak their L2 with a foreign accent” (Flege, 1999, p. 102).

If L1 learning is dramatically compromised with age, one would logically expect L2 to be affected in the same manner. However, a deeper look at related literature in SLA shows that consensus has not been reached. “It is generally accepted among psycho-linguists that a critical period for L1 acquisition exists, but controversy arises when the critical period claim is extended to L2 learning” (Marinova-Todd et al., 2000, p. 9).

Many researchers have attempted to explore the topic of the CPH and its relationship to SLA. Long (1990) surveyed the various related studies since Penfield and Roberts (1959) and concluded:

The ability to attain native-like phonological abilities in an SL [second language] begins to decline by age 6 in many individuals and to be beyond anyone beginning later than age 12, no matter how motivated they might be or how much opportunity they might have. Native-like morphology and syntax only seem to be possible for those beginning before age 15. (p. 280)

For Long the available data is clear that language learning and proficiency declines with age. Yet, whether this decline in proficiency is directly caused by the CPH is still being debated. Some speculate that there may be other attenuating circumstances or factors besides age that can account for the differences in proficiency between children and adults.

Evidence Needed to Support the CPH in SLA

The existence of a critical period must be characterized by a distinct time frame of heightened capacity in learning followed by a sudden decline in proficiency. It must be

characterized by a distinct onset and offset. Bongaerts (2005) asserts, at minimum, two forms of evidence that must be present: “(1) there should be a discontinuity in the slope of the decline in L2-proficiency situated around the terminus of the critical period, and (2) no second language learners starting after the terminus period should demonstrate achievement of native-like levels of ultimate L2-attainment” (p. 259).

Yet when we survey the relevant literature, we find contradictory findings which show that these two forms of evidence do not exist. Studies have shown that the expected drop or change at the end of the critical period simply does not exist. Other studies have demonstrated late L2 learners who have attained native-like proficiency in both pronunciation and in their knowledge of grammar. The next two sections below will highlight some of these studies.

Contradictions from Census Data

The greatest advantage of the use of census data is the possibility to make correlations from thousands and tens of thousands of data points. Language researchers have used census data to compare the proficiency of L2 English among various immigrants. Census data has been specifically used to look for any discontinuity in the decline of L2 proficiency based on age. Although census data is often based on the self-assessment of each individual, the sheer number of data points will usually circumvent any anomalies and inconsistencies.

Bialystok and Hakuta (1999) utilized census data from the state of New York for over 24,000 Chinese- and 38,000 Spanish-speaking immigrants. Only people who had lived a minimum of ten years in the U.S. were chosen for this study to ensure that these immigrants had ample time and opportunity to learn English. Within those ten or more years, the researchers were specifically interested in seeing whether language proficiency differed across immigrants based on the different ages of arrival to the U.S. In the census, the immigrants had been specifically asked to rate their proficiency in L2 English. Bialystok and Hakuta plotted these responses based on age and concluded that “[t]he decline in proficiency remains constant across the ages and is similar for both Spanish and Chinese” (p. 175). A sudden drop in proficiency which is characteristic of the end of a critical period was not found in this research.

Hakuta, Bialystok, and Wiley (2003) expanded the analysis of census data to 2.3 million Spanish and Chinese speaking immigrants. The researchers utilized the data from a number of states from the 1990 U.S. Census. “The census form ask[ed] respondents to self-describe their English ability using one of five categories: ‘not at all’, ‘not well’, ‘well’, ‘very well’, and ‘speak only English’” (p. 32). The researchers analyzed this data against the age at which these immigrants first arrived to the U.S. If a critical period existed, the data would have shown a sudden gap or sudden change in proficiency near the ages of puberty. In reality Hakuta et al. (2003) concluded that “...the pattern of decline in second-language acquisition failed to produce the discontinuity that is an essential hallmark of a critical period” (p. 31).

