

## The effect of age in L2 ultimate attainment: Revisiting the evidence

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**ABSTRACT** Learning another language is challenging, and apparently even more so in adulthood. The assumption of a critical period for *second language acquisition* (SLA) based on brain maturational constraints has persisted for a very long time. This view has been challenged though, and proponents of critical periods or sensitive periods are these days most often in favor of a *plurality* thereof in the context of SLA. This means there are multiple periods rather than only one depending on the different skills (e.g., pronunciation and morphosyntax), and the ability to develop these is often assumed to be multiply determined. Drawing on previous research on the effect of age and the *nerve growth factor*, the view that “the sooner, the better” holds true in any case regarding the successful sequential attainment of another language (LX) will be challenged: neuronal plasticity is certainly ongoing at an advanced age, which means that the ability to learn another language does not end, and factors other than age might be more important regarding cortical representation. Furthermore, three premises for study designs on the age factor in SLA will be proposed, thereby stressing the need for a change of paradigm towards a holistic approach to LX users and the necessity to understand the process of LX attainment as a dynamic one. Finally, this chapter highlights the importance of emotions in (un)successful LX acquisition, which is linked to the need for a shift towards a focus on individual differences instead of universals when grappling with the complexity underlying *ultimate attainment* in an LX. All in all, it is suggested that the view on the *age of onset of acquisition* (AoA) influenc-

ing proficiency in a uniform manner might have been too simplistic as the processes underlying SLA are multifaceted and entangled.

**KEYWORDS** age of onset of acquisition, critical periods in SLA, individual differences, multi-competence, neuronal plasticity

## 1 **AGE-RELATED DIFFERENCES IN THE ATTAINMENT OF AN LX: AN INTRODUCTION**

In the context of SLA (*second language acquisition*), the relationship between *age of onset of acquisition* (AoA) and success in learning or acquiring another language has been of interest for a long time and links between the two cannot be denied (Muñoz & Singleton, 2011). However, researchers' opinions diverge regarding the nature of these links, and consequently, numerous theories with varying points of view have been developed, of which the most prominent will be dealt with and critically analyzed in this chapter.

In the past, the assumption of “the sooner, the better” regarding successful *LX attainment* (LX referring to any language acquired after one's first, see Dewaele, 2017) was mostly based on the notion that the brain of early birds differs substantially from those of late birds, making it easier for the former to catch the worm. Thus, early research on the age effect in SLA often explained differences in children's and adults' acquisition processes and attainable proficiency level in terms of biological and neurological differences, which supposedly prevent adults from attaining another language at similar levels as early acquirers. Even though there are “interesting parallels between young and older learners in the initial and intermediate stages” (Peltzer-Karpf, 2003, p. 389), children tend to outperform adults in the long run, whereas the latter tend to start off faster (Muñoz, 2006; Peltzer-Karpf, 2003). This is partly due to increased meta-linguistic awareness and advanced cognitive development in general. Despite both, adults and children, going through similar acquisition processes including comparable *interim solutions*, which means committing similar mistakes (see, e.g., Ortega, 2009; Peltzer-Karpf, 2003), the above-mentioned led to the common assumption that successful LX

attainment is a strictly age-bound event, and various approaches to *critical period hypotheses* (CPH) for SLA were proposed (see, e.g., Lenneberg, 1967; Long, 1990). The trigger for classic treatments of a CPH was Penfield's and Roberts' (1959) assumption of an early AoA being advantageous for successful LX attainment, which will be analyzed in more detail and critically examined in the following section.

In this chapter, I will propose that the view on the AoA influencing proficiency in a uniform manner might have been too simplistic and that the processes underlying SLA are much more complex than previously thought (see also Moyer, 2014), which could to some extent also explain the divergent research findings. In other words, a number of variables have an impact on the success in learning or acquiring another language, such as experience and type of input, amount of exposure and psychological factors, such as motivation. Even though previous research has shown that age is an influential variable in these processes (see also Kong-Insam in this volume), it is certainly not the only variable playing a role and not necessarily the most decisive (see also Muñoz & Singleton, 2011). Thus, the following is an attempt to review research on the age factor and underlying assumptions critically and, in doing so, evaluate if an earlier start is beneficial in any case.

## 2 **BIOLOGICAL AND NEUROLOGICAL APPROACHES TO A CRITICAL PERIOD FOR SLA**

For a long time, researchers have tried to understand the reasons underlying the ease and rapidity with which children acquire multiple languages. This “wonder at the child’s amazing ability to acquire language” (Cook, 1995, p. 52) compared to adults’ seemingly often having difficulty with it raised the question of whether it is at all possible to become a proficient user of an additional language when attaining it relatively late in life. “[S]tudies of the brain suggest that the timing of second language experience plays an important role” (Kuhl et al., 2016, p. 7) indeed, which led to a widely-known assumption in SLA research, namely that of a CPH.

