The Critical Period Hypothesis for Language Acquisition: A Look at the Controversy*

Patricia Andrew
FES-Acatlán

The age factor in second language acquisition (SLA) has long been a controversial topic among researchers and one that has been surrounded by popular beliefs as well. Many of these beliefs have been called into question in recent years and the search for answers has generated a large body of research on the subject. This paper explores the issue of age in SLA, focusing specifically on the debate surrounding the Critical Period Hypothesis (CPH). After a brief discussion of the CPH andfirst language acquisition, a more extensive examination of the different positions on the CPH and SLA is made. Finally, consideration is given to alternative explanations of age effects in SLA. While no irrefutable conclusions can be offered, it is clear that the ramifications for second-language teachers, educational planners and second language theorists are great enough to warrant a careful reappraisal of the CPH.

Palabras clave: *hipótesis del periodo crítico, edad, adquisición de lenguas*
Fecha de recepción del artículo: abril de 2004

Patricia Andrew
FES-Acatlán
Ahuehuetes 42,
Izcalli del Bosque,
Naucalpan, 53278, Estado de México.
Correo electrónico: pjean@servidor.unam.mx

* A briefer version of this paper was presented at the XVIII FEULE (Foro de Especialistas Universitarios en Lenguas Extranjeras) convention in Tijuana, B.C., in March 2004, and a summary will appear in the published proceedings of that event.

El factor edad en la adquisición de una segunda lengua ha sido un tema controvertido entre investigadores, y uno también rodeado de creencias populares. Se han cuestionado muchas de estas creencias en los últimos años, y la búsqueda de respuestas ha generado una cantidad importante de investigaciones. En este trabajo se explora la cuestión de la edad en la adquisición de una segunda lengua, enfocándose específicamente al debate alrededor de la "hipótesis del periodo crítico". Después de una discusión breve de la hipótesis y la adquisición de la lengua materna, se examinan con más detalle las diferentes posturas con respecto a la hipótesis y ala adquisición de una segunda lengua. Finalmente, se consideran explicaciones alternas de los efectos de la edad en la adquisición de una segunda lengua. Aunque no se pueden llegar a conclusiones irrefutables, las ramificaciones para maestros, diseñadores de programas y teóricos de lenguas extranjeras, son suficientemente grandes como para reflexionar sobre una revaloración de esta hipótesis.

Any discussion of the age factor in second language acquisition must necessarily give major consideration to the Critical Period Hypothesis (CPH). This is the most clearly articulated theory concerning age constraints on first language acquisition, and reflection on its applicability by extension to SLA logically precedes the exploration of alternate explanations of the relationship of age to the acquisition process. Questions of whether we are neurologically programmed for language acquisition at a defined period of time during our childhood, whether it is possible to acquire a second language after this critical period has ended, what kinds of limitations might be entailed, and what the ramifications are for teaching and learning languages, comprise some of the issues of crucial importance in understanding the role that age plays in SLA.

The controversy surrounding this theory has been an animated one among SLA researchers in the 35 years since Lenneberg (1967) posited the existence of a critical period for language acquisition.[1] According to the CPH, children have a special capacity for language development that is supported by an innate language learning mechanism. The critical period ends around puberty, after which time the innate mechanism is no longer available and language development is virtually halted. This phenomenon is ascribed to the loss of neural plasticity of the brain and the establishment of hemispheric lateralization (White and Genesee 1996, Bongaerts *et al.* 1997). At this point, "the ability for self-organization and adjustment to the physiological demands of verbal behavior quickly declines" (Lenneberg 1967: 158). Central to Lenneberg's notion of an "age-limited potential for language acquisition" are its biological bases, alluded to in the title to his book, namely, aspects of the child's neural structure involved in a fundamental way in the development of language. These are the key elements of the hypothesis as set forth by Lenneberg.

1. The Critical Period Hypothesis and First Language Acquisition

Evidence for the existence of a critical period begins with the commonplace observation that all normal children become fully competent in their first language, following a similar timetable through analogous developmental stages (Long 1990). Comparable critical periods are characteristic of different kinds of behavioral development in nonhuman species as well.

Studies of language recovery in adults and children who have suffered brain lesions indicate that children are clearly advantaged over adults. As Lenneberg points out:

> The most revealing evidence for an age limitation of language acquisition is provided by adventitious language disorders. The chances for recovery from acquired aphasia are very different for children than for adult patients,

[1] According to White and Genesee (1996), the hypothesis was first proposed by Penfield and Roberts (1959). It was then developed more fully by Lenneberg (1967).

> the prognosis being directly related to the age at which insult to the brain is incurred. (1967: 142)

In addition, research into delayed first language acquisition has tended to give substantial support to the concept of a critical period, in the sense that the linguistic competence ultimately attained by the subjects under study has proved to be deficient. Studies of feral children such as the wild boy of Aveyron (Lane 1977, Shattuck 1980), and others deprived of language input in early childhood as a result of abuse or neglect, have offered valuable examples of the defective language that results. Victor, the wild child, neither spoke nor understood spoken language despite years of attempts to promote his language development. He learned to communicate using written signs and gestures (Shattuck 1980).

