

**Age effects in L2 acquisition:
ultimate attainment at the syntax-morphology interface**

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Abstract

This paper presents a selective overview of studies that have examined age effects in second language (L2) acquisition. The focus was on adult second language learners and the L2 ultimate attainment at syntax-interface morphology, with particular attention given to the problematic case of inflectional morphology. We present different kinds of evidence including behavioural, descriptive and brain-based data. Although the main focus was on the syntax-morphology interface, other domains such as semantics, phonology were also briefly mentioned. Learners involved come from different L1 backgrounds. The results show that there is a general divergence between native and non-native speakers, however certain exceptions are noted. The paper is an addition to the existing body of literature in the field of second language acquisition on critical periods, age effects in language acquisition, and endstate grammars.

Keywords: age effects, critical periods, ultimate attainment, syntax-morphology interface

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Chapter 1

Introduction

The majority of adult second language (L2) learners rarely attain the native-like level of proficiency in the new language. In reality, the ultimate attainment in the L2 that does not reach the criterion of native-likeness, has often been associated with the period after childhood and it has been referred to as 'late' L2 acquisition. As a result, a great deal of research has been trying to address the question of why late second language learning is generally less successful than early L1 or L2 learning. One of the most significant responses to this enquiry has been provided in the form of a critical period (e.g., Penfield and Roberts, 1959; Lenneberg, 1967) that places certain limits on second language acquisition. For language learning on the whole, a critical period is said to define a period in time that is bound by maturation during which successful language acquisition is possible, before neurocognitive changes prevent an individual from acquiring the language to a required standard.

Yet, it has been found that late second language acquisition is not uniformly unsuccessful in all areas of language. For example, late L2 speakers do a lot better when it comes to the acquisition of syntax in the unknown language, than when it comes to learning of phonology of the target language (TL). Thus, the researchers suggested that it would be difficult to account for this in terms of a single critical period for language learning. Instead, it has been proposed that there are possibly multiple critical periods and that it is essential to determine whether or not domains of language (syntax, morphology, phonology, semantics, etc.) and / or elements involved language processing, are exposed to a critical period (or periods) which places constraints on native-like attainment of the target language by late L2 learners.

The aim of this paper is to investigate performance similarities and differences between adult native and adult non-native speakers in L2 endstate grammar. We look at different linguistic domains, but special attention is given to the syntax-morphology interface. The paper is an addition to the existing body of literature in the field of second language acquisition on critical periods, age effects in language acquisition, endstate grammars. We

attempt to locate the areas of knowledge and language processing where non-natives behave or do not behave like natives and determine what the causes and scope of divergence between the two groups are.

In the first chapter, we look at the concept of critical periods in detail, i.e., its biological foundations and what this translates into in the realm of linguistics. We present the results of several studies which are pertinent to the area under discussion. In the second chapter the focus is shifted to the syntax-morphology interface, and specifically to the problematic case of L2 inflection.

Chapter 2

The Critical Period Hypothesis

Most research in the second language acquisition has been in some way informed by the Critical Period Hypothesis (CPH), that is, the concept that maturation can account for the differences between early and late language acquisition. In the first chapter, we look at the concept of critical periods in detail, i.e., its biological foundations and what this translates into in the realm of linguistics. First used by Penfield and Roberts in 1959, and advanced by Lenneberg in 1967, the Critical Period Hypothesis (or different versions of it) have been extensively employed to give reasons for the successful child L1 acquisition as well as the relatively unsuccessful acquisition of L2 by adult second language learners. This chapter presents the concept of critical periods in behavioural and cognitive development and illustrates how it applies to language learning. Different evidence that speaks for and against maturationally-constrained period is discussed. The chapter provides a broad overview of how age-related effects in second language acquisition have been dealt with. A number of representative studies is discussed.

In paragraph 2.1 we introduce the biological foundations of a critical period. In the next paragraph, we briefly discuss the notion of a critical period for language acquisition (first and second). The paragraphs 2.3 and 2.4 contain review of literature relating to the CPH. Lastly, the paragraph 2.5 contains a review of the neuroimaging and ERP studies which contribute to the discussion of the CPH.