The term *critical period* (CP) is commonly used in biology in connection with an organism's learning abilities. Thirty-five years ago, Colombo (1982, p. 261) defined it as "a time during the life span of an organism in which the organism may be affected by some exogenous influence to an extent beyond that observed at other times". This means that during a particular time in life (referred to as a critical period) an organism is most sensitive to stimuli relevant for developing a specific ability, such as attaining another language (see also Lenneberg, 1967). In case the respective stimuli are absent during the CP, the ability may either not develop fully or even not develop at all. Most importantly, sensitivity to respective stimuli will decline in a non-linear way after the critical period, a point referred to as *terminus*. Thus, all critical periods involved in the development of an organism share specific geometric features. With regard to a CP in SLA, showing the presence of an offset and flattening is crucial. Additionally, it has to be proven that the terminus itself marks the end of a correlation between age and the respective ability if there was a CPH for SLA (Van Boxtel, 2005). Bongaerts (2005) summarizes the main idea underlying all critical period hypotheses for SLA having been proposed so far. Following Birdsong (1999, 2004), researchers in favor of a CPH of some sort all claim that "age effects operate within a circumscribed period of time, bounded by an onset which marks the beginning and a terminus which marks the end of a period of heightened sensitivity to ambient language input" (Bongaerts, 2005, p. 259). Hence, those theories share the common assumption that in a certain period of life, a language may be acquired with ease whereas after the end of the so-called CP it is no longer possible to become equally proficient in all language skills.

As already mentioned, there is no agreement regarding this assumption, and the proposed offset points, especially, show great variation (Muñoz & Singleton, 2011). In 1959, the neuroscientists Penfield and Roberts suggested that a child is able to acquire multiple languages with ease until the age of nine and that children are, in general, more successful in learning an L2 (*second language*) than adults due to brain maturational constraints experienced in adulthood. Lenneberg (1967), following the two neuroscientists' ideas, also based his well-known CPH on biological factors. According to him, the critical period for SLA is marked by an AoA of two years and by the offset of the time by which brain lat-

eralization is completed. As soon as each of the two hemispheres have developed their specific functions, which coincides with puberty, an L2 cannot be attained as easily, successfully or efficiently anymore due to the rapid increase of “language-learning-blocks”, and foreign languages “have to be taught and learned through a conscious and laboured effort” (Lenneberg, 1967, p. 176). Thus, according to Lenneberg, the offset corresponds to puberty. Also, he stresses that exposure to a language is usually no longer purely naturalistic in these cases, and states furthermore that pronunciation seems to pose a major challenge to anyone starting to learn their L2 after the first decade (see also Kong-Insam in this volume).

Subsequently, Lenneberg’s (1967) assumptions were discredited and from then on, researchers have tried to test his hypothesis and have modified and developed it further based on their own findings. Long (1990), for instance, summarized research into these matters from Penfield and Roberts up until 1990 and concluded the following:

The ability to attain native-like phonological abilities in a SL begins to decline by age 6 in many individuals and to be beyond anyone beginning later than age 12, no matter how motivated they might be or how much opportunity they might have. Native-like morphology and syntax only seem to be possible for those beginning before age 15 (Long, 1990, p. 280, cited in Bongaerts, 2005, p. 259).

As can be derived from the citation above, Long (1990) differentiates between specific language skills and, therefore, different ages of offset are accredited to their attainment. Interestingly, it becomes clear that also from Long’s point of view, pronunciation seems to have a special status when learning another language and is probably the most difficult language skill to be acquired later in life.

These are only two of the many approaches to the topic that have been developed so far, and Singleton and Ryan (2004) are therefore certainly right when highlighting that it is important to avoid speaking of *the* CPH for SLA given the high number of different attempts to study this issue. Not only do these approaches vary concerning the age of offset, but there is also disagreement about the causes as well as the affected learning capacities (Bongaerts, 2005). Clearly, the view of a general “window of opportunity” (Kuhl, 2011, p. 33) of full LX glory has been

challenged and proponents of CPHs (for a summary, see, e.g., Cook & Singleton, 2014 and Singleton & Ryan, 2004) are these days most often in favor of a *plurality* thereof depending on the different skills (e.g., pronunciation and morphosyntax). Others prefer speaking of *sensitive periods* “whenever the effects of experience on the brain are unusually strong during a limited period in development” (Knudsen, 2004, p. 1412), which looks like a weaker, non-definite version of any proposed critical period (see, e.g., Kuhl, 2004).