Two renowned instances of language deprivation are the cases of Genie (Curtiss 1977,1982) and Chelsea (Curtiss 1988). Genie, a victim of gross parental abuse, received no language input between the age of 20 months and nearly 14 years old. Her subsequent language development was characterized by its disparate and abnormal nature, some progress being evident in certain areas, notably in the acquisition of lexical elements and less in morphosyntax, but not so in others, such as speech production. A large chasm separated her comprehension and production skills (Curtiss 1977). Chelsea, a congenitally deaf child of hearing parents who was misdiagnosed as retarded as a small child, only began to receive linguistic input at the age of 31. Her language ability never reached a level of complexity comparable to that of Genie, remaining limited to "utterances [that] appeared to have no structure at all" (Eubank and Gregg 1999: 74). Nevertheless, it is important to point out that cases such as these often involve extraneous factors that make their interpretation difficult (Harley and Wang 1997).

Another source of information has come from studies of congenitally deaf subjects whose first contact with American Sign Language (ASL), a fully functional language, occurred at different ages *(ibid.)*. Language development of Down's syndrome children has also proven a useful way to look at the issue of delay in first language acquisition. Studies of these children shows that their language learning closely follows the normal pattern of development, but at a slower rate, and that progress comes to a stop at puberty (Lenneberg 1967). However, possibilities for carrying out this type of empirical work more extensively have necessarily been limited by ethical considerations and by the fact that incidences of delayed first language acquisition are relatively rare (Harley and Wang 1997, Eubank and Gregg 1999).

While the neurobiological basis of first language acquisition is largely accepted, the CPH as originally set forth has come under closer scrutiny as more is known about the structure and working of the brain. The ensuing debate on issues such as the age at which the critical period begins and ends, or when hemispheric lateralization occurs and whether this is significant, has given rise to alternate versions of the CPH. Some researchers suggest that, given the complex nature of language, "one cannot exclude the

possibility that there may be multiple critical periods for linguistic competence, perhaps with different timings, or that some components (modules) of linguistic competence may be subject to critical periods whereas others are not" (Eubank and Gregg 1999: 74).

Furthermore, in view of research findings with delayed first language learners, the strong version of the CPH, which holds that no learning "would be possible if a child was not exposed to language before a certain age, usually given as puberty," has tended to give way to a weak version in which "some learning would be possible beginning after that age, but that native-like abilities would be unattainable, and that the course of development would become more irregular and would fall further short of native levels the later the age of onset" (Long 1990: 256-257).

The acceptance of the CPH for first language acquisition, in either its strong or weak form, of necessity precedes any discussion of the more contentious issue of a neurobiologically based critical period for second language acquisition, for it is unlikely that the latter could exist if the former did not. Bialystok gives a lucid explanation:

> The possibility that there is a sensitive period for second language acquisition is logically contingent upon the parallel claim regarding first language acquisition. If there is a sensitive period for first language acquisition, there may or may not be a similar constraint upon second language acquisition [...] Conversely, if there is no sensitive period for first language acquisition, then the question does not even arise for second language acquisition. It is implausible that a first language could be learnt at any time in life if a second language were confined to a specified period in childhood. However, if there is a sensitive period for second language acquisition, then there *must* be a similar constraint on first language acquisition. (1997: 118)

The foregoing considerations provide the necessary contextualization for looking at the CPH as applied to SLA, a task of more immediate concern in this paper.

2. The Critical Period Hypothesis and Second Language Acquisition

Whereas first language acquisition normally leads to full proficiency, second language acquisition rarely does, and instead is characterized by a broad variation in outcomes (Larsen-Freeman and Long 1991, Ellis 1994, Towell and Hawkins 1994). Larsen-Freeman and Long neatly summarize the problem:

> One of the major conundrums in the SLA field is the question of differential success. While it is surely the case that some people are more dexterous than others in using their mother tongue, all children with normal faculties and given normal circumstances master their mother tongue. Unfortunately, language mastery is not often the outcome of SLA. (1991: 153)

Divergent views regarding the potential of the CPH to explain this latter phenomenon have positioned SLA researchers at a number of different points along a *continuum.* There is little consensus among them, their work addressing a wide gamut of concerns about very particular aspects of language proficiency. This situation complicates a straightforward treatment of the CPH since there is only a minor area of overlap in their studies. Consequently, the present discussion will proceed along very general lines, with an attempt to tie in the various contributions where they seem pertinent.

Two broad claims about SLA furnish a point of departure.

- Second language learners rarely attain overall native-like language proficiency.
- Younger second language learners are generally more successful than older ones.

