

Age Effects in Second Language Acquisition : Overview

Rieko Matsuoka¹ Ian Smith²

¹ National College of Nursing, Japan : 1-2-1 Umezono, Kiyose-shi, Tokyo, 〒 204-8575, Japan

² Independent Researcher
matsuokar@adm.ncn.ac.jp

[Abstract] Age has been regarded as an important factor in acquiring second languages successfully as well as in acquiring first languages. In this review article, previous studies regarding age and language acquisition are examined, and the ways in which age may affect the process of acquiring a second language are discussed. For instance, some previous research (e.g., Johnson & Newport, 1989) evidenced the strong negative correlation ($r > |-.7|$) between age of acquisition/arrival and accuracy or native-like proficiency, which means the younger learners are, the more native-like they become. This correlation supports the critical period hypothesis. The focus of this study is on examining whether the critical period hypothesis in first language acquisition is valid in second language acquisition. Some studies have revealed that adult learners whose age of acquisition/arrival is after puberty are not successful in acquiring a native-like proficiency in a second language, which again supports the critical period hypothesis; whilst others have shown cases where adult learners reached a native-like proficiency, thus refuting the critical period hypothesis. Finally, some pedagogical implications are drawn, using previous interdisciplinary studies in areas such as neuropsychology and phonology. These implications may help adult learners wanting to enhance their proficiency in a second language.

[Keywords] age 年齢, second language acquisition 第二言語習得, age of arrival/acquisition 習得年齢, critical/sensitive period hypothesis 臨界期 / 敏感期仮説, fossilization 化石化

Introduction

Age has been regarded as an important factor in the ways in which language learners differ, and a vast amount of research has been conducted regarding age effects on second language acquisition (e.g. Birdsong, 1992; DeKeyser, 2000; Oyama, 1976; Patkowski, 1980). It is generally believed that children enjoy an advantage over adults in learning languages because of their 'plasticity'.

According to Chomsky (1957), humans are equipped with a 'language acquisition device', which enables them to acquire the language in a way that goes beyond simple habitual formation. The 'universal grammar' proposed by Chomsky later on (1966) is thought to be an innate system of language acquisition, the so-called language acquisition device. Although Chomsky has not mentioned the possibility of applying this theoretical device in the brain to the acquisition of second languages, 'grammaticality judgment tests', the purpose of which is to measure learners' universal grammar, have been widely used for second language acquisition research (e.g. Johnson & Newport, 1989). These 'grammaticality judgment tests' consist of morphosyntactic items, implying that the 'universal grammar' is really about how

learners organize the target language's morphosyntactic system.

On the other hand, Lenneberg (1967) hypothesized that humans' latent language structure, i.e. the cognitive structure for automatic language acquisition, might stop functioning when the human brain matures, or at the time of lateralization of the human brain, which possibly occurs around puberty. He established the critical period hypothesis, which was originally proposed by Penfield & Roberts (1959), and explained the difficulty of acquiring our first language after puberty, based on neuropsychological factors (Lenneberg, 1967).

In the area of second language acquisition research, the critical period hypothesis has been taken into consideration in age-related studies. There is believed to be a period up to a certain age during which learners can acquire a second language easily and achieve native-speaker-like competence. The sensitive period hypothesis, which is used by Patkowski (1980), has been sometimes used as an alternative term to refer to the critical period hypothesis in second language acquisition, and has often been freely substituted in second language research literature. However, the critical period hypothesis has been predominantly used in first language acquisition, whilst the sensitive period hypothesis has been generally restricted to

second language acquisition.

Second language acquisition researchers differ over when the critical period/sensitive period comes to an end. In first language acquisition research, as Lenneberg (1967) posits, the critical period ends at puberty, and humans are believed to fail to acquire a first language in cases where they are unable to expose themselves to a human language before puberty, which is illustrated by Genie's case in some pieces of literature (e.g. Brown, 1968; Jones, 1995). In second language acquisition, some researchers (e.g. Birdsong, 2006, Birdsong & Park, In Press) claim the cutting-off age should be at puberty or at 12 years of age, the same as in first language acquisition. However, others postulate a younger age such as six years old (e.g. Long, 1990) or an older one such as 18 years old (e.g. Bialystok & Hakuta, 1994) as the terminal point of the critical period/sensitive period, depending on the focal area of acquisition, i.e., whether in phonology/pronunciation (in the younger case) or morphosyntax/grammar (in the older case).

