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Effects of age on second language acquisition

Abstract. There are many differences among second language learners. In first language acquisition by children, individual differences (e.g. across genders or the language being learned) are largely overshadowed by striking similarities in terms of natural stages and ultimate attainment. However, in second language acquisition, individual differences have more of an impact on the second language learning process, and their role has thus received considerable attention in recent years. Learners' beliefs and affective factors are likely to have a direct effect on second language learning, but they themselves may be influenced by a number of general factors relating to learners' ability and desire to learn and the way they choose to go about learning. One of those important areas of difference among second language learners is *age*. We now turn to a discussion of four main effects of age on second language acquisition.

Keywords: first language acquisition; second language acquisition; affective factors; age; learners' beliefs; native-speaker proficiency

1. Introduction

An individual difference that is believed to play a key role in second language learning is *age*. It is commonly thought that younger language learners are more successful and indeed researchers have found a relationship between *age of acquisition* and *ultimate attainment* in at least some aspects of the second language, with age showing itself to be the strongest predictor of success. This is supported by the *Critical Period Hypothesis*. Originally

discussed in the late 1960s by Eric Lenneberg, this hypothesis states that language acquisition must occur before puberty in order for the speaker to reach native-like fluency. Penfield and Roberts (1959), for example, argued that the optimum period for language acquisition falls within the first ten years of life, when the brain retains its plasticity. Initially, this period was equated with the period taken for lateralization of the language function to the left side of the brain to be completed. Work on children and adults who had experienced brain injuries or operations indicated that damage to the left hemisphere caused few speech disorders and was rapidly repaired in the case of children but not adults (Lenneberg 1967).

Although subsequent work (for example, Krashen 1973; Whitaker, Bub, and Leventer 1981) has challenged the precise *age* when lateralization takes place, resulting in doubts about the neurological basis of the critical period hypothesis, the age question has continued to attract the attention of researchers. This controversy centres on both whether there are significant differences in L2 learning according to age, and also on the theoretical explanations for those differences which researchers claim to have found. As Larsen-Freeman and Long (1991) point out, however, the age issue is an important one for theory building in second language acquisition research, for educational policy-making, and for language pedagogy. If it can be shown that older learners are different from younger learners, the claim that adults have continued access to Universal Grammar is called into question. If it can be shown that younger learners do better than older learners, the case for an early start in foreign language education is strengthened. If it can be shown that children learn in different ways to adults, language teachers will need to identify different approaches and techniques to suit the two kinds of learners. In order to untangle the research results, it is helpful to consider a number of separate but related questions:

- What effect does age have on the processes of second language learning?
- What effect does age have on the rate of second language learning?

- What effect does age have on learners' levels of second language achievement?
- What effect does age have on learners' ability to achieve native-speaker levels of proficiency?

2. The effects of age on the process of second language acquisition

There have been few studies of the effects of age on the process of second language acquisition. The morpheme studies showed that the order of acquisition of a group of English morphemes was the same for children and adults (Bailey, Madden, and Krashen 1974; Fathman 1975). However, conclusions based on the morpheme studies are circumspect given their methodological problems. Studies which have investigated the sequence of acquisition in transitional structures such as negatives and interrogatives are not subject to the same methodological strictures, however. They show that adults go through the same stages of acquisition as children (for example, Cancino et al. 1978). Age, therefore, does not appear to affect the general developmental pattern.

By far the most detailed study of the effects of age on the acquisition process is Harley's (1986) investigation of early and late immersion programmes. Harley found remarkably similar patterns in the two groups' acquisition of the French verb phrase. For example, the two age groups generally made similar types of errors and both groups tended to use the relatively unmarked French verb forms more accurately than the marked forms. A few differences were noted but these were minor, and Harley did not feel that they constituted evidence of different mental processes, arguing instead that the differences reflected variations in the second language input to which the learners were exposed.

Process differences may occur in second language pronunciation, however. Riney (1990) reviewed literature relating to whether learners display a preference for an open syllable structure in early interlanguage. He argued that in the case of learners who began before the age of 12 years, no open syllable preference is evident (as Sato's (1987) study

indicates), but in the case of learners beginning after 12 years there was, as in Tarone's (1980a) study. In data collected from Vietnamese learners of English, Riney was able to show that whereas age had no effect on the final deletion of consonants (one way of making a target-language closed syllable open), it did have a marked effect on epenthesis (the insertion of a vowel at the end of a closed syllable). Whereas the incidence of epenthesis in 10 -12-year-old children was less than 5 percent, in some adult learners it was over 30 percent. Furthermore, epenthesis in adult learners did not significantly decline with increased exposure to English. It is obviously premature to conclude that age has no effect on the process of acquisition. The research to date suggests that the effect may be a minimal one in the case of grammar, but possibly more significant in the case of pronunciation.