On the whole, both these beliefs have a certain limited acceptance. Points of divergence derive primarily from considerations of what role the CPH plays, and whether it can be applied to all aspects of language proficiency and in all SLA contexts.

The fundamental questions to be addressed, then, are:

- Can the CPH account for the typically unsuccessful results of most second language learners in achieving full mastery of the language?
- Does the CPH explain the better long-term achievement of younger learners in a second language with respect to that of older learners?

A negative answer to either of the foregoing leads to the following question:

- What alternate theories are offered to account for these phenomena?

An affirmative response, albeit a qualified one, generates further questions, such as:

- How does the CPH explain the variability in SLA outcomes?
- To what extent can the CPH provide the sole explanation for this?
- Do distinct critical periods exist for different aspects of the language acquisition process?
- What other factors interact with the neurobiological ones in SLA, and to what extent?

These questions, in turn, will produce additional ones.

3. The Viewpoints

The strong version of the CPH, that language acquisition can take place exclusively during the period of human development from infancy through puberty, maintains that once this period has ended, it is no longer possible, or exceptionally difficult, to learn a language. With regard to SLA, there is less support now for this extreme position, namely, that there exists an abrupt moment which ends any further language development. Were this true, post-critical period learners should not be able to learn a second language, patently not the case. Instead, supporters of a strong version of the CPH hold that after the close of the critical period, as a consequence of the loss of neural plasticity in the brain and because the biologically endowed faculty for language is no longer available, second languages are learned only with great difficulty (Lenneberg 1967, Birdsong 1999). They point to findings that demonstrate a general tendency for younger learners to do better than older learners in SLA, claiming that these results are attributable precisely to the accessibility of the innate language learning mechanism to young learners but not to older ones (Oyama 1976,1978,Patkowski 1980, Johnson and Newport 1989, Long 1990).

However, a number of research studies have reported findings at variance with these in specific language domains, thereby casting doubt on the soundness of the strong version of the CPH (Ioup *et al.* 1994, Bialystok 1997, Birdsong 1999). For example, Bongaerts (1999) found incidences of older Dutch speakers who had attained native-like accents in English and in French. In view of this growing body of counter-evidence and as a consequence of an increasing awareness of the inherent complexity of the SLA process and the impossibility of tracing the variation in outcomes to a single origin, a weak version of the CPH now has considerable credence among SLA researchers. In this version of the hypothesis, the term *sensitive period* is often used in preference to the more rigidly deterministic *critical period* (Harley and Wang 1997, Birdsong 1999), denoting an optimal interval of time in which circumstances are favorable for developing a particular type of behavior, and after which efficiency gradually declines.

While few researchers completely reject any biological basis of observed age-related differences in SLA outcomes, there are some who would agree with Bialystok that the causal nature of the assertion that "mastery of a second language is determined wholly, or even primarily, by maturational factors" has not been adequately established (1997: 116). To make such a claim, according to Bialystok, evidence must be provided of "a consensus of empirical support in which second language proficiency levels are unambiguously linked to the age at which learning began, and the acquisition age leading to a decline in attained proficiency is consistent across studies" *(ibid.:* 118). Her standpoint, in essence, is that the burden of proof is on those affirming the validity of the CPH, and not the other way around.

3.1 The Evidence

Age-related effects on SLA are generally studied in terms of either the rate of acquisition or ultimate attainment, a distinction with critical implications for interpretation. In the first case, the underlying assumption is that a faster rate of acquisition demonstrates a greater facility for learning languages. In the second, the supposition is that a higher degree of achievement in the final outcome corresponds to a greater fulfillment of the potential for language learning. Both types of focus have been used to look at age of onset (AO)[2] or, less frequently, length of residence (LOR), as they relate to some measure of language proficiency. Interestingly, rate-of-acquisition studies, most of which were carried out in the 1970's and 1980's, found that older learners performed better than younger ones on measures of morphology, syntax and pronunciation (Long 1990). Long discusses this research in his survey of second language investigation on age, and concludes that the initial advantage for adults is a transitory one *(ibid.)*. The consensus is that, in the long run, children outperform adults (Singleton 1989, Long 1990, Singleton and Lengyel 1995). Only one major study of the rate of acquisition (Slavoff and Johnson 1995) has been reported recently in the literature, perhaps because "rate differences are not central to arguments for the critical period hypothesis" (Marinova-Todd, Marshall, and Snow 2001:171).

