

Effects of Early Exposure to a Second Language on Its Proficiency at Later Age

Yen-Cheng Tseng

(Department of Business Administration and Language Education Center, Chang Jung Christian University, Tainan, Taiwan)

Abstract: With the globalization, more and more people have the opportunity and need to use a second language (L2). Many countries implement foreign language instructions at earlier ages, and some researchers proposed that a child be at an optimum age for language learning, with the puberty marking the offset of the critical period. On the basis of empirical studies, this review evaluates whether early exposure to an L2 leads to a higher level of its proficiency at later age, particularly as measured by standardized tests. The early exposure examined in L2 studies is usually the “age of arrival” (AOA), defined as the age at which a person begins to live in the L2 environmental. Many studies on the acquisition of English as an L2 in an L2 environment found AOA affected ultimate attainment of L2 and could serve as a predictor of L2 proficiency independent of social, environmental and affective variables. In addition, this review found studies on the acquisition of languages other than English were also limited and observed inconsistent results. Therefore, more research should be conducted on the effects of early classroom exposure on L2 learning and the age factor in the acquisition of an L2 other than English.

Key words: early exposure, second language, language acquisition, standardized test

1. Introduction

With the economic globalization, more and more people have the opportunity and need to use a second language (L2) as a tool of communication. This trend drew the attention of the educators and policy-makers to gearing up foreign language instruction in the early grades. Foreign language programs are introduced at various grades in different countries: in France, a compulsory L2 is introduced at the start of secondary schooling, but 94% of the pupils at public schools start learning a foreign language at 5 years old; in Germany, foreign languages are compulsory from age 10 to 11; and in Denmark, English as the first foreign language is compulsory for all pupils from age 9 to 10 (Ward, 2002). To evaluate the effects of early exposure on acquiring an L2, a considerable number of studies were conducted on the relationship between the age of first exposure and the level of proficiency one can finally achieve in an L2. Still, researchers argue today about whether there is an optimal or a critical period for L2 acquisition.

Yen-Cheng Tseng, EdM, CAGS, Department of Business Administration and Language Education Center, Chang Jung Christian University; research areas: second language acquisition, language development, language teaching, child development. E-mail: yvonneyct@yahoo.com.

On the basis of neurological development, Penfield and Roberts (1959) proposed that a child be at an “optimum” age for language learning because of the neural plasticity of the child's brain, which makes it receptive and well adapted to the development of speech mechanisms. They argued that “the child’s brain has a specialized capacity for learning language — a capacity that decreases with the passage of years” (p. 240). Specifically, they believe the age of the learner is the most important factor in the language-learning process and, if language learning is to be successful, it must take place before puberty. In line with Penfield and Roberts, Lenneberg (1967) proposed that between the age of two and puberty the human brain shows the plasticity which allows a person to acquire the first language (L1) in childhood. He concluded that “puberty marks a milestone for the facility in language acquisition” (p. 168). Lenneberg’s Critical Period Hypothesis (CPH) concerns L1 acquisition initially, but he moved on to address the issue of L2 acquisition noting that children have a greater propensity for acquiring foreign languages before the early teens than after the late teens (Lenneberg, 1969).

Acknowledging that there might be a period after which language acquisition becomes more constrained, many researchers evaluated the age factor in acquiring L2, and the CPH was found to be relevant for the acquisition of L2 in various linguistic domains such as pronunciation (Oyama, 1976; Asher & Garcia, 1969; Flege et al., 1995a, 1995b; Moyer, 1999) and morphosyntax (Johnson & Newport, 1989; DeKeyser, 2000).

Nevertheless, even among those who advocated the CPH, there are still controversies regarding the best age to start and the critical period for each linguistic domain in L2 learning. On the basis of their study, Walberg et al. (1978) concluded that “there is no evidence for early-age sensitivity to language” (p. 436). In the same year, Snow and Hoefnagel-Hohle (1978) explored the L2 skills in groups of young, teenage children and adults who learned Dutch and drew the conclusion that “a critical period extending from 2 to 12 does not exist” (p. 1125). As the doubts remain, the objective of this review, therefore, is to evaluate whether early exposure to an L2 leads to a higher level of its proficiency at later age, particularly as measured by standardized tests, and thus to identify the effects of age on each linguistic domain in L2 learning, if the answer is positive.