3. The effects of age on rate of second language learning

In their review of the research that has addressed the age issue, Krashen, Long, and Scarcella (1979) concluded that

a) adults are superior to children in rate of acquisition

b) older children learn more rapidly than younger children

The study most often cited in support of these conclusions is Snow and Hoefnagel-Höhle (1978). This study investigated the naturalistic acquisition of Dutch by eight- to ten-year-old English-speaking children, twelve- to fifteen-year-old adolescents, and adults over a ten-month period. The learners' proficiency was measured on three separate occasions (after three months, six months, and at the end of the study). With regard to morphology and syntax the adolescents did best, followed by the adults, with the children last. However, there were only small differences in pronunciation, and the grammar differences diminished over time as the children began to catch up.

Experimental studies have also shown that adults outperform children in the short term. For example, Olsen and Samuels (1973) found that American English-speaking

adolescents and adults performed significantly better than children after ten 15-25 minute German pronunciation sessions. However, other studies suggest that, at least where pronunciation is concerned, adults do not always progress more rapidly than children. Cochrane (1980), for example, investigated the ability of 54 Japanese children and 24 adults to discriminate English /r/ and /l/. The average length of naturalistic exposure was calculated as 245 hours for the adults and 193 for the children (i.e. relatively little). The children outperformed the adults, although in a follow-up experiment in which the two groups were taught the phonemic distinction, the adults benefited while the children did not. The research gives general support to Krashen, Long and Scarcella's generalization that adults learn faster than children. It appears to be more applicable to grammar than pronunciation (where children seem to learn as rapidly, if not more rapidly, than adults), although in the case of formal learning situations adults seem to do better even in this area of learning.

4. The effects of age on learners' second language achievement

The majority of second language learners fail to reach native-speaker levels of ability. It is also important to ask whether age effects are evident in such learners. Do learners who begin learning as children in general reach higher levels of second language ability than those who start as adolescents or adults? This question has been addressed in research that has compared the level of proficiency reached by second language learners who began as children with that of learners who began as adults. We do not know, of course, if these studies show the effects of age on these learners' ultimate level of attainment, as the assumption that they have reached their '*final state*' (are fossilized) may not be justified.

A number of studies have investigated the relative effects of starting foreign language education in the primary school as opposed to the secondary school on the levels of attainment. For example, Burstall (1975) reports on a pilot scheme in England and Wales. She compared two groups of students with five years of instruction. One group had begun

learning French at the age of 8, while the other had begun at the beginning of secondary school (11 years). She found that the older learners were '*consistently superior*'. When both groups were compared at the age of 16, the secondary school starters outperformed the primary school starters on tests of speaking, reading, and writing and were inferior only on a test of listening. Harley (1986) investigated the levels of attainment of children in French bilingual programmes in Canada. She focused on the learners' acquisition of the French verb system, obtaining data from interviews, a story repetition task, and a translation task. She compared early and late immersion students after both had received 1,000 hours of instruction. Neither group had acquired full control of the verb system, but the older students demonstrated greater overall control. However, the early immersion group showed higher levels of attainment at the end of their schooling, a result that may reflect the additional number of years' instruction they had received rather than starting age. The results from these and other school-based studies (see Singleton (1989) for a review) is not supportive of the claim that children's level of attainment is greater than that of adolescents/ adults. One possible explanation for this- advanced by Singleton- is that formal learning environments do not provide learners with the amount of exposure needed for the age advantage of young learners to emerge. Studies of learners in naturalistic learning situations provide the most convincing evidence that younger is better and, therefore, some support for the *critical period hypothesis*.

Learners who start as children achieve a more native-like accent than those who start as adolescents or adults. Oyama (1976) investigated 60 male immigrants who had entered the United States at ages ranging from 6 to 20 years and had been resident there for between 5 and 18 years. She asked two adult native speakers to judge the nativeness of the learners' accents in two 45-second extracts taken from performance on a reading-aloud task and a free-speech task. Oyama reports a very strong effect for *age of arrival* but almost no effect for

'number of years' in the United States. She found that the youngest arrivals performed in the same range as native-speaker controls. Other studies which have investigated the effects of age on pronunciation (for example, Asher and Garcia 1969; Tahta, Wood, and Loewenthal 1981) support the younger-is-better position.