Ultimate attainment studies are considered more important in investigating maturational constraints on second language development because of their long-term nature (Long 1990). Most of the earlier studies concluded that ultimate attainment declines as AO increases. These findings are interpreted as corroborating the strong version of the CPH. The most frequently cited are those of Oyama (1976, 1978), Patkowski (1980), and Johnson and Newport (1989). Oyama studied Italian immigrants in New York whose AO ranged from 6 to 20. She reported a clear advantage for the younger immigrants over the older ones on degree of foreign accent (1976) and on listening comprehension (1978). Subjects who began learning English before early adolescence performed like native speakers, whereas those who began in late adolescence demonstrated deficiencies in the two aspects of language proficiency under study. In both cases, LOR was determined to have had no significant effect on the outcomes. Similarly, Patkowski (1980) found AO to be a strong predictor of syntactic proficiency in the group of immigrants he studied. Those whose initial exposure to English occurred before the age of 15 were significantly better than those who came into contact with the language after 15. In another major study, Johnson and Newport (1989) used grammatical judgment tests of English morphology and syntax to evaluate Chinese and Korean speakers who had arrived in the US between the ages of 3 and 39, finding a relationship between higher test performance and an AO before puberty. In analyzing their data, Johnson and Newport

[2] The terms *age on arrival* (AA or AOA), *age of immersion, age of exposure* and *age of initial acquisition* have also been employed to refer to the moment when contact with the L2 begins. For the sake of consistency, *age of onset* (AO) will be used in the present article.

considered two hypotheses, the *exercise hypothesis* and the *maturational state hypothesis.* The *exercise hypothesis* contends that if a capacity is not exercised, it will be lost over time. The *maturational state hypothesis* maintains that human beings have a greater capacity for language acquisition when they are young, and that it declines with age. Johnson and Newport interpret their findings as supporting the latter hypothesis.

Some recent investigation has attempted to disprove the broader claims of these earlier studies, by focusing on cases of highly successful older learners, adults who have achieved near-native proficiency in one or more language domains, despite a later AO. In the introduction to his book on SLA and the CPH, Birdsong (1999) describes his own research, in which he found subjects who performed at the same level as native-speakers of French. Similar findings by White and Genesee (1996) showed no significant difference between near-native speakers and native speakers of English in performance on grammatical judgment and written production tasks. The cases of two women who achieved a native-like level of proficiency in Egyptian Arabic are documented by Ioup et al. (1994). These studies have primarily explored the grammatical features of language. The most recent studies on age have looked at English as a third language in bilingual communities in the Basque Country and in Catalonia, and have found that older learners have an advantage over younger ones in formal instruction contexts, even for pronunciation skills (García Mayo and García Lecumberri 2003).

The question of phonetics and phonology is perhaps even more important to the discussion of adult learner success than morphosyntax, for the reason that pronunciation is generally held to be more susceptible to age constraints than other aspects of language. The widely held view is that late learners will have a more marked foreign accent than their younger counterparts (Lengyel 1995). In separate studies that corroborate this standpoint, both Flege (1999) and Moyer (1999) showed that age correlates negatively with phonological performance. Their research is representative of other studies that have found an age-related decline in ultimate attainment in pronunciation, although not necessarily in other language domains. As Singleton points out, "the earlier an immigrant arrives in the host country and begins to be exposed to its language the more likely he/she is to end up sounding like a native" (1995: 8-9). Nonetheless, some studies, such as those carried out in Spain, have demonstrated that older learners can achieve a native-like accent (Birdsong 1999). In an early study, Neufeld (1978) trained 20 adult English speakers in the pronunciation of a set of utterances in two non-Indo-European languages, without giving them any corresponding syntactic or semantic information. When their taped performance was rated, nine were identified as native speakers and six as near-native speakers. On the basis of these results, Neufeld concluded that adults retain the potential for native-speaker proficiency in pronunciation. In the cases of the two speakers of Egyptian Arabic studied by Ioup *et al.* (1994), both were judged to have accents indistinguishable from those of native speakers. Likewise, Bongaerts reported that some older learners attained native-like pronunciation of French and of English in studies undertaken with Dutch speakers (Bongaerts *et al.* 1997, Bongaerts 1999). The body of

research findings describing instances of exceptional second language learners in the areas of morphosyntax and phonology constitute the principal counter-evidence used to challenge the theory that maturational constraints produce an age-related decline in proficiency.

Nevertheless, it is important to point out that, at present, evidence in support of the CPH is still forthcoming, principally from neuroscience research. Neurobiological findings have, for the most part, remained consistent with the earliest principles of the CPH, yet a great deal more is now known about the brain since the theory was first set forth. A study by Weber-Fox and Neville (1999) used neural imaging techniques to reveal that linguistic processing is subject to maturational constraints, older second language learners exhibiting slower processing than younger ones. In addition, the processing of grammatical aspects of the language was discovered to be quite distinct from that of semantic aspects. This is an example of the vast potential of modem neuroscience to help clarify our understanding of the inner workings of the brain and its central role in SLA.