2.1 Critical period: origins

In developmental biology, a critical period refers to the period in the early development of an organism during which it exhibits a high sensitivity to the stimuli present in the environment. During this period, these experiences dictate a particular way of that organism's development. Importantly, in the case of absence of appropriate stimuli the organism may encounter difficulties, be less successful, or even unable to eventually form certain functions. Following the period, a non-linear decline in sensitivity is observed (Siegler, 2006).

The development of vision in cats can serve as an example of a critical period in biology (e.g. Baxter, 1966). Cats will be able to perceive only the patterns (e.g. vertical stripes) that they were exposed to in early weeks of their life. If such an exposure does not take place, cats will never be able to these specific patterns. Other examples include the development of the sense of touch in mice (Glazewski, Chen, Silva, and Fox, 1996), the mating song in certain African frogs (Watson and Kelley, 1992) or the sense of hearing in the barn owl (Knudsen and Knudsen, 1990) to name a few (all cited in Hopp, 2007). Chaffinches (Thorpe, 1958), zebra finches or white-crowned sparrows (Marler, 1970) are perhaps most relevant examples in this context, as it has been hypothesised that a critical period for song learning in these birds bears the closest analogy to the development of language in humans. A young chaffinch must hear an adult male singing during some period after hatching. Otherwise, the exact learning of the song will never be possible. Also, the birds have to hear themselves during the period in order to succeed in acquiring the highly intricate song (e.g. Brenowitz, Margoliash and Nordeen, 1997, cited in Hopp, 2007). Take away these conditions and atypical song patterns are developed rendering such birds impervious to new song patterns of the same species. The results of some empirical studies imply that such critical periods are brought into being neurally and that the process of song acquisition for example, can be manipulated by neurophysiological intervention or administering of hormones (ibid).

Broadly speaking, critical periods can be characterized by different geometric and temporal features (for detailed discussion see, e.g., Bornstein, 1989; Birdsong, 2005). They do, however, share certain common aspects, which can be summarised as follows. Usually, a critical period starts quite abruptly following a time of low sensitivity to the present stimuli. Consequently, there is an onset, a peak of sensitivity and an offset or a steady decline with succeeding flattening out of the level of sensitivity, as shown in Figure 2.1 below.

The onset is regulated by maturation. It is, however, possible that it is delayed if there are no stimuli in the given environment, for instance in cases where cats are reared in the dark for some time (Baxter, 1966). In the phase where sensitivity is at its highest (peak), being subjected to the existing stimuli is most influential. Where the flattening occurs, one should be careful when drawing a parallel between age and the relevant behaviour, as that behaviour should not be subjected to significant variation in this phase. In her paper, Sonja van Boxtel (2005) makes an interesting point in this regard. She states that the existence of a critical period can only be confirmed by the occurrence of an offset and flattening and that the

relationship between the age factor and the relevant ability should not be considered at that stage.