Similar results have been obtained for the acquisition of grammar. Patkowski's (1980; 1990) study of 67 educated immigrants to the United States found that learners who had entered the United States before the age of 15 were rated as more syntactically proficient than learners who had entered after 15. Furthermore, there was a marked difference in the distribution of the scores (based on native speakers' ratings on a five-point scale) for the two groups. The adult group's scores were evenly distributed, with the majority at midpoints on the rating scale. The child group's scores clustered at the high end of the rating scale, with 29 out of 33 achieving a rating of 4+ or 5. Patkowski also investigated the effects of number of years spent in the United States, amount of informal exposure to English, and amount of formal instruction. Only the amount of informal exposure had any significant effect, and even this was negligible in comparison with the age factor. Patowski's findings are confirmed by Johnson and Newport's (1989) study of 46 native Koreans and Chinese who had arrived in the United States between the ages of 3 and 39, half before the age of 15 and half after 17. The subjects were asked to judge the grammaticality of 276 spoken sentences, about half of which were grammatical. Overall the correlation between age at arrival and judgment scores was -0.77 (i.e. the older the learners were at arrival, the lower their scores). Far less variation was found in the scores of the *child group* than in the adult group. Neither the number of years of exposure to English beyond five nor the amount of classroom instruction was related to the grammaticality judgment scores, and although an effect for 'identification with American culture' was found, this was much weaker than that for age. In his summary of these and other studies, Singleton (1989) writes:

Concerning the hypothesis that those who begin learning a second language in childhood in the long run generally achieve higher levels of proficiency than those who begin in later life, one can say that there is some good supportive evidence and that there is no actual counter evidence (1989: 137).

This is one of the few definite conclusions that Singleton feels able to reach in a comprehensive survey of age-related research. It is worthwhile noting, however, that this conclusion may not hold true for the acquisition of second language literacy skills, Cummins and Nakajima (1987) examined the acquisition of reading and writing skills by 273 Japanese children in grades two to eight in Toronto. They found that the older the students were on arrival in Canada, the more likely they were to have strong second language reading skills and, to a lesser extent, better second language writing skills. The explanation Cummins and Nakajima offer is that the older learners benefited from prior literacy experience in Japanese (see the discussion of the Interdependency Principle in Chapter 6 *The Study of Second Language Acquisition*, Rod Ellis 1994).

5. The effects of age on the acquisition of native-speaker proficiency

The controversy regarding the role of age is fiercest when it comes to considering the effects of age on the achievement of native-speaker levels of proficiency. This question is the crucial one for the critical period hypothesis. Neufeld's (1978) study is often cited by those seeking evidence to refute the hypothesis. In this study, 20 adult native speakers of English were given 18 hours of intensive instruction in the pronunciation of Chinese and Japanese. To test the *nativeness* of their pronunciation, the learners were then given an imitation test and their utterances judged on a five-point scale (from unmistakably native to heavily accented) by native speakers of the two languages. Nine and eight of the subjects were rated as *native* for Japanese and Chinese respectively. This study suggests, therefore, that under the right conditions adults can achieve native ability in pronunciation—the area of language generally considered to be the most difficult for adults to acquire. Neufeld {1977; 1979) conducted other studies with similar results. However, his studies have been strongly criticized by

supporters of *the critical period hypothesis*. Long (1990a), for instance, argues that Neufeld's subjects represented an 'elite', that the imitation test produced 'rehearsed' rather than natural data, and that the instructions given to the raters predisposed them to think that some of the subjects were native speakers. These criticisms — and those made by Patkowski (1990) — are legitimate, but they do not refute the essential claim that Neufeld seeks to make, namely that it is possible for adults to achieve native-speaker levels of proficiency in a second language.

Another frequently cited experimental study provides evidence to support the *critical period hypothesis*. Coppieters (1987) tested 21 highly proficient speakers of French, all of whom had begun learning as adults, and compared their performance on a grammaticality judgment task with that of 20 native speakers. Coppieters notes that it was not possible to distinguish the two groups by the mistakes they made, their choice of lexis, or grammatical constructions and six of the subjects were also described as having no traces of a foreign accent. The results of the grammaticality judgment test, however, showed clear differences between the two groups, suggesting that despite the native-like performance of the learners in language production, their grammatical competence differed from that of native speakers. Again, though, it is possible to raise methodological objections to this study. Coppieters did not include a group of learners who had started to learn second language French as children, thus we cannot be sure that the results he obtained reflect age as opposed to some other factor. Also, as in the case of Neufeld's imitation test, doubts can be raised about whether grammaticality judgments constitute a valid means of measuring competence. Birdsong (1992) identifies "numerous procedural and methodological features of the Coppieters study that compromise its conclusions" (1992: 711).