32 The Interpretation

Interpretation of the evidence concerning age-related effects on SLA has proved as interesting as the outcomes themselves, and has taken more varied paths. As might be expected in the cases where the evidence has been at variance with the notion of a critical period, alternate theories have emerged. On other hand, where the data have been consistent with the CPH, this has traditionally been the preferred reading. However, increasingly, even when a later AO has been found to correlate with declining proficiency, this has not always been interpreted as a confirmation of the CPH, and other explanations have been tendered (Singleton 1995). For example, Moyer (1999) suggests that the CPH alone cannot account for age-related differences found in pronunciation, and that further study of this problem should be expanded to include motivation and other affective factors as well as instructional variables, such as the type and extent of exposure to the L2. By the same token, Flege (1999) does not consider the CPH to be the best explanation for the better pronunciation observed in younger learners. Instead, he claims that "the LI and L2 influence one another, and that this interaction constrains performance accuracy in both languages" (ibid.: 108). Bialystok agrees with this notion in principle, maintaining that LI similarities and differences are more important for second language attainment than AO, in the sense that "the linguistic structure of our first language sets important boundaries around subsequent linguistic structures that we attempt to learn" (1997:130).

Others have addressed the issue from the perspective of the theory of Universal Grammar (UG) (Cook 1995, Martohardjono and Flynn 1995, White and Genesee 1996). The central question is whether the innate domain-specific faculty for language acquisition is still operative in the case of post-puberty SLA and, if so, whether parameters can be reset for the L2. The basic positions on the availability of UG for adult second language learners are generally defined in terms of *full access*, *no access*, and *partial access* (for example, Skehan 1998). This classification has been faulted for being overly simplistic

(Eubank and Gregg 1999) and, furthermore, may not be completely useful because, as Skehan claims, "generally, results fall somewhere between the alternatives" (1998: 78). White offers a description that attempts to capture the distinctions more clearly:

- UG is available and works exactly as it does in LI acquisition.
- UG is totally unavailable in L2 acquisition.
- Access to UG is mediated via the LI. There are actually two different versions of this hypothesis:

  a) UG is inaccessible but any aspects of it available in the LI can be used in the L2.
  b) L2 learners initially assume the LI value of UG parameters, but are still able to tap UG. Hence, they can reset to L2 parameter settings.

- UG is available but does not work in identical fashion to LI acquisition. (1989:48-49)

Those adopting one of the more extreme positions in regard to UG accessibility have proposed alternate explanations of age-related differences. For example, Bley-Vroman (1989) contends that poor achievement in SLA, as compared to first language acquisition, can be explained by the fact that older learners no longer have access to UG, a view largely consistent with the CPH. Instead, these learners must resort to their LI knowledge, as an indirect source of knowledge about UG, as well as to general learning principles. This is known as the *fundamental difference hypothesis* precisely because it illustrates the essential distinction between LI and L2 learning (Eubank 1991, Ioup *et al.* 1994).

The contrary position, that full access to UG is not limited by age, has similarly obliged its supporters to provide an explanation for diminished attainment by older learners. White and Genesee (1996), who found no age-related decline in access to UG and no critical period for L2 competence, acknowledge that younger learners generally outperform older learners, and suggest that other factors are responsible for their findings, such as the subject selection procedures and task types used in the research design. Felix (1985) also maintains that there is full access to UG, but suggests, in his *competition model?* that the general problem-solving system available to post-puberty learners works in competition with UG, resulting in less success in SLA (Long 1990, Harley and Wang 1997, Birdsong 1999). This, he claims, is because "problem-solving is a fundamentally inadequate tool to process structures beyond a certain elementary level" (Felix 1985: 51).

The partial access, or intermediate position, is that UG is available to second language learners through their experience with LI, and the principles are not lost to them; however, the difficulty resides in resetting the L2 parameters (Birdsong 1999).

[3] This is not to be confused with the Competition Model proposed by MacWhinney, which he describes as "a functionalist and connectionist view of both first and second language learning that attributes development to learning and transfer, rather than to the principles and parameters of Universal Grammar" (1997: 114).

As a consequence, older learners rely on the settings for LI (Flynn 1989, White 1989). On the other hand, "UG principles which are not instantiated in the LI remain available to adult L2 learners, strongly suggesting that UG is not affected by a critical period" (Martohardjono and Flynn 1995:140-141).

A different interpretation of the age-related disparity in achievement in SLA is framed in terms of language aptitude components. Based on a study of L2 learners with different AOs, Harley and Hart (1997) found that verbal analytical ability is a predictor of success in adults whereas memory ability is in children. This is consistent with the view of other researchers (Bley-Vroman, Felix and Ioup 1988, Flynn and Manuel 1991) that adults use a different set of cognitive mechanisms in SLA. In a similar vein, DeKeyser (2000) predicted that only those adults with a high level of verbal analytical ability would reach near-native competence, but that this would not be true of children. His findings led him to a "reconceptualization" of the CPH, in which, by limiting its scope to implicit learning mechanisms, there are no exceptions .