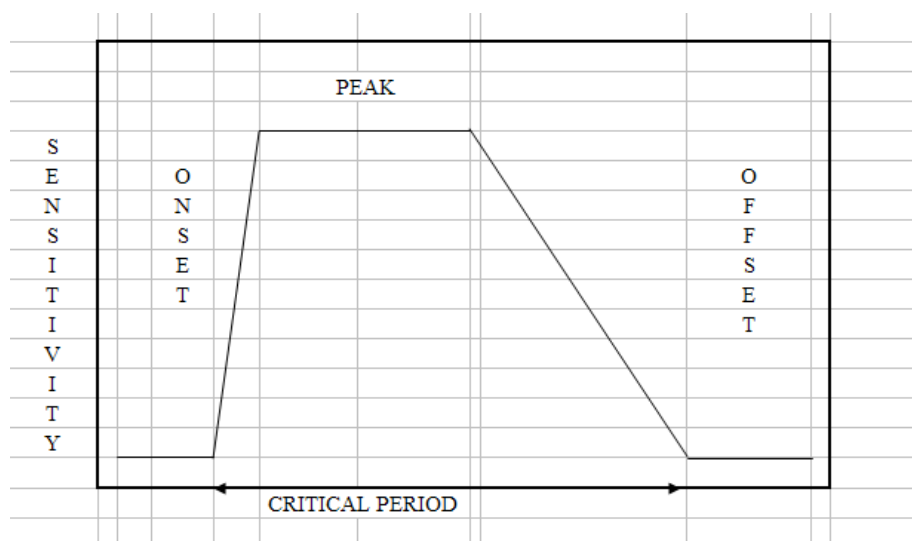


Figure 2.1 *Geometric features of a critical period (adapted from Birdsong, 2005; cited in Hopp, 2007: 8)*

From this, it can be concluded that late L2 learners exposed to the same kind of input should exhibit similar patterns of behaviour to other later L2 learners, but not so similar patterns to early learners.

2.2 Critical period for language acquisition

The Critical Period Hypothesis has informed much research relating to language acquisition. It was first formulated by Penfield and Roberts in 1959. They asserted that such a period ends around 9—12 years of age and following on from that, a full command of language is not easy and rather doubtful. This constraint was ascribed to the loss of neural plasticity in the brain. Lenneberg (1967) later elaborated the hypothesis and proposed that the development of hemispheric specialization for language was responsible for establishing age limitations on language acquisition. Since then however, several studies produced contrary evidence which proved that left hemispheric specialization for language processing may actually exist at birth and become fully developed by the age of 5 (Krashen, 1974; Molfese and Molfese, 1979, cited in White and Genesee, 1996).

The existence of a critical period for language acquisition comes from various types of evidence such as: (1) feral and abused children who were deprived of human language exposure and who, if found, acquired language in an abnormal manner; (2) deaf children; and (3) better recovery rates from aphasia in children rather than adults (Van Boxtel, 2005).

In literature, it is quite common to find references to a critical period that applies generally in the realm of language acquisition. Language however, is a complex system which comprises a multitude of conceptually and neutrally discernible subparts such as syntax, phonology, semantics, etc. Different versions of the CPH suggested that there is more than one critical period (Long, 1990; Seliger, 1978), each corresponding to different subcomponents of language and having different geometric and temporal features. It has been assumed that each of these parts could be affected differently, or not affected at all. In fact, studies reporting on linguistic failure in delayed first language acquisition provide support for different formulation of multiple critical periods. Consider cases of feral children, for instance a girl called Genie (Curtiss, 1977; 1988), who was locked away inside a bedroom for almost all of her first thirteen years of life. Her case demonstrates differences in the acquisition of certain subparts of language. Genie, having been deprived of linguistic input, never acquired the language to the required standard. Since she was rescued, her vocabulary and communication developed quickly, whilst her syntax and intonation stayed quite basic despite a long-lasting exposure. For instance, she would say something like, “Applesauce buy store,” rather than “We need to buy applesauce at the store.” Curtiss inferred that Genie used the non-dominant right hemisphere for language and that her language was similar to those who acquire it outwith the critical period, indicating particular constraints on the nature of acquisition process outside of this maturational phase. Further examples can be found in Pinker, 1994, and Singleton and Ryan, 2004 (cited in Hopp, 2007).

To summarise, it can be concluded that critical periods limit the development of language in cases such as that described above. Nevertheless, certain subcomponents of language are impacted on in different ways, or are not impacted on at all (Scovel, 1988, suggested that there a critical period exists for pronunciation alone), demonstrating various levels of recoverability upon late exposure.