Different in character from first language acquisition, which humans undergo unconsciously, second language acquisition becomes more difficult and is rarely entirely successful after a certain period, i.e., the critical period/sensitive period. Selinker (1972) named this phenomenon fossilization. Many second language learners fail to reach target-language competence and establish their own internalized rule system, which is called interlanguage (Selinker, 1972). Ellis (1994) suggests that age is one of the internal factors of fossilization, arguing that learners reach a critical age when their brains lose plasticity and certain linguistic features cannot be mastered.

Ellis (1994, p. 494) consolidated his research into age and second language acquisition and made proposals in six areas – in (a) sensory acuity, (b) neurological factors, (c) affective-motivational factors, (d) cognitive factors, (e) input, and (f) storage. In terms of sensory acuity, children or younger learners are better in their ability to perceive and segment sounds in a second language. This leads to more native-like pronunciation among younger learners. Neurologically, loss of plasticity or lateralization and cerebral maturation, which occur at certain ages, have been proved to affect learners' abilities to acquire both pronunciation and grammar. Certain ages are the cutting-off points for the so-called 'critical period' or 'sensitive period'. Therefore, neurological structure may affect both pronunciation and grammar. Regarding affective and motivational factors, child learners are, in general, more strongly motivated to communicate with native speakers and to integrate culturally because they are less conscious and suffer less from anxiety about communicating in a second language. In cognitive areas,

children use their language acquisition device, while adult learners rely on inductive learning abilities in learning a second language. In the process of inputting the language information, children input it more efficiently than adults, who may utilize more negotiation of meaning. Lastly the difference exists in the means of storage. Young children store first language and second language information separately and become coordinate bilinguals whilst adult learners store first language and second language knowledge together and become compound bilinguals. Coordinate bilinguals can use both languages automatically whilst compound bilinguals cannot.

Among the more recent literature, Birdsong (2006) summarizes the variables affecting the second language acquisition, including biographical variables such as the age of acquisition/arrival at which learners start to expose themselves to their second language, and endogenous variables such as motivation, aptitude and psycho-social integration with the second language culture. Thus, not only biographical variables but also endogenous variables constitute the affective-motivational factors suggested by Ellis (1994) as influences on learners. Birdsong (2006) also shows the function of age in actual behavioral data concerning both morphosyntax and phonology, which yields a strong negative correlation between the age of acquisition/arrival and the second language proficiency. Brain-based evidence has been also coordinated with second language research in recent studies (e.g. Birdsong, 2006 for review; Ullman, 2001, 2007), looking at whether the process of second language acquisition is conducted in the same way as, a similar way to or a different way from the process of first language acquisition.

In this article, the previous studies of age effects on second language acquisition will be reviewed and discussed from multiple perspectives, in order to explore some pedagogical implications for adult learners of second languages.

Age-related studies

In order to facilitate a comparison between – and a discussion of – previous studies, the supporting studies and refuting studies of the critical/sensitive period are introduced separately below. Some studies, however, have produced both supporting results and refuting results regarding the 'younger-the-better' position because, as Selinger (1978) proposes, there may be multiple critical/sensitive periods for different aspects of language. The studies with mixed results will be placed in the middle.

Studies supporting the critical/sensitive period hypothesis

We have observed that learners who start early in life to expose themselves to their second language are more likely to attain a native or native-like accent than older starters. Oyama (1976) examined 60 male learners who had immigrated to the United States. Their ages ranged from 6 to 20 years old and they had lived there for between 5 and 18 years. Two adult native speakers judged the 'native-ness' of the learners' accents during a reading-aloud task and during free speech. The results showed a significant negative correlation in 'age of arrival and acquisition', which meant that the younger their age of arrival was, the more authentic the accent they acquired. For instance, the youngest arrivals were rated the same as native speakers. However, no significant relationship was found between the length of stay and their accent.

Other studies that examined the effects of age on pronunciation (e.g. Tahta, Wood & Loewenthal, 1981) also indicated that an earlier age of arrival or acquisition leads to better pronunciation.