Other explanations of the evidence revolve around methodological issues in the research studies themselves. White and Genesee (1996) consider that the subject selection procedures and task types they used in their study influenced the outcome. The artificiality of some types of tasks used to assess performance in other studies is questioned by Slavoff and Johnson (1995). They also point to the fact that age differences in test-taking ability are not controlled for in research studies, and that test training favors older learners. Marinova-Todd et al. criticize much of the existing research on the age factor in SLA because "age differences reflect differences in the situation of learning rather than in capacity to learn" (2000:9). Both Cook (1995) and Harley *et al.* (1995) suggest that current research places undue emphasis on success, or product, rather than on possible differences in language processing mechanisms, thereby omitting an excellent source of valuable information. Finally, among supporters of the concept of a critical period, there is a general lack of agreement concerning the exact age at which it concludes. The commonly held belief among them is that puberty marks the end of the critical period, yet different researchers have set this as young as age 12 (Singleton 1995), around 15 (Patkowski 1980), over 16 (Weber-Fox and Neville 1999), or 16-17 (DeKeyser 2000), perhaps too large an age span to be reliable in comparing the findings of different studies. For those who link this abrupt close of the critical period to cerebral lateralization, the evidence is also inconclusive, for it is now considered to occur much earlier in childhood than previously thought (Martohardjono and Flynn 1995). Furthermore, there seem to be "no known neurological correlates for a sudden decline in language ability at puberty" (Harley and Wang 1997: 23). This has led to some researchers to reject the notion that the critical period ends at puberty and to suggest instead that it is characterized by a gradual decline beginning as early as 6 or 7 for some language domains (Martohardjono and Flynn 1995).

In light of the complexity of the issues and the diversity of research findings, some researchers have adopted the multiple critical period hypothesis proposed by Seliger

(1978) and Long (1990). This theory maintains that there are distinct critical periods for different language domains. Martohardjono and Flynn observe that this hypothesis offers an explanation of "what seemed to be a discrepancy between the upper age limit in the acquisition of phonology on the one hand and that of syntax and the lexicon on the other" (1995: 146). In basic agreement with this view, Eubank and Gregg (1999) suggest that *language* is a cover term, an *epiphenomenon*, for a series of subcomponents, and that there may be one or more critical periods for one or more elements of it.

4. Discussion

It seems clear from the research findings to date concerning the age factor in SLA that a complete acceptance of the CPH is an untenable position. There is simply not enough neurobiological evidence to justify such a stance. Nor has the CPH given a satisfactory explanation of how SLA does, in fact, occur after the critical period has ended. Yet it is plain that younger learners are generally better than older ones in the long run and in virtually all aspects of language performance, which lends some credence to the notion that maturational constraints are operating in some way. On the other hand, a total rejection of the CPH is equally unsustainable since no single factor or set of factors can completely account for these age-related differences in outcomes in non-biological terms. Hyltenstam and Abrahamsson express it this way:

> The consistent pattern observed in a number of studies is that age of onset (AO) is strongly predictive of ultimate L2 attainment, whereas other factors, such as length of contact with the L2 environment, type and amount of input, degree of motivation, and aptitude, cannot account for the variation in outcomes between younger and older learners. (2001: 156)

Moreover, the general lack of success that characterizes SLA cannot be explained convincingly without providing reasons for the evidence of its unmistakable association with age. No such explanation has been forthcoming. It would appear, then, that the ramifications of the CPH for SLA are too complex to admit either such unembellished point of view.

Most recent research findings support a weak version of the CPH, a midway position in which age and biological factors seem to have some degree of relationship to SLA, but not necessarily a causal one. In other words, a neurobiological program for human development is thought to exist, consisting of different stages that facilitate or constrain, but do not predetermine, the outcome of SLA. Ample evidence of this has been given in the studies of exceptionally successful older learners. Yet the exact nature of the neurobiological component of the brain and how it exerts influence on human learning at different ages is far from being understood. Nevertheless, the common viewpoint of SLA researchers advocating a weak version of the CPH is that the biological age factor

operates in an attenuated way in conjunction with other factors, both internal and external to the learner. Language aptitude, motivation, the relationship of the learner's LI to the L2, and socio-psychological factors are among some that are considered in the studies described here, and have been seen to play a role in SLA. More than age, they are believed to be responsible for the variability in learner outcomes. However, not enough evidence exists at present to determine which of them are the crucial factors and what their relative importance is. These issues will undoubtedly continue to occupy the agendas of second language researchers for some time and will generate more refined versions of the CPH.

References

BIALYSTOK, E. (1997) "The Structure of Age: In Search of Barriers to Second Language Acquisition". In *Second Language Research* 13 (2): 116-137.

BIRDSONG, D. (ed.) (1999) ***S**econd Language Acquisition and the Critical Period Hypothesis.* Mahwah, NJ: Lawrence Erlbaum.

BLEY-VROMAN, R. (1989) "What Is the Logical Problem of Foreign Language Learning?" In S. M. Gass and J. Schacter (eds.) *Linguistic Perspectives on Second Language Acquisition.* Cambridge: Cambridge University Press, 41-68.