2.2.1 The Critical Period Hypothesis and second language acquisition

In second language acquisition, a proposal has been made that a re-conceptualisation of a critical period in terms of its characteristics as they have been so far described is required

(Eubank and Gregg, 1999, cited in Hopp, 2007). Birdsong (1999), states that the facts about adult second language acquisition notably differ from those relating to first language acquisition. First of all, attention has to be drawn to the fact that adult second language acquisition, under normal circumstances, takes place following a successful acquisition of the mother tongue (L1) during the critical period. This is quite the opposite to the cases of critical periods described earlier where in crucial moments of the development the stimuli was absent from the environment. Thus, it cannot be said that a late L2 learner failed to go through a period sensitive for language acquisition. Nonetheless, learning does not start until after the critical period. In that case, if one assumes that the linguistic knowledge gained through the acquisition of L1 is organised according to some neurocognitive pattern constructed for that L1, during late L2 learning this already existing pattern has to be re-established. Ignoring the nature of the changes that would have to occur for a moment, it should be mentioned that the extent to which the neural architecture and cognitive processes are reorganised is a lot smaller compared to the extensive organisation of these two aspects in the process of moving from the young person's pre-linguistic to their mature stage (Lenneberg, 1967: 176). Accordingly, for example Eubank and Gregg (1999, cited in Hopp, 2007) advise that behavioural reactions which relate to critical period effects noted in adults L2A should be comparatively minor in scope.

Most individuals of average intelligence are able to learn a second language after the beginning of their second decade, although the incidence of "language-learning blocks" rapidly increases after puberty. Also automatic acquisition from mere exposure to a given language seems to disappear after this age, and foreign languages have to be taught and learned through a conscious and laboured effort. Foreign accents cannot be overcome easily after puberty. However, a person *can* learn to communicate in a foreign language at the age of forty. This does not trouble our basic hypothesis on age limitations because we may assume that the cerebral organisation for language learning as such has taken place during childhood, and since natural languages tend to resemble one another in many fundamental aspects [...], the matrix of language skills is present. (Lenneberg, 1967: 176)

It is this understanding of the critical period for second language acquisition that the majority of researchers in the field have in mind when referring to testing CPH for SLA. The notion of critical period for SLA has been further elaborated with various explanations being given, for instance Birdsong (2005) or Pinker (1994).

Against this backdrop, it is worth mentioning that since language consists of many components, it has been suggested that there may be multitude of critical periods with each of them corresponding to a different linguistic subcomponent. Some of the subparts of language

may not be subjected to a critical period at all, whilst others may show critical periods of varying onsets and offsets. Table 2.1 (adapted from Singleton, 2005, cited in Hopp 2007: 12) illustrates an overview of some proposals.

| | End of offset for general CP | End of offset for phonology | End of offset for (morpho-)syntax | End of offset for semantics |
|---|---------------------------------|--------------------------------|--------------------------------------|--------------------------------|
| Penfield and Roberts (1959) | 9 | | | |
| Lenneberg (1967) | puberty | | | |
| Scovel (1988) | | 12 | | |
| Johnson and Newport (1989; 1991) | puberty or earlier | | | |
| Long (1990; 2005) | | 6 or 12 | mid-teens | |
| Rubén (1997) | | 1 | 4 | 16 |
| Hyltenstam and Abrahamsson (2003) | shortly after birth | | | |
| Clahsen and Muysken (1986; 1989); Hawkins (2001) | | | puberty | |

Table 2.1 Summary of proposals for offset of critical periods.

Following Hopp (2007), the working definition of the Critical Period Hypothesis adopted in this paper is that there is a critical period for language acquisition which ends at the end of puberty at the latest; past that period the acquisition of native-like neurocognitive representations and processing of syntax and its interfaces is not possible (p. 14).

Among the approaches to critical periods in second language acquisition, two broad ones have been identified: the comparative approach (adult L2 versus child L2 learners) and the ultimate attainment approach (adult L2 learners versus natives) (Hopp, 2007). Each of the approaches requires certain types of evidence to validate the concept of a critical period. The former considers the following: (1) child L2 learners should outperform adult L2 learners as far as the ultimate attainment is concerned; (2) there should be a non-linear relationship between age of onset and ultimate attainment, in accordance with the geometric features of a critical period; and (3) child L2 and adult L2 learners should display different developmental

sequences if different mechanisms lie beneath the language development in the two cases. The latter in turn considers the following: (1) adult learners should not reach native-like proficiency in L2; (2) neurophysiological representation and cognitive processing should exhibit qualitative differences between late learner and natives; and (3) non-nativeness in L2 should exist regardless of L1-L2 pairings.