Similar results have been provided from studies in morphosyntax/grammar, but in their studies the cutting-off age for the critical/sensitive period is later or older than the studies on pronunciation. Patkowski (1980) investigated 67 immigrants to the United States, finding that learners who had entered the United States before the age of 15 were rated as more proficient in grammar than learners who had entered after the age of 15. There was also a significant difference in the distribution rate of scores based on a five-point scale for the two groups. The range of adult group scores was smaller than the range of child group scores. In addition, Patkowski examined the effects of the length of the stay in the United States, the amount of informal exposure to English and the amount of formal instruction. Neither the length of the stay nor the amount of formal instruction provided a significant effect but the amount of informal exposure did have a significant effect, though this was much less significant than the age factor.

In a similar line to Patkowski (1980), Johnson & Newport (1989) investigated 46 native Koreans and Chinese who had immigrated in the United States between the ages of 3 and 39, using an aural grammaticality judgment test. Half of them arrived there before the age of 15 and the other half arrived after the age of 17. The participants were asked to judge the grammaticality of 276 spoken sentences. The results indicated a negative correlation between age at arrival and judgment scores, which was -0.77 , meaning that the later the learner arrived, the lower the score they got. However, one difference from Patkowski's study was that the scores of the younger group varied less than those of the adult group. Also, neither the

number of years of exposure to English nor the amount of classroom instruction was related to the grammaticality judgment scores.

Johnson (1992) followed up on the study by Johnson & Newport (1989) by using the same participants in the earlier study a year later with written tests, working on the belief that written test materials eliminated extragrammatical properties that were present in the auditory materials. The results showed a negative correlation ($r = -0.54$) between age of arrival and performance, and suggested that the grammatical knowledge of young learners is native or near-native whereas that attained by older learners is ill-formed or incomplete. Thus, the critical period effects could be found in a test of grammar with a minimum number of extragrammatical properties. This shows the robustness of critical period effects in second language acquisition

DeKeyser (2000) tested the fundamental difference hypothesis (Bley-Vroman, 1988), which states that while children are known to learn a language almost completely through implicit domain-specific mechanisms, adults have largely lost the ability to learn a language without reflecting on its structure and they have to use alternative mechanisms, drawing especially on their problem-solving capacities, to learn a second language. The hypothesis implies that only adults with a high level of 'verbal analytical' ability will reach near-native competence in their second language, but that this ability is not a significant predictor of success in childhood second language acquisition. A study of 57 adult Hungarian-speaking immigrants confirmed the hypothesis. Very few adult immigrants scored in the range achieved by child arrivals in a grammaticality judgment test. Also, though the few who participated in his study had high levels of verbal analytical ability, this ability was not a significant predictor for the childhood arrivals. This study replicates the findings of Johnson & Newport (1989) and provides an explanation for the apparent exceptions in their study.

Studies with mixed results

Burstall (1975) compared two groups of students with five years of instruction in England and Wales. One group had begun learning French at the age of 8, whilst the other had begun at the start of secondary school when they were 11 years old. Burstall found that the secondary school starters were superior in three areas (speaking, reading, and writing) to the early starters, who were superior in only one area (listening) when compared at the age of 16.

Harley (1986) investigated the levels of attainment of

children in French bilingual programs in Canada, focusing on the learners' acquisition of French verb rules. She compared early and late immersion students after both had received 1,000 hours of instruction, using data from interviews, a story repetition task and a translation task. The older students demonstrated better overall control. However, at the end of their schooling, the early immersion group showed higher levels of ability than the older group.

Riney (1990) indicated in a review article that age had no effect on the final deletion of consonants, while it did have a marked effect on epenthesis, that is, the insertion of a vowel at the end of a closed syllable. The incidence of epenthesis in 10-to-12 year old children was less than 5 percent, while in adult learners it was over 30 percent, and epenthesis in adult learners did not significantly decline with increased exposure to English.

Counter studies

The morpheme studies (Bailey, Madden & Krashen, 1974; Fathman, 1975) showed that the order of acquisition of English morphemes was the same for children and adults. They showed that adults go through the same stages of acquisition of morphemes as children and therefore age does not appear to be a factor here.

Harley (1986) investigated early and late immersion programs, finding similar patterns in the two groups' acquisition of French verb phrases. Harley did not feel that they constituted evidence of different mental processes.