What all these approaches have in common is the notion of biological predispositions and brain maturational changes being the key to age-related differences in *ultimate attainment* in L2 users. Consequently, most proponents of CPHs or sensitive periods argue that a decline in neuronal plasticity should be seen as the main argument for the existence of a time span in which human beings most effortlessly acquire an L2 (Bongaerts, 2005). The question of whether this assumption holds true indeed, will be critically examined in what follows.

### 3 **AGE-RELATED DIFFERENCES IN NEURONAL PLASTICITY**

Clearly, “the brain’s capacity to get organized and to reorganize itself as a reaction to internal or external changes” (Peltzer-Karpf, 2003, p. 370) varies greatly throughout the lifespan and also slows down after 13 brain growth spurts that take place until early adulthood (i.e., the age of 19/20). In this period, synaptic circuits are established and axons and dendrites form trees. These processes are far from unidirectional and linear though, as the brain also reorganizes initial inputs to become more efficient. *Neuronal plasticity* should thus be understood as dynamic processes, forming *dynamic systems*, which autonomously become more complex and generate form (see Hohenberger in this volume). Previous states are responsible for the current state and the current, again, forms the basis of future developments (Peltzer-Karpf, 2012). Until early adolescence, glucose values change and so does synaptic density. Long-range nerve fibers are developed and myelination takes place (Peltzer-Karpf, 2003). Humans experience phases of proliferation of neurons, for instance, but they also undergo phases of synaptic pruning (Lewis, 2005)

“true to the motto[s] ‘neurons that fire together wire together’” (Peltzer-Karpf, 2012, p. 67) and *use it or lose it*. These processes are essential in making humans ready for processing more complex tasks.

Critical periods are reflected on the level of brain maturation too, equaling short, system-specific time spans, in which cortical connections can be modified with ease and experiential fine-tuning is possible. As spurts are observable with regard to both language development and brain growth (Peltzer-Karpf, 2003), the assumption was made that the ability of our brains to reconfigure or change in function or shape (Li, Legault, & Litcofsky, 2014) could also be linked to a time window in which we are most ready to acquire an LX. Consequently, the question arose whether there is a stop to attaining an LX due to a decline in neuronal plasticity.

Ongoing research in the area of developmental cognitive neurosciences has clearly abandoned the long held belief that neuronal plasticity stops at a certain age and that “nervous pathways are fixed, finite and immutable” (Ramon y Cajal, 1909, cited in Peltzer-Karpf 2003, p. 371). Even if whatever humans did not use during development is lost at an advanced age, this does not automatically imply a loss of plasticity in adulthood. The mechanisms underlying the competition between connections may still be present and work on the remaining ones (Brown, Hopkins, & Keynes, 1991). Having identified the *nerve-growth factor*, Levi Montalcini also clearly rejects the idea of neuronal plasticity being restricted to young age and being finite when stating that neuronal plasticity may still be ongoing “nella fase senile” – at an advanced age (Levi Montalcini, 1998, p. 51).

The existence of neuronal plasticity among adults has a crucial effect on our understanding of LX attainment in adulthood, too. Clearly, adults’ brains differ from those with an early AoA. Therefore, keeping the neuronal circuits active is, in general, essential. Following Selkoe (1992) and Levi Montalcini (1998), Peltzer-Karpf (2003) states that despite the loss of unused neural circuits and biochemical changes throughout the lifespan, creative and cognitive capacities are still present at an advanced age. Even though infants’ brains seem to be “exquisitely poised to ‘crack the speech code’ in a way the adult brain cannot” (Kuhl, 2011, p. 36) as the neural networks differ from the latter, older L2 learners are able to compensate for age-related disadvantages, for instance, by changing existing

brain structures (Peltzer-Karpf, 2003) as well as by training neuronal circuits in the processing of specific tasks. When it comes to successful attainment of an additional language, age might be one factor, but not necessarily the most important or only factor.

The following section will critically examine the role of age effects by drawing on evidence from neuroscientific and behavioral studies focusing exemplarily on two aspects, namely pronunciation and morphosyntax. As a more thorough discussion would go beyond the scope of this chapter, these two domains were selected as they are among the most widely researched in this context. Furthermore, pronunciation is said to be the most difficult skill to attain in an LX, and the well-known study by Johnson and Newport (1989) led to much discussed controversies and galvanized linguists into investigating the morphosyntactic domain thoroughly.

