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Critical Period Hypothesis in Language Acquisition

Jiang Chiheng

Wuhan University, Luojia Street, Wuhan, China
jchjiangcheng@gmail.com

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Abstract: Critical period hypothesis, a popular topic of great significance in language acquisition, was initially deprived from first language acquisition, and further applied to second language acquisition though disputes remain. Former researchers have done myriads of empirical study and concluded diverse theories. This paper purports to briefly review former researches of critical period hypothesis in both first language acquisition and second language acquisition, and then try to probe its interrelation with age effect and implicit learning.

1. Introduction

Amid numerous factors that may exert various influence on language acquisition, age patterns remain a perceptible one that cannot be ruled out. The concept "critical period", derived from biology, was first introduced into the field of language acquisition by neurologist Wilder Penfield and his co-author Lamar Roberts in 1959 [1]. In first language acquisition, "Critical period hypothesis" implies that the ability to acquire language is to some extent biologically linked to age. If individual miss the ideal time window to acquire language, full command of language can hardly be achieved. In second language acquisition, nevertheless, disputes remain unsettled. Disputes range from the existence, exact length of "critical period" to the specific aspects of language that are under the control of this hypothesis, as some of which present robust features of critical period while others running the opposite [2]. Three major perceptions will be reviewed in the third part. As an interdisciplinary concept which entails researches from cognitive science, neuroscience and linguistics etc., though it is highly controversial in many facets, it yields undeniable impact on language acquisition and other related linguistic fields. This paper aims at succinctly reviewing related researches over critical period in both first language and second language acquisition, and discussing its interrelationship with age effect and implicit learning.

2. Critical Period Hypothesis in First Language Acquisition

The application of critical period hypothesis in first language acquisition embraces strong correlation with neuroscience. Initially proposed by neurologists Penfield and Roberts in 1959 and refined by Lenneberg in 1967, critical period hypothesis refers to a claim of general age effect that the ability to acquire language is biologically linked to a certain period: from age two to puberty according to Lenneberg [3], after which language acquisition becomes much more arduous and ultimately less successful.

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As native language acquisition is inevitable and eventually achievable sooner or later for a normal child, opposite cases of children with certain diseases, such as aphasia patients and deaf individuals, or infants with tragic experience of being isolated from human society like feral kids are often used as supportive evidences for critical period hypothesis. According to researches, full resilience of aphasia is much easier for children compared with adults. And deaf individuals who are not exposed to a sign language as children never achieve full proficiency, even after 30 years of daily use [4]. The two most famous cases of children who failed to acquire language after the critical period are Genie and the feral child Victor of Aveyron [5]. However, the tragic circumstances as well as moral and ethical impermissibility of replicating them make it difficult to draw further decisive conclusions. Lenneberg explicate language in the context of growth and maturation and corresponds the "critical period" with the lateralisation of human brain, in which the two hemispheres were equipotential at birth, while at age 3 to 5 cerebral dominance appears and language gradually becoming lateralized in the left hemisphere, thereby offering a biological possibility for the existence of "critical period" in first language acquisition.

Branches of language such as lexicon, phonology and grammar composed of linguistic milestones in first language acquisition as they are not acquired simultaneously, but rather follow a fixed chronological rule. According to statistics and researches summarized by Lenneberg, infants at the completion around 6 months are able to babble resembling one-syllable utterances; at around 12 months identical sound sequences and words are emerging; at around 24 months infants begins spontaneously to use two-word phrases; and at age 4 language is almost well-established. Therefore, to some extent, there exist multiple "critical period" for achievement of each milestone.

Albeit proponents of critical period in first language acquisition vindicate their opinion with reliable evidences, opponents refute as following. For feral children cases, some people refuse to contribute their inability of speech to some "critical period", instead they believe it is the extreme trauma they have experienced that lead to their speech defect. Just as Singleton (1989,54) [6] claims, the one qualification that might be entered with regards to such evidence is that deprivation of language input during the phase in a child's life when cognitive development is at its most intense may have quite general psychological/cognitive effects, and that it may be these general effects that are reflected in later language development rather that effects relating specifically to a critical period for language.