_____, FELIX, S. W. and IOUP, G. (1988) "The Accessibility of Universal Grammar in Adult Language Learning". In *Second Language Research* 4: 1-32.

BONGAERTS, T. (1999) "Ultimate Attainment in L2 Pronunciation: The Case of Very Advanced Late L2 Learners". In D. Birdsong (ed.) *Second Language Acquisition and the Critical Period Hypothesis.* Mahwah, NJ: Lawrence Erlbaum, 133-159.

_____, VAN SUMMEREN, C., PLANKEN, B. and SCHILS, E. (1997) "Age and Ultimate Attainment in Pronunciation of a Foreign Language". In *Studies in Second Language Acquisition* 19 (4): 447-466.

COOK, V. (1995) "Multi-competence and Effects of Age". In D. Singleton (ed.) *The Age Factor in Second Language Acquisition.* Clevedon: Multilingual Matters, 51-66.

CURTISS, S. (1977) *Genie: A Psycholinguistic Study of a Modern-Day 'Wild Child*\ London: Academic Press.

_____ (1982) "Developmental Dissociations of Language and Cognition". In L. K. Obler and L. Menn (eds.) *Exceptional Language and Linguistics.* New York: Academic Press, 285-312.

_____ (1988) "The Special Talent of Grammar Acquisition". In L. K. Obler and D. Fein (eds.) *The Exceptional Brain: Neuropsychology of Talent and Special Abilities.* New York: Guilford Press, 364-386.

DEKEYSER, R. M. (2000) "The Robustness of Critical Effects in Second Language Acquisition". In *Studies in Second Language Acquisition* 22 (4): 499-533.

ELLIS, R. (1994) *The Study of Second Language Acquisition.* Oxford: Oxford University Press.

EUBANK, L. (1991) *Point Counterpoint: Universal Grammar in the Second Language.* Amsterdam: John Benjamins.

_____ and GREGG, K. R. (1999) "Critical Periods and (Second) Language Acquisition: Divide et Impera". In D. Birdsong (ed.) *Second Language Acquisition and the Critical Period Hypothesis.* Mahwah, NJ: Lawrence Erlbaum, 65-99.

FELIX, S. W. (1985) "More Evidence on Competing Cognitive Systems". In *Second Language Research* 1 (1): 47-72.

FLEGE, J. E. (1999) "Age of Learning and Second Language Speech". In D. Birdsong (ed.) *Second Language Acquisition and the Critical Period Hypothesis.* Mahwah, NJ: Lawrence Erlbaum, 101-131.

FLYNN, S. (1989) "The Role of the Head-Initial/Head-Final Parameter in the Acquisition of English Relative Clauses by Adult Spanish and Japanese Speakers". In S. M. Gass and J. Schacter (eds.) *Linguistic Perspectives on Second Language Acquisition.* Cambridge: Cambridge University Press, 89-108.

_____ and MANUEL, S. (1991) "Age-Dependent Effects in Language Acquisition: An Evaluation of 'Critical Period' Hypotheses". In L. Eubank (ed.) *Point Counterpoint: Universal Grammar in the Second Language.* Amsterdam: John Benjamins, 117-145.

GARCIA MAYO, M. D. P. and GARCÍA LECUMBERRI, M. L. (eds.) (2003) *Age and the Acquisition of English as a Foreign Language.* Clevedon: Multilingual Matters.

HARLEY, B. and HART, D. (1997) "Language Aptitude and Second Language Proficiency in Classroom Learners of Different Starting Ages". In *Studies in Second Language Acquisition* 19 (3): 379-400.

_____ , HOWARD, J. and HART, D. (1995) "Second Language Processing at Different Ages: Do Younger Learners Pay More Attention to Prosodic Cues to Sentence Structure?" In *Language Learning* 45 (1): 43-71.

_____ and WANG, W. (1997) "The Critical Period Hypothesis: Where Are We Now?" In A. M. B. de Groot and J. F. Kroll (eds.) *Tutorials in Bilingualism.* Hillsdale, NJ: Lawrence Erlbaum, 19-51.

HYLTENSTAM, K. and ABRAHAMSSON, N. (2001) "Comments on Stefka H. Marinova-Todd, D. Bradford Marshall, and Catherine E. Snow's 'Three Misconceptions about Age and L2 Learning': Age and L2 Learning: The Hazards of Matching Practical 'Implications' with Theoretical 'Facts'". In *TESOL Quarterly* 35 (1): 151-170.

IOUP, G., BOUSTAGUI, E., EL TIGI, M. and MOSELLE, M. (1994) "Reexamining the Critical Period Hypothesis: A Case Study of Successful Adult SLA in a Naturalistic Environment". In *Studies in Second Language Acquisition* 16 (1): 73-96.