Cummins & Nakajima (1987) examined the acquisition of reading and writing skills by 273 Japanese children in grades two to eight in Toronto. They found that older students are more likely to have strong second language reading skills and, to a lesser extent, better second language writing skills. The explanation Cummins & Nakajima (1987) offered is that the older learners benefited from prior academic experiences in reading and writing in Japanese. Cummins (1981) formulated the 'interdependency principle' to refer to the idea that cognitive academic language proficiency (CALP) is common across languages, and can therefore easily be transferred from first language use to second language use by the learner. Other research, into the Portuguese-Canadian community in Toronto (Cummins, Swain & Allen, 1990), and into Turkish immigrant children in Holland (Verhoeven, 1991), supports the importance of first language academic skills as a basis for the successful development of second language ability in cognitive academic activities.

Ioup, Boustagui, El Tigi & Moselle (1994) examined the linguistic competence of an adult second language learner of

Egyptian Arabic, who was first exposed to the target language after the end of the critical period. The participant in this study had acquired native-like proficiency in an untutored learning context. To determine her level of achievement more exactly, her performance in various linguistic areas was compared to that of both native speakers and a highly proficient, tutored learner of Egyptian Arabic. The results suggested that a reexamination for the critical period hypothesis might be necessary.

The last example of counter research, a study by Harley & Hart (1997), examined the relationship between language aptitude components and second language outcomes among learners whose intensive second language exposure began at different ages. This empirical study showed the different learning styles among early and late immersion groups, without agreeing or disagreeing with the existence of the critical/sensitive period hypothesis. The learners in this study were 65 eleventh-grade students in continuing early and late French immersion programs. The main hypothesis was that in late immersion, starting in adolescence, there is a positive relationship between second language outcomes and the analytical aspect of language aptitude, whereas in early immersion, beginning in grade 1, a positive relationship will hold between second language outcomes and memory ability. A further hypothesis that early immersion students will have a higher language aptitude as a result of their early second language exposure was not supported by the findings. This study presented evidence in support of the view that different cognitive abilities tend to be associated with relative second language success in early and late immersion programs. The eventual second language proficiency outcomes from early immersion were more closely associated with memory abilities, and later immersion outcomes with analytical language ability.

Discussion

Whether critical/sensitive period hypothesis exists, age clearly should be regarded as an important factor that influences the possibility of attaining native-like proficiency in a second language, though there are some differences in the learning difficulties involved because of the similarities and differences between the first languages and second languages and because of given contexts such as whether or not the learners reside in the countries where their second languages are spoken (Birdsong, 2007). However, the empirical studies about age as an important factor in second language acquisition, described in the previous section, have provided different positions towards the critical/sensitive period hypothesis.

The first five studies (Oyama, 1976; Tahta, et al., 1981; Patkowski, 1980; Johnson & Newport, 1989; Johnson, 1992) support the hypothesis, that is, second language learners will not be able to attain a level of native-like proficiency if the age of arrival or acquisition is after the critical/sensitive period. The first two studies used data about phonology/pronunciation and the other three studies were based on the results of grammaticality judgment tests measuring the level of morphosyntax/grammar. Thus, the adult participants in these studies may have been in the fossilized phase of development in the areas of phonology and grammar.

Regarding the critical ages for acquisition, according to several researchers (e.g. Ellis, 1994; Long, 1990) acquiring native-like pronunciation is possible until the age of 6 – the final age for arrival and acquisition. On the other hand, native-like grammatical/morphosyntactical competence should be possible up to the age of 15 (e.g. Patkowski, 1980). As Selinger (1978) proposes, there may be multiple critical/sensitive periods for different aspects of language. The period during which a native accent is easily acquirable appears to end sooner than the period governing the acquisition of a language's grammar. In other words, the biological sensory acuity for attaining native-like pronunciation terminates much earlier than the cognitive plasticity that manages grammaticality judgment. Pinker (1994) makes the following note.

Acquisition of a normal language (phonology) is guaranteed for children up to the age of six, is steadily compromised from then until shortly after puberty, and is rare thereafter. Maturation changes in the brain, such as the decline in metabolic rate and the number of neurons during early school-age years, and the bottoming out of the number of synapses and metabolic rate around puberty, are plausible causes. (p. 293)

On the other hand, the most recent neurocognitive evidence has indicated the mechanism that manages language in the brain's system. Ullman (2007) argues as follows.