Though facing arguments of a specific "critical period" for language acquisition, people can hardly deny that age indeed plays a critical role in the ultimate effect of language learning.

3. Critical Period Hypothesis in Second Language Acquisition

The critical period hypothesis has triggered drastic discussion when being extended to the field of second language acquisition. It supposes that there exists a critical period in second language acquisition as well. As a consequence, learners of a second language who missed it rarely achieve native-like fluency as younger learners do, even though limited cases of individuals successfully mastering a second language after the presumed critical period do exist. Researchers study this hypothesis mainly from three aspects: phonology, syntactics and lexicon. And therefore this chapter will unfold three kinds of perspectives toward these three aspects.

Some assume that critical period exist in phonology acquisition exclusively when being applied to second language acquisition. Flege and his partners (Flege 1995;Flege et al. 1999;Flege & MacKay 2004) [7][8] did a series of representative researches, one amid which studied English pronunciations of 240 Korean speakers, showing that learners with higher age of arrival have stronger accent. Flege (1987) owes this kind of inaccessibility to neural maturation. Kuhl & Iverson (1995) [9];Munro & Mann (2005) [10] and Zhang & Wang (2007) [11] attained similar results in different researches. Snow and Hoefnagel Hohle (1982) [12] investigated the age differences of 136

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native English speakers from 5 to 31 years old, finding that the advantage of older second language learners is transient and younger learners are ultimately more successful in phonology acquisition. Long (1990) [13] summarized former researchers and concluded 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.

Another perspective is that critical period lies not only in phonology, but in syntactics as well. Johnson and Newport (1989 ,1991) [14] tested Korean native speakers of 3 to 39 years old found the judgment of syntactic rationality to be strongly correlated with the age of arrival before puberty (17 years old). And after puberty, the results were low and unstable and not related to the age of arrival. The syntactic test tells no significant difference between 3-7 year-old and the mother tongue group. But as for those who obtained the second language before puberty appear to have higher syntactic achievements than those who start learning later after. DeKeyser (2000) [15] further substantiate their study and recently Qureshi (2016) [16] analyzed 46 researches over grammar and syntactics, and drawing the generally consistent conclusion except slight difference in the definition of the accurate age of puberty.

As a significant part of linguistics, some researches shows that age may affect the acquisition of lexicon. Abrahamsson & Hyltenstam (2009) [17] did comprehensive researches over the the acquisition of grammar, phonology and lexicon in second language acquisition and concluded that age has a resilient impact on the acquisition of idioms. Idioms learned before 11 can reach native-like level, while those learned after can hardly achieve. Arnon (2007) [18] and his partners found that lexicon acquired at an early age presents advantages in processing even in adulthood as adults response more rapidly to phrases acquired at an early age. Nevertheless, some researches defines the age effect on lexicon acquisition as an nuance. For example, Silverberg & Samuel (2004) [19] did a research indicating that age has limited effect on the overall lexicon knowledge acquisition.

4. Critical Period Hypothesis and Age Effect

Age effect cannot be circumvented when discussing critical period hypothesis. The two concepts share common grounds but are not equalized. Age effect can be literally explained as age effect on language acquisition. Summed up from former review of critical period hypothesis, it suggested a non-linear relation between age and the level of language acquisition. Critical period ends no later than puberty and thereby implying a sharp decrease of language aptitude after puberty. On the one hand, age effect suggests a declining tendency of language aptitude while aging, therefore, children are better language learners. On the other hand, age effect manifest itself as a continuous effect on language acquisition, rather than an abrupt plummeting after puberty. People who support the critical period hypothesis invoke the first perspective to substantiate their points, and opponents emphasize the latter conclusion and thereby denying the existence of critical period hypothesis.

A major concern over age effect is when exactly the turning point of human language aptitude shows up. Werker & Tee (1983) [20] indicates that the ability to tell voices from other language environment starts decaying when infants are in their 10-12 months, so the critical period may start at an extremely early age. Steven Pinker (2018) [21] extend the time line of critical period to age 17-18, finding that children after 10 still has relatively high language aptitude. As different researches chose various measures and objects and focused on different aspects of the problem, conclusions may not reach a consensus, but meanwhile they offer us with diverse spectacles to view the same issue.