Chiswick and Miller (2008) utilized the 2000 U.S. Census Data to perform a similar analysis. The authors looked at immigrants from Mexico as well as immigrants from other countries. The researchers analyzed thousands of data points of these immigrants and their self-assessed proficiency of L2 English. Chiswick and Miller concluded, “[i]t appears that if a ‘critical period’ for language learning is defined as an age at which there is a sharp decline in the ability of immigrants to obtain proficiency in speaking English, no such critical period exists” (p. 23).

From the examples above, the claim that second language acquisition is affected by a critical period seems untenable. No sudden gap or decline in L2 proficiency at the terminus of a critical period has been found in these studies. We now turn to the contradictory evidence found in research that highlights late L2 learners who appear to have achieved native-like proficiency.

Contradictions from Ultimate Attainment

“A native-like accent is impossible unless first exposure is quite early, probably before 6 in many individuals and by about age 12 in the remainder. Very high standards can be attained starting later, of course, but not, it seems, native-like standards” (Long, 1990, p. 266). Long and other proponents believe that both native-like pronunciation and native-like grammar are unattainable beyond the critical period. If the CPH affects L2 in the same manner as L1, we would clearly expect adult L2 proficiencies to be below that of a native speaker. In reality, there are numerous studies that document late L2 learners who have achieved native-like proficiency in every aspect of the language.

Ioup, Boustagui, Tigi, and Moselle (1994) analyzed the proficiency of two non-native Arabic speakers. Both women were exposed to Arabic as young adults, well beyond the ages of puberty. The two women were tested in both pronunciation and in their knowledge of grammar. The test for pronunciation was based on spontaneous speech. Among the various native reviewers who listened to these recordings, 62% judged the two women as possessing native-like proficiency (p. 80). In the tests for grammatical knowledge, the two women also performed with native-like proficiency. “We can assume, therefore, that both Julie and Laura share intuitions with native speakers on the majority of the syntactic points tested” (p. 89).

Flege, Murray, and MacKay (1995) tested 240 Italian immigrants of various ages in their use of L2 English. The age of arrival in Canada ranged from age 2 to age 23 (p. 3126). A list of English sentences was given to each person to read. The recordings of these sentences were then given to native speakers and rated for authentic pronunciation. Although most of the older L2 learners were judged as having foreign accents, 6% of the late learners (arriving after age 12) were judged to possess authentic pronunciation (p. 3129). The study clearly demonstrated that native-like pronunciation was accessible even after the supposed critical period.

Marinova-Todd (2003) tested 30 adult L2 learners from 25 countries in their proficiency of English. The 30 adults were tested in a variety of linguistic tasks such as pronunciation and grammar knowledge. Although most performed below the proficiency of native speakers, a few of them did very well. Her study “...revealed that three of the L2 learners achieved native-like proficiency across all domains under examination” (p. 47). Marinova-Todd concludes, “[i]t could be argued that while age should not be completely ignored, its effects should be considered together with other cognitive and affective factors... Therefore, it seems that *how* we learn L2s is more important for L2 ultimate proficiency than *when* we learn them” (p. 134). The few individuals who possessed native-like proficiency in their L2 raise real doubts about the effects of the CPH on SLA.

Urponen (2004) tested the grammatical knowledge of L2 English in 100 Finnish women. The age of arrival of these women to the U.S. or Canada ranged from 12 to 50 years old (p. 122). Each woman was tested on their knowledge of whether certain sentence constructs were grammatical or ungrammatical. Urponen’s research concluded that “[t]he grammaticality judgment test responses of 38% of Finnish-born subjects were indistinguishable from the

responses of the native English-speaking control group” (p. 6). In relation to the CPH, Urponen concludes:

Based on the findings of this dissertation it could be claimed that the Critical Period Hypothesis does not provide a full explanation for the level of English language proficiency attained by the native Finnish-speaking subjects in the grammaticality judgment task assessing their proficiency in the English language knowledge areas included in the study. (p. 286)

A decline in L2 proficiency does exist across age. Yet this decline has been demonstrated to be gradual. Research has yet to document a sudden drop in L2 ability at the end of the critical period. The studies above have also demonstrated that native-like pronunciation and grammar are both accessible past puberty. Proficient L2 speakers serve as evidence that attaining L2 proficiency well after puberty is not curtailed by any window of opportunity. If the differences in L2 proficiency cannot be explained by a critical period, the reasons must lie in other factors.