JOHNSON, J. S. and NEWPORT, E. L. (1989) "Critical Period Effects in Second Language Learning: The Influence of Maturational State on the Acquisition of English as a Second Language". In *Cognitive Psychology* 21: 60-99.

LANE, H. (1977) *The Wild Boy of Aveyron.* London: George Allen and Unwin.

LARSEN-FREEMAN, D. and LONG, M. H. (1991) An Introduction to Second Language Acquisition Research. London: Longman.

LENGYEL, Z. (1995) "Some Critical Remarks on the Phonological Component". In D. Singleton and Z. Lengyel (eds.) *The Age Factor in Second Language Acquisition.* Clevedon: Multilingual Matters, 124-134.

LENNEBERG, E. H. (1967) Biological Foundations of Language. New York: John Wiley and Sons.

LONG, M. H. (1990) "Maturational Constraints on Language Development". In *Studies in Second Language Acquisition* 12: 251-285.

MACWHINNEY, B. (1997) "Second Language Acquisition and the Competition Model". In A. M. B. de Groot and J. F. Kroll (eds.) *Tutorials in Bilingualism.* Hillsdale, NJ: Lawrence Erlbaum, 113-142.

MARINOVA-TODD, S. H., MARSHALL, D. B. and SNOW, C. E. (2000) "Three Misconceptions about Age and L2 Learning". In *TESOL Quarterly* 34 (1): 9-34.

_____ , MARSHALL, D. B. and SNOW, C. E. (2001) "Missing the Point: A Response to Hyltenstam and Abrahamsson". In *TESOL Quarterly* 35 (1): 171.

MARTOHARDJONO, G. and FLYNN, S. (1995) "Is There an Age-Factor for Universal Grammar?" In D. Singleton and Z. Lengyel (eds.) *The Age Factor in Second Language Acquisition.* Clevedon: Multilingual Matters, 135-153.

MOYER, A. (1999) "Ultimate Attainment in L2 Phonology: The Critical Factors of Age, Motivation, and Instruction". In *Studies in Second Language Acquisition* 21 (1): 81-108.

NEUFELD, G. (1978) "Language Learning Ability in Adults: A Study on the Acquisition of Prosodic and Articulatory Features". In *Working Papers on Bilingualism* 12: 45-60.

OYAMA, S. (1976) "A Sensitive Period for the Acquisition a Nonnative Phonological System". In *Journal of Psycholinguistic Research* 5 (3): 261-285.

_____ (1978) "The Sensitive Period and Comprehension of Speech". In *Working Papers on Bilingualism* 16: 1-12.

PATKOWSKI, M. (1980) "The Sensitive Period for the Acquisition of Syntax in aSecond Language". In *Language Learning* 30 (2): 449-472.

PENFIELD, W. and ROBERTS, L. (1959) *Speech and Brain-Mechanisms.* Princeton, NJ: Princeton University Press.

SELIGER, H. W. (1978) "Implications of a Multiple Critical Periods Hypothesis for Second Language Learning". In W. C. Ritchie (ed.) *Second Language Acquisition Research: Issues and Implications.* New York: Academic Press, 11-19.

SHATTUCK, R. (1980) *The Forbidden Experiment: The Story of the Wild Boy of Aveyron.* London: Seeker and Warburg.

SINGLETON, D. (1989) *Language Acquisition: The Age Factor.* Clevedon: Multilingual Matters.

_____ (1995) "Introduction: A Critical Look at the Critical Period Hypothesis in Second Language Acquisition Research". In D. Singleton and Z. Lengyel (eds.) *The Age Factor in Second Language Acquisition.* Clevedon: Multilingual Matters, 1-29.

_____ and LENGYEL, Z. (eds.) (1995) ***T****he Age Factor in Second Language Acquisition.* Clevedon: Multilingual Matters.

SKEHAN, P. (1998) *A Cognitive Approach to Language Learning.* Oxford: Oxford University Press.

SLAVOFF, G. R. and JOHNSON, J. S. (1995) "The Effects of Age on the Rate of Learning a Second Language". In *Studies in Second Language Acquisition* 17 (1): 1-16.

TO WELL, R. and HAWKINS, R. (1994) *Approaches to Second Language Acquisition.* Clevedon: Multilingual Matters.

WEBER-FOX, C. M. and NEVILLE, H. J. (1999) "Functional Neural Subsystems Are Differentially Affected by Delays in Second Language Immersion: ERP and Behavioral Evidence in Bilinguals". In D. Birdsong (ed.) *Second Language Acquisition and the Critical Period Hypothesis.* Mahwah, NJ: Lawrence Erlbaum, 23-38.

WHITE, L. (1989) *Universal Grammar and Second Language Acquisition.* Amsterdam: John Benjamins.

_____ and GENESEE, F. (1996) "How Native is Near-Native? The Issue of Ultimate Attainment in Adult Second Language Acquisition". In *Second Language Research* 12 (3): 233-265.