In first language, lexical knowledge depends on the declarative memory brain system, which underlies semantic and episodic knowledge, and is rooted in temporal-lobe structures. Grammar in first language relies rather on the procedural memory system, which subserves motor and cognitive skills, and is rooted in frontal/basal-ganglia circuits. In contrast, evidence suggests that in later-learned second language, learners initially depend largely on declarative memory, not only for lexical knowledge, but also for the use of complex forms. However, with increasing experience second

language learners show procedural learning of grammatical rules, becoming first language-like. Importantly, because the behavioral, computational, anatomical and physiological bases of the two memory systems are reasonably well-understood, including the nature of forgetting of knowledge and skills in these systems, we can make relatively specific predictions about language, including with respect to language attrition. (p. 9)

Thus, second language learners are unable to acquire the target language as long as they use the declarative brain memory system for its grammatical rules. As Ullman (2007) points out, through experience, second language learners come to make use of the procedural memory system. Neurocognitive researchers have presented these findings as reliable through the use of advanced technology, which makes them persuasive. Given that first language grammar is dealt with in this procedural memory system, the so-called universal grammar (morphosyntax in practice) or language acquisition device presumably may refer to the process of using the procedural memory system for grammar or language rules. If so, with the possible exception of getting a native-like accent, even adult learners could attain native-like proficiency in their target language if they practise it enough to make the language behavior their automatic routine – like riding a bicycle, which also uses the procedural memory system – and to make the procedural memory system active in utilizing the second language's morphosyntax/grammar. The maxim that practice makes perfect may hold true for acquiring a second language. In the case of child learners, or learners before the age of 15, the procedural memory system rather than the declarative memory system is more likely to be used for second language grammar. Possibly a lack of plasticity in the brain's system may lead to difficulty in acquiring second languages when we are older. Regarding the subtle distinction between a 'critical' and a 'sensitive' period, the question is whether completely successful acquisition is deemed to be only possible within a given span of a learner's life (critical), or whether acquisition is just easier within this period (sensitive). Therefore, the sensitive period hypothesis seems to be more appropriate for second language acquisition, though the 'critical period hypothesis' has been predominantly used.

The second category of studies with mixed results consists of Burstall (1975), Harley (1986) and Riney (1990). Burstall (1975) showed that the late starters excelled in writing, reading, and speaking while the early starters were better only in listening. As Ellis (1994) posits earlier in this article, younger learners are better in sensory acuity, which led to the better listening skills described by Burstall. The fact that the older

learners were better in all other areas – writing, reading and speaking – may refute the critical/sensitive period hypothesis. It holds true, indeed, that the older learners, secondary school students in this study, outperformed the younger learners because of their advanced cognition and more mature social positioning. However, in the previous literature (e.g. Ellis, 1994), the younger group was said to overtake the older group. In Burstall's study (1975), at the age of 16, the older group still outperformed the younger one. As one explanation, it was assumed that 16 years old was not yet the end of the best period for acquisition. The other explanation was that the older group of learners could have practised until they reached the stage of using the procedural memory system, which enabled them to use their second language automatically like their first language (c.f. Ullman, 2007). Also, various individual differences, not limited to age factors, played a stronger role in their performances in second language learning. His study shows that age is less important and that the more sophisticated cognitive or possibly academic skills they had in their first language played a more meaningful role in their second language acquisition, except in the area of listening, which may be biological and less influenced by external factors. Harley's study (1986) is a robust example showing that the younger learners were able to perform better in the long run, which endorses the validity of the critical/sensitive period hypothesis. Riney's investigation (1990) showed conditional results controlled by phonological environments. Epenthesis, the insertion of schwa sounds, is a well-known phenomenon among Japanese learners of English as well as an example of negative transfer. Possible fossilization caused by having less flexible physiological natures may have rendered the adult learners unable to fix the epenthesis, even after they had exposed themselves to the correct language environment.

The last category of studies consisted of six studies refuting or at least not complying with the critical/sensitive period hypothesis, though the last study by Harley & Hart (1997) suggested different cognitive processes among early and late learners. The first three example studies (Bailey, et al., 1974; Fathman, 1975; Harley, 1986) dealt with morphology, a part of so-called grammar; however, they did not present the features of the critical/sensitive period hypothesis, which may question the validity of the hypothesis. The fourth study, by Cummins & Nakajima (1987), gave clear results counter to the critical/sensitive period hypothesis because the older learners provided better results in writing and reading tests. The interdependent principle (Cummins, 1981), which emphasizes the importance of academic skills in first languages, may well support the

starting age for learning English in Japan. The reality, however, is that both reading and writing are not directly related to oral communication. In other words, linguistic behaviors such as writing and reading can be classified only as a school subject, not as a part of language acquisition. Probably that is why they failed to comply with the critical/sensitive period hypothesis. On the other hand, the fifth study by Ioup, et al. (1994) investigated an exceptional older learner who succeeded in acquiring a second language and its findings should encourage adult language learners to try to gain native-like proficiency.