2. Effects of Early Exposure on Acquisition of English as an L2 in an L2 Environment

Krashen et al. (1979) proposed that, on the basis of a review of literature, there are three generalizations concerning the effects of age on the rate and eventual attainment in L2 acquisition: (1) adults proceed through early stages of syntactic and morphological development faster than children (where time and exposure are held constant), (2) older children acquire faster than younger children, and (3) acquirers who begin natural exposure to L2 during childhood generally achieve higher L2 proficiency than those beginning as adults (p. 202). To assess the relationship between early exposure and proficiency level, the current review will begin with examining the studies focused on the third generalization. The early exposure examined in L2 studies is usually the “age of arrival” (AOA), defined as the age at which a person begins to live in the L2 environment (Asher & Garcia, 1969; Oyama, 1976, 1978; Johnson & Newport, 1989; Patkowski, 1990; Flege et al., 1999) (Table 1). Although sometimes the term age of learning (AOL) was used to represent AOA (Flege et al., 1995a; 1995b), AOL may be misleading because people may begin to learn L2 before the arrival in the L2 environment. For the third generalization proposed by Krashen et al. (1979), AOA is more pertinent, particularly when there was no exposure to that L2 before the arrival.

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Table 1 Effects of Early Exposure on Acquisition of English as a Second Language (L2) in an L2 Environment

Study (Country)	Study Populations	AOA ¹ (years)	Domain	Test ²	Major Findings
Asher & Garcia, 1969 (U.S.)	71 Cuban immigrants 30 Americans	7 to 19	pronunciation	no	age ≤ 6 had the greatest probability of achieving a near-native pronunciation
Fathman, 1975 (U.S.)	200 public school students with diverse language backgrounds	3 to 14	syntax morphology	yes	children 6–10 years old are more accurate in producing elicited phonological structures, but children 11–15 years old performed better in morphosyntactic tasks
Oyama, 1976 (U.S.)	60 Italian immigrants	6 to 20	pronunciation	no	strong effect of AOA, but no effect of length of stay
Oyama, 1978 (U.S.)	60 Italian immigrants	6 to 10 11 to 15 12 to 20	ability to integrate meta-linguistic knowledge	yes	strong effects on pronunciation and comprehension
Flege et al., 1995a, 1995b (Canada)	240 Italian immigrants	2 to 23	pronunciation	no	strong effect
Flege et al., 1999 (U.S.)	240 Korean immigrants	1 to 23	phonology morphosyntax	no	greater effects on phonology than morphosyntax
Johnson & Newport 1989 (U.S.)	46 Chinese and Korean immigrants	3 to 7 8 to 10 11 to 15 17 to 39	syntax morphology	yes	strong linear relationship up to puberty, no relationship afterwards
Dekeyser, 2000 (U.S.)	57 Hungarian immigrants	1 to 40	syntax morphology	yes	strong linear relationship up to puberty, no relationship afterwards
Tsukada et al., 2005 (U.S. and Canada)	108 Korean immigrant children and adults with 2 to 6 years of residence as well as English-speaking children and adults	6 to 14 in children 21 to 38 in adults	pronunciation	yes	significant effect
Kang & Guion, 2006 (U.S.)	10 English monolingual, 10 Korean monolingual, 10 early Korean-English bilinguals, 10 late Korean-English bilinguals	mean = 3.8 in early bilinguals mean = 21.4 in late bilinguals	phonology	no	significant effect
MacKay et al., 2006 (Canada)	138 Italian immigrants	7 to 36	pronunciation	no	significant effect

¹age on arrival; ²standardized test(s) applied

Across the related studies, AOA remains the strongest predictor of the ultimate attainment of L2. Asher and Garcia (1969) compared 71 Cuban immigrant children between the age of 7 and 19 with 30 American children in their pronunciation of English sentences to examine the optimal age for children to develop native-like pronunciation. Each participant was asked to read the same set of four sentences, and the audio-recording was judged by 19 American high school students as “native speaker”, “near native speaker”, “slight foreign accent”, and “definite foreign accent”. Recordings from Cuban immigrants and American were mixed, and the mode of the decisions was adopted as the final score. The results showed the greatest probability of achieving a near-native pronunciation of English when the children were 6 or under. Specifically, while none of the immigrants was classified as “native speaker”, among those who had lived in the States for 1 to 4 years, the proportion of

achieving “near native speaker” was 50%, 22%, and 8% respectively in those whose AOA was 1–6, 7–12, and 13–19 years; among those who had lived in the States for 5 to 8 years, the proportion was 71%, 46%, and 17%, respectively. They speculated that the child’s observed language facility in the natural setting may be due to learning the foreign language in a physically active, play situation, whereas adults do so in a non-physically active, non-play situation. This study seemed to confirm the “the younger the better” anecdote in acquiring the native-like pronunciation, but no statistical tests were performed to evaluate the differences among the groups, even though the number of participants in each group was generally small. Furthermore, only inter-observer reliability was assessed (70%), and the validity was less than 80% (only 23 of the 30 American participants were put into the “native speaker” category).