Opponents like Birdsong (2005) [22] would like to invoked exceptional cases of successful late learners to deny the existence of critical period hypothesis. Marinova-Todd's research (2003) [23] studies 30 late learners from Harvard University that embraces almost the same level of language acquisition. Opponents thereby conjure that language acquisition is the same as other physical

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mechanism that will be influenced by aging instead of by a critical period which represent a sharp decline after puberty. Though successful late learners may somehow subvert the "critical period hypothesis", they still remain as the minority that are not potent enough to reverse the overall trend of the rule of language acquisition.

Sum up the former discussion, though dissents remain in the exact timing of the turning point and the rationality of "critical period hypothesis", rarely can someone deny the age effect on language acquisition.

5. Critical Period and Implicit Learning

Though different studies assume critical period as a universal biological mechanism, first language acquisition for children and second language acquisition for adults may depend on separate learning systems. Viewed from the psychological process of language acquisition, children acquire language through implicit learning, which refers to a subconscious learning process. Nevertheless, adults, in other words, late learners, who may miss the critical period of language acquisition, resort to a problem-solving system to learn the second language, as their innate faculty no longer serves any purpose. This kind of psychological process refers to the means of explicit learning, an active process of language learning with consciousness.

The concept "critical period hypothesis" gains support from one of the most influential nativists Chomsky as it manifests an intrinsic characteristic of an innate faculty that enables implicit learning. And the critical period of second language acquisition coincides with the time when "universal grammar" acts, and when universal grammar loses its function, it represents as the end of the critical period in the process of language acquisition. Theories suggesting that the human brain has a unique congenital capacity for language acquisition include Chomsky and the Language Acquisition Device, Piaget and Cognitive theory and Lenneberg and the Critical Period. They all turn to innate faculty to search for the answer of language acquisition. And according to Selinker, late learners can seldom reach the same level as native speakers as they acquire the second language by activating a latent psychological structure, however, language ability acquired through such means is not complete. As merely small amount of adult second language learners can acquire the language by activating latent language structure, namely the language acquisition devices mentioned by Chomsky, they are able to reach or be close to the level of native speakers.

Based on dichotomy of implicit leaning and explicit learning, discussion over "non-interface position" and its converse arises. Krashen (1981) [24] held the view of non-interface position that "explicit knowledge" cannot transfer into "implicit knowledge", while other scholars like Ellis (1985a, 1994) believed that "explicit knowledge" is able to transfer to "implicit knowledge" though methods like practicing. As DeKeyser (2000) [15] proposed, if the critical period hypothesis can be confined in implicit learning, exceptional cases of successful late learners will be ruled out. When it comes to successful late learners, the view of "interface position" may offer a possible explanation. Those late learners managed to transfer the knowledge acquired through explicit learning to implicit knowledge, so as to reach the same level as native speakers. Therefore, under the perspective of nativist, critical period is interrelated with implicit leaning which happens merely within puberty or rarely transformed from explicit learning.

6. Conclusion

Critical period hypothesis in first language acquisition embodies a biological mechanism that language can hardly be acquired after a certain age. Controversy remains in the specific timing that marks the end of critical period. Nevertheless, according to former discussion, critical period hypothesis still embodies great enlightenment.

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Critical period hypothesis implies that in aspects like pronunciation, age has rather conspicuous effect on its acquisition. Thus when applying critical period hypothesis to language teaching, early learners may carry less accent in pronunciation. However not all facets of language suggest the theory of "the earlier the better". Children and adults embraces their advantages in language learning in different aspects respectively. Against the backdrop of explicit leaning, adults have rather mature cognitive structure that enables them to have a better comprehension over convoluted language phenomenon. Children are better language learners as they have inborn superiority in implicit learning, and certain implicit knowledge cannot be acquired through explicit learning. Hence in the context of classroom setting, with highly structured teaching content that require more explicit learning to acquire, elder learners are better learners. While in non-classroom context, by being exposed in language environment, children learn better.