Birdsong's own replication of this study casts serious doubts on the results Coppieters obtained. Birdsong administered a grammaticality judgment test to 20 English-speaking

learners of second language French, who were near-native in their oral ability, and to 20 native speakers of French. The study was motivated by Long's (1990a) challenge to researchers to investigate '*whether the very best learners actually have native-like competence*' (1990a: 281). Contrary to Coppieters, Birdsong found no evidence of any dramatic differences in the judgments of the non-native speakers and native speakers. A number of the non-native speakers performed in the same range as the native speakers on the grammaticality judgment test. Furthermore, Birdsong could find no evidence of marked differences between the two groups in the think-aloud data that he collected from the subjects as they performed their judgments. This study, then, suggests that at least some learners who start learning a second language after puberty achieve a level of competence indistinguishable from that of native speakers.

Another way of investigating the claims of the *critical period hypothesis* is to investigate whether learners who start learning a second language as young children and enjoy favorable learning conditions succeed in reaching native levels of proficiency. Thompson's (1991) study of foreign accents in Russian immigrants in the United States addressed this question. Thompson found that those learners who had arrived before they were ten years old had a more native-like English accent than those who came after this age—a finding that bears out the results of earlier studies reported in the next section. What is interesting about this study, though, is that two subjects who came to the United States at the age of four years were still rated as having a *slight accent*, a result that Thompson considers "a problem for the Critical Period Hypothesis" (1991: 199). Thompson speculates that these learners' failure to achieve native-speaker levels of pronunciation was because they had maintained a high level of speaking proficiency in Russian, and that this led to what Weinreich (1953) has called an *interlingual* identification. Thompson's study is important he-

cause it suggests the need to consider age in relation to other factors, such as first language maintenance, and that not all learners will wish to sound like native speakers.

Yet another way of assessing whether learners can achieve native-speaker levels in a second language is to see whether they are able to recognize spoken or written *accents* in the same way as native speakers. Scovel (1981) asked four groups of judges (adult native speakers, child native speakers, adult non-native speakers, and adult aphasics) to rate speech samples and written pieces produced by a mixture of native and non-native speakers. He found that even the most advanced non-native speakers achieved an accuracy rate of only 77 percent, which was about the same as the child native speakers (73 percent) but less than the adult native speakers (95 percent) and even the aphasic native speakers (85 percent). Like Coppieters' study, this study suggests that even very advanced learners lack some of the linguistic abilities of native speakers.

The experimental studies that have investigated the effects of age on the acquisition of native-speaker levels of proficiency have produced mixed results and, at this stage, the verdict must remain an open one. It is possible that under ideal circumstances learners who start after puberty can learn to produce speech and writing that cannot easily be distinguished from that of native speakers. Whether qualitative differences in competence still remain, as claimed by Coppieters, is still not clear, although Birdsong's carefully designed study would suggest that at least some learners achieve native-speaker levels of grammatical knowledge. Also, as Thompson's (1991) study shows, starting early is no guarantee that native-speaker abilities will be achieved, even in the most favorable learning situations.

6. Conclusion

The research that has addressed the *age* issue is quite enormous. Not surprisingly, commentators have arrived at different conclusions, but despite this some consensus is emerging.

- 1) Adult learners have an initial advantage where rate of learning is concerned, particularly in grammar. They will eventually be overtaken by child learners who receive enough exposure to the L2. This is less likely to happen in instructional than in naturalistic settings because the critical amount of exposure is usually not available in the former.
- 2) Only child learners are capable of acquiring a native accent in informal learning contexts. Long (1990a) puts the critical age at 6 years, but Scovel argues that there is no evidence to support this and argues for a pre-puberty start. Singleton (1989) points out that children will only acquire a native accent if they receive massive exposure to the second language. However, some children who receive this exposure still do not achieve a native-like accent, possibly because they strive to maintain active use of their first language. Adult learners may be able to acquire a native accent with the assistance of instruction, but further research is needed to substantiate this claim.
- 3) Children may be more likely to acquire a native grammatical competence. The critical period for grammar may be later than for pronunciation (around 15 years). Some adult learners, however, may succeed in acquiring native levels of grammatical accuracy in speech and writing and even full '*linguistic competence*'.
- 4) Irrespective of whether native-speaker proficiency is achieved, children are more likely to reach higher levels of attainment in both pronunciation and grammar than adults.
- 5) The process of acquiring a second language grammar is not substantially affected by *age*, but that of acquiring pronunciation may be.

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