In order to investigate the age-related limitation on the learning of phonology, Oyama (1976) recruited 60 Italian-born immigrants to examine their degree of accent. She collected two samples from each subject; one was the reading of a short paragraph containing a number of phonological variables, and the other was a brief casual speech, evoked by a request to recount an experience in the participant’s life. The study showed a strong effect of AOA, but virtually no effect of the length of stay in the United States. In a later study, Oyama (1978) divided 60 Italian immigrants into three groups according to AOA in the United States (6–10, 11–15, and 12–20 years old) to investigate the comprehension of speech and applied the masked speech test to tap the subjects’ ability to integrate meta-linguistic knowledge including phonology, syntax, intonation and redundancy patterns. She found a strong age effect, not only on the ability to speak an L2 with a convincing accent, but also on the ability to understand it effectively, although the results did not imply that late learners had difficulties comprehending under normal circumstances. Oyama (1978) argued that the CPH is consistent with factors such as motivation and input.

Flege et al. (1995a; 1995b) used AOL to represent AOA to study 240 native speakers of Italian who had arrived in Canada between the age of 2 and 23 years and had lived there for at least 14.6 years and found that AOL (AOA, in fact) exerts a powerful influence on the overall degree of perceived foreign accent in the pronunciation of English sentences. In a similar study of 240 native speakers of Korean who had arrived in the United States between the age of 1 and 23 years and had lived there for at least 8 years, Flege et al. (1999) applied three methods to evaluate the CPH: *discontinuity test* that accounts for age-related changes in L2 acquisition, *pre/post correlation test* that computes the correlation between AOA and L2 performance, and *matched subgroup* that tests the hypothesis that factors associated with AOA, rather than AOA itself, are responsible for what have been interpreted as “age” effect in previous studies. Taking variables correlated with AOA into account and examining AOA effects on two language domains (phonology and morphosyntax), they found that AOA constrains the learning of L2 phonology to a greater extent than L2 morphosyntax, which supported the argument raised by Pakowski (1990) earlier. The scores obtained from the grammaticality judgment test also agreed with the results of Johnson and Newport (1989). These studies not only provided support to the CPH, but also indicated that the critical period may have different effects on different linguistic domains.

Among the linguistics domains, pronunciation is the most frequently studied. To compare English vowel production and perception by Korean adults and children English learners, Tsukada et al. (2005) recruited 108 participants, including equal numbers of children and adults as well as equal numbers of native English speakers, immigrants with 2 to 4 years of residence, and immigrants with 4 to 6 years of residence (six groups with 18 each). The participants’ perception of English vowels was assessed using a categorical discrimination test employed in many previous studies, and they found that Korean children discriminated English vowels more accurately than adults but less accurately than native English-speaking children. They also found that Korean children produced

significantly larger between-vowel contrasts than adults but did not differ from native English-speaking children. MacKay et al., (2006) studied 138 Italian immigrants to Canada aged 40 to 71 years with AOA ranging from 7 to 36 years and applied analysis of variance and principle components analysis to evaluate the effects of AOA while taking other correlated variables such as chronological age and length of residence into account. They found that variation in AOA and language use, but not chronological age or residence duration, accounted for a significant amount of variance in the foreign accent ratings. The findings of the study were interpreted to mean that AOA effects on foreign accent are due to the development of the native language phonetic system rather than to maturational constraints on L2 speech learning.