## 4 **STUDIES CHALLENGING THE NOTION OF A CRITICAL PERIOD FOR SLA**

### 4.1 **Evidence from neuroscientific studies**

Non-invasive methods to study brain activity have deepened our understanding of the age factor in SLA and showed that factors other than AoA are certainly relevant in these processes. Abutalebi, Cappa and Perani (2001), having approached the topic by giving a review of PET (*positron emission tomography*) and fMRI (*functional magnetic resonance imaging*) studies (see Reitbauer in this volume for an overview of brain response measurements), for instance, come to the conclusion that “[c]onsistent results indicate that attained proficiency, and maybe language exposure, are more important than the age of acquisition as a determinant of the cerebral representation of languages in bilinguals/polyglots” (2001, p. 179).

Perani et al. (cited in Mehler & Christophe, 2000) also conducted research focusing on bilingualism and cortical representation in 1998. By comparing early Spanish-Catalan bilinguals and late Italian-English bilinguals (AoA = 10 years), they found that the cortical representations of the two respective languages were very similar in highly proficient early

and late bilinguals. As the results clearly differed from those of low-proficiency speakers, Mehler and Christophe (2000) also suggest that in bilinguals whose languages show historical, lexical and syntactic proximity, proficiency in the L2 is more decisive than AoA with regard to its cortical representation. Still, it needs to be mentioned that an AoA of ten years might have been too early to show any differences, and the different L1s might also have created too much noise in their data.

Zhang and Wang (2007) support the view that throughout the years research has shown that it is linguistic experience rather than maturational or biological constraints that changes language-related cortical responses and influences the way a language is acquired (see, e.g., Flege, 1995; Gaillard et al., 2000; Hernandez, Li, & MacWhinney, 2005; Kuhl, 2000; Yetkin, Yetkin, Haughton, & Cox, 1996). According to them, neural plasticity is still present in adulthood as long as enriched linguistic experience is given, and even new phonetic categories may be acquired by adults under certain circumstances. Thus, the results of various neuroscientific investigations “support the view that language learning is not a strictly timed developmental process with rigid cut-off points” and therefore “not an irreversible age-bound event” (Zhang & Wang 2007, p. 154; see also Bongaerts, Planken, Schils, & Van Summeren, 1997; Flege, 1995; Hakuta, Bialystok, & Wiley, 2003).

## 4.2 Evidence from behavioral studies

Behavioral studies investigated the effect of age in SLA in two different ways: they either tried to identify a terminus marking the end of reaching native-like proficiency<sup>1</sup> and, consequently, a critical period, or they tried to find exceptionally talented LX users, who started acquiring their LX after the closure of any of the proposed CHPs.

### 4.2.1 *Pronunciation: The hindrance to full foreign language glory?*

Soon after birth, the brain undergoes maturational changes and also specializes in sound processing of the L1 from eight months onwards, which

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<sup>1</sup> Native-likeness refers to LX users performing on levels similar to those of native speakers in specific tasks (i.e., standard deviations from NS values).

is when the so-called *native language magnet* (Kuhl & Rivera-Gaxiola, 2008) takes over control, turning children into specialists in L1 sounds in their first year. Peltzer-Karpf (2003, p. 390) concludes that “the only hindrance to foreign language glory lies in the phonological domain”. In other words, the sooner the exposure to an LX starts, the better the pronunciation and the less a foreign accent is discernible usually applies (see also Scovel, 1988). If the AoA was the only decisive factor in ultimate attainment in an L2 and a CP existed, the correlation between age and the ability to attain a language proficiently should stop at a certain age. However, studies have shown controversial outcomes in this respect.

Patkowski (1980, 1990), for instance, investigating bilinguals’ pronunciation in their L2, found a discontinuity at a certain age, which does not correspond to the terminus of any of the proposed CPHs. In this study, the participants’ ability to pronounce words in a native-like way was marked by a discontinuity at an AoA of 15, which is obviously much later than, for example, Lenneberg (1967) or Long (1990) suggested. However, Harley and Wang (1997) stated that in Patkowski’s study, the discontinuity described was not very striking as the decline in pronunciation abilities was actually very similar among the group having acquired their L2 before the age of 15 and the post-15 groups (Bongaerts, 2005). There are numerous other early studies investigating the issue, which support Harley and Wang’s statement. Oyama (1976), for instance, found a gradual decline in proficiency with increasing AoA. Similarly, Flege, MacKay and Munro (1995), who observed 242 Italian immigrants to Canada, were only able to report a continuing decline in pronunciation ratings but, again, no sharp discontinuities. Also, Flege, Liu and Yeni-Komshian (1999) reported on findings which correspond to the linear decline described above. This challenges the classic notion of a CPH for pronunciation in an LX. Still, these studies show that there is a continuous decline in pronunciation ratings, the higher the AoA is. Does this mean that at some point in life it becomes impossible to acquire pronunciation on a level similar to those of native speakers? What can certainly be concluded from these investigations is that even if there was a critical period for LX acquisition, Long’s (1990) suggested age of twelve marking the terminus is probably too early.