FUTURE RESEARCH ON THE CPH AND SLA

The contradictory evidence from census data and from L2 speakers who have achieved native-like proficiency raises strong doubts about the influence the CPH may have on SLA. The mystery remains of why L2 proficiency gradually declines among language learners. Some researchers resolutely argue that the cause lies in a biological critical period. Yet the cumulative research appears to negate this reality. Future research in neurology may or may not shed light on this mystery:

The ever-expanding toolkit of the geneticist and neurobiologist is mostly useless. Most people do not want their brains impaled by electrodes, injected with chemicals, rearranged by surgery, or removed for slicing and staining... So the biology of language remains poorly understood. But accidents of nature and ingenious indirect techniques have allowed neurolinguists to learn a surprising amount. (Pinker, 1994, p. 299)

For those concerned with SLA, researching the common factors that have produced success may be more profitable than looking for the biological reasons for L2 learning failure. As referenced above, different studies already exist that demonstrate native-like proficiency among late L2 learners. The focus of future research should explore the factors and ingredients that make native-like proficiency possible in late L2 learners. Deeper research in this area could lead to a better understanding of why some adults are able to attain native-like pronunciation and grammar. In fact, a few studies have arrived at preliminary explanations.

For example, personal motivation is one factor that is mentioned that may explain the high proficiency found in some L2 speakers:

For many of them, the target language was either part of their profession or they had very strong integrative motivation to become bona fide residents of L2 society... In studies on successful adult learners, complete immersion in the host environment (in many cases in the form of marriage to a native speaker) for an extended period of time has been found to be conducive to native proficiency. (Nikolov & Djigunovic, 2006, p. 6)

Bongaerts (1999) recognizes the role of motivation and adds to this discussion:

In sum, what we suggest is that the success of the exceptional adult learners we identified may have been at least partly due to the combination of three factors: high motivation, continued access to massive L2 input, and intensive training in the perception and production of L2 speech sounds. (p. 155)

The current understanding of SLA and the CPH could be greatly enriched from future studies focusing on factors besides age.

CONCLUSION

Based on SLA literature and research, it is unlikely that SLA is affected by the CPH. Contrary to what a critical period might cause, we find a steady and gradual decline in language proficiency across age. The various studies have demonstrated that there is no sudden gap or decline in L2 proficiency with respect to age. Furthermore, various research has highlighted the native-like proficiency of late L2 learners. Beyond the critical period, one would expect late learners to never be able to achieve this, yet we find research with contradictory evidence. “The conclusion is that there is insufficient evidence to accept the claim that mastery of a second language is determined wholly, or even primarily by maturational factors” (Bialystok, 1997, p. 116).

A decline in L2 proficiency cannot be explained by age alone or neurological reasons. It is quite possible that other factors such as motivation or language input play a crucial role in the final proficiency of an L2 speaker. “The good news for adult L2 learners is that it is not too late to improve their skills in the L2, if they choose to do so. Most important, intensive use of the L2 is the factor that most likely would lead to an improvement in their overall proficiency” (Marinova-Todd, 2003, p. 139). Future research that moves towards exploring these factors could contribute to a better understanding of SLA, possibly offering new insights to struggling language learners.

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Makoto Tokudome is a recent graduate of Biola University. Having earned a M.A. in Applied Linguistics and a Certificate in TESOL, Makoto hopes to teach English as a foreign language and continue to make contributions to the field of applied linguistics.

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