There are also studies on specific linguistic features. For example, to study the effects of age of acquisition (similar to AOA) on the interaction of Korean and English stop systems in Korean-English bilinguals, Kang and Guion (2006) recruited 40 adult participants, including 10 each of four groups: native monolingual speakers of English, native monolingual speakers of Korean, early Korean-English bilinguals (mean age of acquisition = 3.8 years), and late Korean-English bilinguals (mean age of acquisition = 21.4 years). They analyzed production of Korean and English stops in terms of three acoustic-phonetic properties: voice-onset time, amplitude difference between the first two harmonics, and fundamental frequency. They found that early bilinguals were more likely to be native-like in production of English and Korean stops and maintain greater independence between Korean and English stop systems than late bilinguals. Specifically, while early bilinguals were not different from the monolinguals of either language, late bilinguals were different from English monolinguals for English voiceless and voiced stops in all three properties. Considering the independence of the two stop systems, they speculated that late bilinguals seem to have merged English voiceless and Korean aspirated stops, whereas early bilinguals seem to have two independent stop systems. Johnson and Newport (1989) recruited 46 native speakers of Chinese or Korean with variable AOA in the U.S. but similar lengths of exposure and divided them into four groups according to AOA (3–7, 8–10, 11–15, and 17–39 years old). Through the grammaticality judgment test, they observed a clear and strong relationship between AOA and the L2 level in terms of knowledge of English syntax and morphology. With experiential and attitudinal variables considered, they argued that AOA has a clear independent effect on ultimate L2 performance. Furthermore, they found the relationship between AOA and L2 performance was linear up to puberty, and after puberty the performance was low and unrelated to AOA; this finding is not only an evidence of the existence of an age factor, but also a direct support for the CPH, indicating the critical period is before puberty. Following Johnson and Newport (1989), Dekeyser (2000) recruited 57 adult native speakers of Hungarian and asked them to perform the similar grammaticality judgment test. The results confirmed the findings of Johnson and Newport (1989) and supported the CPH. As the results implied that explicit learning processes were necessary for achieving a high level of competence in an L2 after childhood, Dekeyser argued further that the study provides evidence for Bley-Vroman's (1988) Fundamental Difference Hypothesis, which postulates that no adults can reach a native level of competence in L2 morphosyntax unless they have been able to rely on explicit, analytic, problem-solving capacities. The Fundamental Difference Hypothesis is in line with the CPH stating the critical period accounts for implicit learning of abstract structures.

There is also a body of counter evidence to the CPH, and many studies showed that the age factor favoring younger students holds for phonological abilities only. Fathman (1975) found that children 6–10 years old were more accurate in producing elicited phonological structures, whereas children 11–15 years old performed better in morphosyntactic tasks. Specifically, older learners were able to learn and produce higher order structures more quickly than younger learners. Therefore, it is very important to refer to the target linguistic domain when

addressing the issue of critical period. Many other studies did not include participants with AOA before and after the puberty and thus were less convincing in providing either evidence or counter-evidence to the CPH.

In conclusion, AOA is considered to be an index of the age at which the learners first began to learn their L2 and affects ultimate attainment of L2. It also serves as a predictor of L2 proficiency independent of social, environmental and affective variables. Studies have shown that the L2 pronunciation of younger learners is consistently better than that of older learners (Ash & Garcia, 1969; Fathman, 1975; Flege, Munro, & MacKay, 1995; Flege, Yen-Komshian, & Liu, 1999) whereas older learners are more successful in acquiring morphosyntactic structures of L2.

3. Effects of Early Exposure on Acquisition of English as an L2 in an L1 Environment

On the age factor of L2 acquisition, more studies were conducted in an L2 environment, mostly on immigrants in a natural environment, than in an L1 environment with explicit instructions. Cenoz (2001) conducted a study on the influence of age on the acquisition of English as a third language. He recruited 60 elementary (average 13.1 years old) and secondary (16.2 years old) students who used Basque or Spanish at home and used mostly Basque at school. They all had learned English for 6 years (564 hours) at school. All the participants filled out a background questionnaire and completed a battery of English tests, including telling two stories (oral tests; one the same for both group, and the other different between the groups), a listening comprehension test (36 points), a cloze test (34 points), reading comprehension and grammar test (31 points) and a composition. The results indicate that the younger group obtained lower scores in various aspects of language proficiency than the older group. Students who started learning English at grade 6 (11 years old) presented a higher degree of proficiency in English as reflected by all tests than those who started at an earlier age (8 years old). In a later study (Cenoz, 2003) on 135 students in the same language environment, participants were categorized into three groups: "Primary 5", who started learning English at kindergarten 2 (4 years old) and had a mean age of 10.1 years; "Secondary 2", who started learning English at primary 3 (8 years old) and had a mean age of 12.9 years; and "Secondary 5", who started learning English at primary 6 (11 years old) and had a mean age of 16.3 years. They all had learned English for 600 hours at school. All the same tests and questionnaire administered in the previous study were applied, and an attitude questionnaire and a motivation questionnaire were added. The results indicate that the language proficiency increased as the age increased, except for the pronunciation component of the oral test. In the evaluations of attitude and motivation, however, whereas the two secondary school groups showed similar results, both groups were lower than the primary school group. The results of code-mixing analysis showed that students starting at kindergarten did not mix codes more often than the other two groups. In addition to arguing that starting learning earlier does not lead to a higher proficiency in English, the study found younger learners present more positive attitudes and are more motivated. It should be noted that both studies covered learners before puberty only, which means they were unable to evaluate the CPH if the offset of the critical period is the puberty as most researchers believe. Furthermore, these studies did not follow up long enough to evaluate the ultimate attainment of English, which in fact was the third language of the study population.