Bongaerts and colleagues (Bongaerts et al., 1997; Bongaerts, Mennen, & van der Slik, 2000; Bongaerts, Planken, & Schils, 1995) approached the

question from a different angle: is it possible for people to reach a level of proficiency in the phonological domain in an L2 similar to that of a *native speaker* (NS) when learning it after a certain point in life? The participants of four studies were highly successful L2 learners having learned their L2 after any suggested critical period in instructed settings. All studies included a control group of native speakers as well as experienced judges (linguists) and inexperienced ones (NS), who had to evaluate recorded speech samples on a scale ranging from ‘definitely native’ to ‘definitely non-native’ (Birdsong, 1999). In these studies, the participating NNS (*non-native speakers*) differed on the level of language exposure, motivation, type of L1 (e.g., Dutch, French, German, Armenian or Turkish) and, consequently, the typological proximity of the L1 and L2 (in three studies English, in one study Dutch). In all studies, some participants were in fact assigned ratings similar to those of the NSs. Interestingly, these findings correspond to Moyer’s suggestions, who concluded from her own study that in sequential LX acquirers “overt phonological instruction appears necessary for some learners to acquire native-level production” (1999, p. 99). This is also in line with Klein’s (1995) suggestion of biological constraints being not as severe as being an actual barrier.

From these studies, Bongaerts concludes that “the success of the exceptional adult learners we identified may have been at least partly due to the combination of three factors: high motivation, continued access to massive L2 input, and intensive training in the perception and production of L2 speech sounds” (1999, p. 155). This suggests factors other than AoA, such as motivation (Moyer, 1999), appraisal, amount of exposure and typological proximity of the L1 and L2 (Bongaerts et al., 2000) might actually be decisive in ultimate attainment too, as was also put forward by neuroscientists (see, e.g., Abutalebi et al., 2001; Mehler & Christophe, 2000; Zhang & Wang, 2007).

To sum up, it seems a foreign accent is easily discernible in most people starting to acquire an LX relatively late in life. Still, there are some exceptionally talented sequential LX acquirers who are even mistaken for native speakers, which is taken as evidence against a CPH (e.g., Bongaerts, 1999). However, proponents of a CPH would not accept this as counter-evidence and would doubt the measures’ validity and reliability due to typologically close L1-L2 pairings, native speakers performing on

lower levels than 100%, and/or including non-native speakers sounding very foreign in their sample so that near-native speakers more easily sound native, which would lead to a distortion of the results (Long, 2005).

Of course, the aforementioned studies can be criticized easily – whether they support or reject the idea of a CPH – as the extent to which age is confounded with other variables, such as amount of input, naturalistic exposure, motivation and frequency of use was most often not disentangled sufficiently. Furthermore, the presented studies are difficult to compare due to different elicitation tasks and different L1s. These aspects are crucial though as studies such as Bongaerts', for instance, demonstrated the important role of the typological proximity/distance of the L1 and LX. Therefore, it is important to be aware of LX attainment always being determined by various factors (Moyer, 2004).

#### 4.2.2 *Morphosyntactic rules*

Besides pronunciation, morphosyntax has been another area of great interest to SLA researchers investigating ultimate attainment. However, the results from these studies are quite contradictory. In 1989, Johnson and Newport carried out an influential investigation regarding this matter: they analyzed 43 Korean and Chinese L2 learners of English with the aim to investigate the relation between L2-proficiency and age. Participants were tested on grammaticality judgment, and the results showed a relationship between the age of arrival in the United States and the proficiency level reached, indicating a clear advantage for early arrival. According to Johnson and Newport, the performance on the task was neither influenced by motivation, nor by identification with the US, nor by self-consciousness. They considered their findings as evidence for a critical period in SLA. Other researchers heavily criticized their study for several reasons. Bialystok and Hakuta (1994), for instance, stated that if the classification of participants had been different, the data would have revealed entirely different results. Moreover, Bialystok (1997) criticized Johnson's and Newport's results, as different educational backgrounds could be regarded as a trigger for different proficiency levels too (Van Boxtel, 2005).