References

[1] Penfield, W.; Roberts, L. (1959). Speech and Brain Mechanisms. Princeton: Princeton University Press.

[2] Tallal, P.; Miller, S. L.; Bedi, G.; Byma, G.; Wang, X.; Nagarajan, S. S.; Schreiner, C.; Jenkins, W. M.; Merzenich, M. M. (January 5, 1996). "Language Comprehension in Language-Learning Impaired Children Improved with Acoustically Modified Speech". Science. 271 (5245): 81–84.

[3] Lenneberg, E.H. (1967). Biological Foundations of Language. Wiley.

[4] Newport EL (1990). "Maturational constraints on language learning". Cognitive Science. 14 (1): 11–28.

[5] Curtiss S (1977). Genie: a psycholinguistic study of a modern-day wild child. New York: Academic Press.

[6] Singleton, D.2005. The Critical Period Hypothesis: A coat of many colors. IRAL,43, 269-285

[7] Flege, J. E., G. H. Yeni-Komshian & S. Liu. 1999. Age constrains on second-language acquisition［J］. Journal of Memory and Language 41(1): 78-104.

[8] Flege, J. E. & I. MacKay. 2004. Perceiving vowels in a second language［J］. Studies in Second Language Acquisition 26(1): 1-34.

[9] Kuhl, P. & P. Iverson. 1995. Linguistic experience and the"perceptual magnet effect"Munro, M. & V. Mann. 2005. Age of immersion as a predictor of foreign accent［J］. Applied Psycholinguistics 26(3): 311-341.

[10] Munro, M. & V. Mann. 2005. Age of immersion as a predictor of foreign accent［J］. Applied Psycholinguistics 26(3): 311-341.

[11] Zhang, Y. & Y. Wang. 2007. Neural plasticity in speech acquisition and learning［J］. Bilingualism: Language and Cognition 10(2): 147-160.

[12] Snow , C. & M. Hoefnagel2Hohle. 1982. Age differences in the pronunciation of foreign sounds [A].

[13] Long , M. H. 1990. Maturational constraints on language development [J]. S tudies in Second L anguage Acquisition (12) : 251285.

[14] Johnson , J. S. & E. L. Newport. 1991. Critical period effects on universal properties of language : The status of subjacency in the acquisition of a second language [J].

[15] DeKeyser, R. M. 2000. The robustness of critical period effects in second language acquisition［J］. Studies in Second Language Acquisition 22(4): 499-533.

[16] Qureshi, M. A. 2016. A meta-analysis: Age and second language grammar acquisition［J］. System (60): 147-160.

[17] Abrahamsson, N. & K. Hyltenstam. 2009. Age of onset and nativelikeness in a second language: Listener perception versus linguistic scrutiny［J］. Language Learning 59(2): 249-306.

[18] Arnon, I., S. McCauley & M. Christiansen. 2007. Digging up the building blocks of language: Age of acquisition effects for multi-word phrases［J］. Journal of Memory and Language (92): 265-280.

[19] Silverberg, S. & A. G. Samuel. 2004. The effect of age of second language acquisition on the representation and processing of second language words［J］. Journal of Memory and Language 51(3): 381-398.

[20] J.F. Werker, R.C. 2002. Tees Cross-language speech perception: Evidence for perceptual reorganization during the first year of life［J］. Infant Behavior & Development 25 (2002) 121–133

[21] Hartshorne, J., Tenenbaum, J., B., & Pinker, S. (2018). A critical period for second language acquisition: Evidence from 2/3 million English speakers. Cognition , 177, 263-277.

[22] Birdsong, D, 2005. Nativelikeness and non-nativelikeness in L2A research,43,319-328.

[23] Marinova-Todd S.H.2003 comprehensive analysis of ultimate attainment in second language acquisition. Unpublished doctoral dissertation, Harvard University.

[24] Krashen, S. 1985. The imputes Hypothesis: Issues and implications. Landon: Longman.