In comparison with studies in an L2 environment, studies in an L1 environment are very limited. In reality, however, many more people begin to learn L2 in classrooms in an L1 environment than in an L2 environment. Furthermore, there is a trend to start learning English as a foreign language in regular school systems, i.e., in an

L1 environment. On the other hand, learning an L2 in the classroom through courses is very different from learning it in a natural environment. It has been noted for nearly half a century ago by Hildreth (1959) that the learning an L2 in a classroom environment had limitations such as receiving instruction for fifteen or twenty minutes a day in groups of twenty five or thirty, restrictions on freedom of speech and behavior, isolation from other activities and without reinforcement from home experiences, etc. Therefore, results from studies conducted in L2 environments do not necessarily apply to the learning in an L1 environment, and researchers should pay more attention to the effects of early classroom exposure on L2 learning.

4. Effects of Early Exposure on Acquisition of Second Language other than English

Olsen and Samuel (1973) evaluated the commonly held assumption that younger children are superior to those who are older in learning to speak an L2 with a good accent. Twenty elementary, 20 junior high, and 20 college level students were tested before and after being given identical instructions in German phonemes. Post-test results indicated that both the junior high and college groups were superior to the elementary group and therefore did not support the assumption. The researcher attributed the common observation that children acquire better language pronunciation than adults to an environmental-socioeconomic explanation. It is more probable that children would have a closer approximation to native-like pronunciation because they are surrounded by good models more of the time than their adult counterparts (Olsen & Samuels, 1973).

To incorporate instructional and motivational factors along with the age, Moyer (1999) studied the German pronunciation of 24 native speakers of English, none of whom had had any “measurable exposure to the target language until the critical period for language learning had passed” (p. 86). Phonological tasks including free speech and read aloud items were performed by the participants, and the questionnaire including three categories of variables (biological, affective and instructional) was administered to account for overlapping factors contributing to the final achievement. The results lent support to the previous studies of syntactic, morphological, and phonological accuracy that demonstrate a substantial decline after the critical, or sensitive, period before puberty (p. 92). MacIntyre et al. (2002) studied 268 grades 7, 8, and 9 students attending the late French immersion program at a small junior high school in Nova Scotia, Canada. As described by the researchers, English was far and away the dominant language in the local area, and therefore the students were not in a L2 language-learning environment. They found that students' L2 willingness to communicate, perceived competence, and frequency of communication in French increased from grades 7 to 8 and that these increases were maintained between grades 8 and 9, despite a drop in motivation between grades 7 and 8 and a steady level of anxiety across the three grades. Snow and Hoefnagel-Hohle (1978) compared the phonological performance of 43 children in the critical period (3–5, 6–7, 8–10 years) with that of 17 teenagers (12–15 years) and 21 adults. They found the results impossible to reconcile with the CPH from the laboratory study as well as naturalistic study. Specifically, younger subjects, who were initially worse, surpassed the older subjects, who had the initial advantages in pronunciation after a period of 10–11 months' learning. The older subjects were much better at other aspects of L2 skill including vocabulary, syntax, morphology than the younger ones (Snow & Hoefnagel-Hohle, 1977; 1978). While this study is often cited as counterevidence to the CPH, it has been recognized that the researchers confused the ultimate attainment with the rate of learning (Long, 2005), which was also observed in other studies offering so-called counterevidence to the CPH (Krashen et al., 1982).

5. Conclusion

From the examined literature, there is a distinctive variation between L1 and L2 environment. The numerous studies examine the effect of age at the first exposure to L2 on the eventual proficiency attained in a “naturalistic” (L2) environment. They all show a strong effect for age on the ultimate attainment in L2, especially for pronunciation. On the other hand, a wealth of studies showed adults or older children outperformed younger children, but they involve issues of learning rates. Specifically, in those studies, older learners outperformed younger learners in the learning rates, not necessarily ultimate attainment.

Whereas many more people begin to learn L2 in the classrooms in an L1 environment than in an L2 environment, studies on the age factor in L2 acquisition were rarely conducted in an L1 environment. Furthermore, since learning an L2 in the classroom environment is very different from learning it in a natural environment, results from studies conducted in L2 environments do not necessarily apply to the learning in an L1 environment. This review identified the obvious gap in the data and calls for more studies in classroom environments.

Likewise, the learning of English may be different from the learning of other languages, but this review also found that the related studies on languages other than English are limited. Therefore, more studies should be conducted on other language in order to understand the effects of early exposure on the acquisition of other languages.

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