Since then, numerous researchers (see, e.g., Bialystok & Miller, 1999; Birdsong & Molis, 2001; DeKeyser, 2000; Flege et al., 1999) have tried to replicate the famous study by Johnson and Newport. The outcomes of these studies were quite contradictory and either showed no discontinuities (Bialystok & Miller, 1999) or an inflection point of, for instance, 27.5 years, contradicting any CPH proposed so far (Birdsong & Molis, 2001). Another study showed a strong link between high proficiency in the L2 and AoA, which was also linked to low proficiency in the L1 though (Jia, 1998). This led to the conclusion that factors other than maturational ones, such as L1 proficiency, might be decisive in attaining an L2 too (see also Van Boxtel, 2005). A highly innovative study on ultimate attainment in grammar was carried out by Van Boxtel, Bongaerts and Coppen (2005): they compared the performance of 44 native speakers of Dutch with 43 highly successful late learners of it from various L1 backgrounds (German, French and Turkish) on tasks including dummy subject constructions, which is highly unusual and interesting as they are not covered in prescriptivist literature. In both a sentence imitation and sentence preference task, L2 learners could be identified who performed at the same level as native speakers. Typological proximity was an influential factor though as Turkish learners of Dutch performed poorest. The results led Van Boxtel et al. to question the existence of a CPH for syntax in L2 acquisition, but they still acknowledge the decisive role of age-related differences, such as type of input and biological factors, and state that these might eventually lead to differences in the performance of those with an early start and those with a late start. Nevertheless, it needs to be noted that age-related constraints are “not specific to language and not absolute” (Van Boxtel et al., 2005, p. 377).

In summary, the results of studies on morphosyntax in SLA diverge as do researchers' opinions on the topic as a consequence. As already stated, there are studies which may be viewed as evidence for a critical period as all late learners performed more poorly than native speakers (see Coppeters, 1987; Hyltenstam, 1992; Johnson & Newport, 1989); however, there are also numerous studies in which at least some highly successful L2 learners attained ultimate levels of proficiency in L2-grammar (see Birdsong, 1992, 1997; Hyltenstam & Abrahamsson, 2003; McDonald, 2000; Van Boxtel et al., 2005; White & Genesee, 1996).

### 4.3 **Concluding remarks on the CPH in SLA**

According to Bialystok and Hakuta (1994), it cannot be denied that children tend to acquire an L2 with less effort than older learners, but one must be careful in going so far as to view biological constraints as the single decisive factor, as there are obviously exceptions to this rule. Differences in input and amount of exposure might explain early birds' advantageous position in many cases. Still, young acquirers also sometimes tend to be unsuccessful and some late learners are able to overcome age-related obstacles. Thus, AoA might be an important factor in the acquisition process, but not necessarily the most influential variable, and ultimate attainment is clearly multiply determined (Moyer, 2004). Therefore, confounds between the AoA and other influential variables need to be disentangled carefully to make claims for or against a CPH more convincing. Furthermore, it is crucial not to mistake causality for correlation: the critical period hypothesis certainly is a causal explanation but, so far, there has only been evidence for correlation between AoA and ultimate attainment (Bialystok & Hakuta, 1994, cited in Birdsong, 1999), and this correlation has not consistently been shown. The results of various studies even contradicted any assumption of a negative correlation in this respect.

Even though in early tests of the CPH either instructed learners (see, e.g., Bongaerts' studies) or those having acquired an LX in naturalistic settings were investigated more recent approaches to a CPH negate the applicability of any CPH to instructed settings. A recent longitudinal study by Pfenninger and Singleton (2016), who investigated 200 Swiss learners of EFL (*English as a foreign language*) with L1 German and different ages of onset of instruction (group 1: AoA = 8; group 2: AoA = 13) "provided no clear evidence that there is any special advantage in starting the study of an FL very early" (see also Pfenninger & Singleton, 2017, p. 215). Their data showed, in fact, a rate advantage for the late starters. After six months of instruction, the group with a later start caught up to and performed on similar levels as early starters (some even outperforming early starters), and also, when tested at the end of high school they still did so. Moreover, their findings demonstrate the "multi-faceted complexity of the role played by starting age" (Pfenninger & Singleton, 2016, p. 311) and highlight the role of socio-psychological factors in SLA

as well as the interaction of these with age. Indeed, affect may trump age in instructed learning (Singleton & Pfenninger, 2016), which points to the crucial role emotions play with regard to successful LX attainment (for a more detailed discussion see below).

To conclude, what is stated above clearly demonstrates that an early AoA cannot be taken as a guarantee for success in learning another language (see also Grosjean, 1982). Reality is more complex and early research on the age factor frequently neglected the complexity inherent in the process of acquiring another language and the possible interaction between AoA and other variables (Moyer, 2014). Therefore, the following section calls for a long overdue shift of paradigm towards a holistic view on LX users in study designs on various levels and postulates different premises for any investigation into the age factor in SLA.