Various kinds of interpretations have been provided to account for the existence of a critical/sensitive period. For instance, Muhlhauser (1986) proposes that 'adults and children appear to behave very much in the same manner', which indicates that 'activation of certain linguistic developments is dependent on the presence of specific environmental factors, rather than on different cognitive abilities of children and adults' after an extensive study of the developmental stages of pidgin languages and their similarities to language acquisition (1986, p. 265-266). Long (1990), on the other hand, concludes that a neurological explanation is best and proposes a 'mental muscle model', where the language-specific faculty remains intact throughout our lives, but access to it is impeded to varying degrees and impeded progressively with age, unless the faculty is used and so kept plastic. Such a view is compatible with studies of exceptional language learners, which demonstrate that some adult learners are capable of achieving native-speaker levels of competence, as seen in the study by Ioup, et al. (1994). As Birdsong (1992) points out, the critical/sensitive period hypothesis may have to be reexamined if many such learners are found.

Concluding remarks about pedagogical implications

The criteria for the most appropriate age to acquire a language seem to be based on phonology (pronunciation) and morphosyntax (grammar). Previous age-related studies have claimed that the process of acquiring a second language grammar (morphosyntax) is not substantially affected by age, but that of acquiring pronunciation (phonology) may be. The critical period hypothesis that originated from first language acquisition (Lenneberg, 1967; Penfield & Roberts, 1959) is based on neuropsychological factors, and the most important of these is brain maturation. It is widely known that the cognitive structures that allow for automatic language acquisition in a child deteriorate as the human brain matures. In second language acquisition, if a critical/sensitive period hypothesis does exist, adult learners or learners starting to learn after a

certain age (puberty for instance) may experience fossilization in phonology and/or morphosyntax regardless of their efforts, due to neurological/physiological factors. All those who possess a first language are certainly capable of acquiring some degree of a second language; however, second language acquisition in a mature human is not as successful as first language acquisition in many cases. Although some researchers (e.g. Bley-Vroman, 1988) have argued that older learners no longer have access to their innate language acquisition device, consisting of the principles of universal grammar (Chomsky, 1981) and language-specific learning procedures, it has been found to be possible for adult learners to activate such a device by using the procedural memory system (Ullman, 2007) instead of using the declarative memory system, by following the innate grammatical structure while using the language, and by thorough practice until the structure is internalized in the learners' minds and becomes automatic in their behavior. Ullman (2001) suggests that 'an increasing amount of experience (i.e. practice) with a second language should lead to better learning of grammatical rules in procedural memory, which in turn should result in higher proficiency in the language' (p.118). Even in adult language learning, which has usually been achieved through first language knowledge, so-called universal grammar may be accessible to adult second language learners, but their second languages are eventually acquired only if they are encouraged to use the procedural memory system instead of the declarative memory system.

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第二言語習得における年齢研究の文献検討

Rieko Matsuoka¹ Ian Smith²

1 国立看護大学校；〒204-8575 東京都清瀬市梅園1-2-1 2 英語教育学研究者

【要旨】 年齢は、第一言語習得の場合と同様に第二言語を習得する際にも重要な要因とみなされてきている。本稿では、年齢および言語習得に関する先行研究について検証し、第二言語習得の過程において年齢がどのように影響を与えるかについて考察する。たとえば、習得年齢と母語話者レベルの習熟度達成には、強いマイナスの相関関係（相関係数の絶対値：0.7以上）があることが証明されており、これは、臨界期仮説を擁護すると考えられる。本稿の主たる目的は、第一言語習得でいわれる臨界期仮説が第二言語習得においても妥当であるかどうかを検証することである。実際、思春期以降第二言語の習得を開始した学習者が母語話者レベルの言語習得に成功できないことを立証し、臨界期仮説の存在を肯定している先行研究がある一方で、思春期以降の第二言語学習者で母語話者レベルの習得に達したケースを提示し臨界期仮説に異議を唱える研究もある。先行研究からの脳科学や音声学など学際的な見地に基づき、思春期以降の第二言語習得者の習熟度を高めるような言語教育方法がいかにあるべきかについての示唆を最後に掲げる。