## 5 **A CALL FOR A CHANGE OF PARADIGM TOWARDS A HOLISTIC VIEW ON MULTILINGUALISM AND ULTIMATE ATTAINMENT**

What can be derived from the previous sections is that the question of the link between AoA and attainable proficiency is not as easy to answer as linguists in the past had hoped. The difficulty lies in the complexity and dynamics underlying LX attainment. Therefore, this chapter also aims to highlight the necessity for a change of paradigm when investigating the age factor in the context of SLA research and puts forward three premises.

Firstly, previous research most often ignored the fact that “L2 acquirers, by definition, possess [...] knowledge of an L1 [...] when they begin learning the additional one” (Ortega, 2009, p. 31), and this knowledge is certainly not to be treated as isolated from the L2 (or LX). Thus, previous research often took a monolingual perspective (Cook, 2016, p. 1) on L2 users, which means that the languages an LX user knows were treated as separable and comparable to NSs’ performance. Consequently, L2 users were frequently measured against NS, which is equal to comparing apples and oranges (Cook, 2009), as “[i]n the literal sense it is impossible for an L2 user to become a native speaker, since by definition you cannot

be a native speaker of anything other than your first language” (Cook, 2007, p. 240). Thus, the “knowledge of more than one language in the same mind” (Cook, 2012, p. 3768) needs to be approached adequately in scientific investigations as L2 users are language users in their own right and should be treated as such and not as if they used an LX deficiently (i.e., deviating from a native speaker norm). They will never use their language in the same way as a(n idealized monolingual) native speaker of said language (see also Selinker, 1972), as the languages in their mind show a mutual influence. This call for a change of paradigm towards a holistic view on multilinguals is also known as a linguistic perspective called *multi-competence* (Cook, 2009), the first version of which was proposed by Cook in 1991. Linking it to the idea of a CPH, this means the following: strictly speaking, when measuring NNSs against NSs, of course, “non-nativeness will eventually be found” (Birdsong, 2014, p. 47). The results from a study by Abrahamsson and Hyltenstam (2009), who investigated 195 Spanish-Swedish bilinguals, for instance, made them conclude that nativeness is unattainable by adult learners and actually hardly ever attained when learning another language in childhood. If native-likeness is what the CPH requires, then this is, if even, only possible for people growing up with two languages simultaneously, which might eventually reduce the idea of a CPH to absurdity.

The second premise is linked to the first one and refers to the dynamic underlying linguistic systems: knowing a language involves various skills and this knowledge is neither fixed nor static – neither in an individual, nor in the community. The languages in an LX user’s mind clearly behave like liquids, which means “when mixed, they acquire completely new properties” (Herdina & Jessner, 2002, p. 27). Even though the dynamics underlying *linguistic systems* are also prominent in monolinguals, they become more complex (and obvious) in speakers knowing more than one language: all languages a person knows show constant interplay, making multilinguals’ situations unique (Cook, 2006). Thus, the second premise is, consequently, a call for acknowledging *dynamic systems theory*: not only do the languages in someone’s mind show a mutual influence, but learning another language is also a highly dynamic process as such and assessing someone’s proficiency equals measuring the current state only. In fact, achieved proficiency is always to be seen as a basis for future developments and the outcome of previous ones (Peltzer-Karpf, 2012, see

also Hohenberger in this volume). To put it in Hohenberger and Peltzer-Karpf's words: "[l]anguage learning is a nonlinear dynamic process in time. It is poised between determinism and indeterminism, order and chaos" (Hohenberger & Peltzer-Karpf, 2009, p. 504). Research on the effect of age is often criticized for not having captured the complexity and dynamic inherent in LX attainment as well as the multiple influential factors in these processes (Moyer, 2014). Nowadays, statistical tools enable researchers to build statistical models, such as the *multilevel modeling approach* (MLM), which was applied by Pfenninger and Singleton (2016, p. 315) in their longitudinal study. These allow researchers to investigate the interaction of possibly influential variables.

Such an approach would also allow fulfilling the third premise: a stronger focus on individual differences in SLA research. Interestingly, "[t]he traditional age effects/CPH literature has been overwhelmingly concerned with universals, not with individual differences" (Moyer, 2014, p. 447), which are clearly illusive and unrealistic as they are highly idealized. When trying to depict the processes underlying ultimate attainment in a foreign language, such a focus is much needed as the individual plays a decisive role in both language outcome and processing (Moyer, 2014). This focus on individual differences is also linked to the need for taking a *complexity perspective* (Mercer, 2011, p. 57). Even though Mercer suggested it with a focus on the self-concept of language learners, grappling with the complexity of ultimate attainment is much needed too. As recent studies have shown, there is a much stronger need for investigating psychological aspects in foreign language learning including learners' emotions (e.g., Dewaele, MacIntyre, Boudreau, & Dewaele, 2016; Dewaele, Witney, Saito, & Dewaele, 2017; Pfenninger & Singleton, 2017) and potentially those of teachers (Gkonou & Mercer, 2017) as these are much more influential than had been previously assumed. This need for a stronger focus on emotions holds true for SLA and multilingualism research in general (see, e.g., Dewaele, 2010; Resnik, 2018). So far, motivation has been the only variable which has been investigated extensively (see, e.g., Dörnyei & Ushioda, 2009; Gardner & Lambert, 1959, 1972). Motivation might actually have appraisal at its basis (Schumann, 1997) and emotions are crucial regarding the absence or presence of learning (see, e.g., MacIntyre, 2002) and, consequently, decisive in (un)successful LX acquisition (Dewaele, 2010). AoA or one's chronological age might,

for instance, interact with the emotions of LX learners and, hence, these should certainly not be neglected. Being, besides language, one of “the two basic systems involved in communication” (Reilly & Seibert, 2009, p. 535), the need for investigating the interplay of language and emotion in SLA processes becomes obvious. Positive valuations of a language and culture as well as the learner’s perception of self are also decisive in ultimate attainment (Panicacci & Dewaele, 2017). Furthermore, foreign language enjoyment and anxiety are crucial factors in these processes (see, e.g., Dewaele et al., 2016; Dewaele et al., 2017). It might eventually even be suggested that positive emotions of LX users possibly bear the potential of overcoming age-related constraints in SLA.

## 6 CONCLUSION AND IMPLICATIONS

This chapter shed light on investigations into the age factor in SLA, “one of the most frequently researched and debated topics in Second Language Acquisition” (Muñoz, 2008, p. 578). It showed that early investigations into these matters mostly focused on testing proposed CPHs for SLA, which were entirely based on brain maturational factors. These investigations led to contradictory results not only with regard to the nature of the differences between younger and older learners, but also with regard to whether or not there is an actual end to becoming a highly proficient user. While any CPH for SLA is actually a causal link between AoA and proficiency, most of the studies to date could only reveal a negative correlation (Bialystok & Hakuta, 1994; Birdsong, 1999), which cannot be seen as evidence for any CPH. In addition, early investigations into the relevance of AoA did not distinguish between “ultimate attainment and rate” (Krashen, Long, & Scarcella, 1979, cited in Muñoz, 2006, p. 2), a difference of which is crucial. Furthermore, often no distinction was made regarding the nature of the input, and findings from studies on SLA in naturalistic settings were frequently compared to processes underlying foreign language learning in instructed settings, without acknowledging the differences in quality of input and also amount of exposure (Muñoz, 2006, 2008). Disentangling effects of the context of acquisition is important to prevent unjustified generalizations.

This is also linked to another important aspect: the complexity and intersectionality of variables (possibly mutually) influencing the success of the learning process. To date, findings from various studies – large- and small-scale – showed that various factors might be age-related and shape attainment as well as underlying learning processes (Moyer, 2014). Importantly, there is a strong need for investigating the mutually constitutive relations of influential variables (see, e.g., Pfenninger & Singleton, 2016), including psychological factors. I proposed in this chapter that emotions play a crucial role in the success of attainment and any kind of learning too, and it is, thus, essential to also investigate emotions in these processes (see, e.g., Dewaele, et al., 2016; Dewaele et al., 2017; Mercer, 2011) as these are crucial in the process of becoming a multi-competent successful LX user (Cook, 2016; Dewaele, 2017; Resnik, 2018). This includes another vital aspect, namely linguistic multi-competence, and points to the incomparability of native speakers and LX users. As Muñoz and Singleton (2011, p. 2) state, the “maturational constraints perspective has relied too much on native speaker behaviour as a basis for comparison”. Clearly, it is more about “difference” rather than “deficit” (Moyer, 2014, p. 447).

While fully acknowledging the importance of early studies in the field and not questioning their relevance in any way, research has also led to progress, and this is what future investigations need to build on. As Singleton and Ryan (2004, p. 227) mention, “the idea of a critical period specifically for language development may well have its day”. This does not mean that investigations into the age factor become irrelevant, but researchers will simply need to build on the newly gained insights to do the complexity of the underlying processes full justice.

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