In the following subchapters relevant literature investigating these accounts, mostly those relating to the ultimate attainment approach, will be reviewed.

2.3 The Critical Period Hypothesis, ultimate attainment: the age function

The prediction that attaining native-likeness in second language will prove unfeasible if the onset of L2 learning does not come about until after a particular age, is an important aspect of the Critical Period Hypothesis for second language acquisition (L2A). The CPH/L2A tackles the upper limits of attainment possible in L2. Therefore, it is the evidence based solely on learners at the L2A end state that is resolutely pertinent to the CPH/L2A, and according to Birdsong (2004), this reasonable prerequisite is not provided in all studies claiming to test CPH/L2A.

Generally, it is the age of arrival (AOA) in a given country that is a good predictor of the relative degree of ultimate attainment in second language learning. The remaining causes of age effects in L2A, for instance age of first exposure, especially in a classroom environment, do not offer the same prognosis (e.g. Birdsong and Molis, 2001; Johnson and Newport, 1989). Several studies have shown that the next strongest predictor, after age of arrival, seems to be the amount and quality of L2 input and interaction (e.g., Birdsong and Mollis, 2001; Flege, 1999; Flege, Frieda and Nozawa, 1997; Flege, Yeni-Komshian and Liu, 1999, cited in Birdsong, 2004).

Johnson and Newport's study (1989) is undoubtedly the most prominent in the discussion of the CPH for the L2A assumption that there should be a non-linear relation between L2 proficiency and age of arrival. In the study, the participants were 46 adult second language learners of English. They were of Chinese and Korean background and arrived in the United States at various ages, ranging from three to 39. All were exposed to English for at least five years and resided in the US for a minimum of three years. The participants were not chosen on the grounds of language proficiency. They were assigned to one of the four age groups, according to their age of arrival (AOA 3-7, AOA 8-10, AOA 11-15, AOA 17-39). It

was assumed that they had reached the end state in the target language. Also, 23 native speakers of English were asked to take part as a control group. The aim of the study was to investigate an overall proficiency in English. The authors examined a variety of aspects relating to twelve morphosyntactic rules in English, for example particle movement, plural marking, word order, question formation or past tense. An oral grammatical judgment test was employed to do this. The examining of participants' responses revealed a strong correlation between age of arrival and test results ($r = -.77$, $p < .01$). The main findings were that none of the subjects who came to the US at the ages above of 15 years performed as well as the control group. The youngest group (AOA 3-7) was the only one, whose scores were in the same range as the group of native speakers. A linear decline in proficiency could be observed for the AOA 8-10 and 11-15 groups. Whilst there was a significant relationship between AOA and test results for the subjects aged less than 15 years, ($r = -.87$, $p < .01$), this was not the case for the after-puberty group ($r = -.16$, $p < .05$). Additionally, a considerable amount of individual differences among late arrivals was noted. It can be summed that age of arrival makes a prognosis in terms of performance for early learners, but such a prognosis cannot be made for late arrivals. Johnson and Newport take these outcomes as evidence for a critical period in second language acquisition, which is governed by maturation and which ends around puberty (15 years of age).

The study and its conclusions have brought on a great deal of debate among L2A researchers. The original data from the study has been re-examined and the study reproduced on many occasions, both fully and partially, often producing results different from the original ones. One has to be cautious, however, when making direct comparisons with the Johnson and Newport's study, as varying methodology, procedures and stimuli, has been employed by researchers. A number of studies and their outcomes will be considered here.

In their reanalysis, Bialystok and Hakuta (1994) for instance, showed some variance in the correlations between AOA and performance when grouping the subjects differently. The authors selected an age of arrival of 20 years (the point outwith the frame of a critical period) to make a distinction between early and late learners and found that while the relationship between AOA and performance for the early learners stayed unchanged ($r = -.87$), it was nearly significant for the older group ($r = -.49$). In Bialystok 1997, it is claimed that the disparity between the two groups, particularly when variability between individuals' accuracy is considered, could be due to diverse educational history, where the younger ones were taught English in American schools, while the majority of the older ones were not. She

believes that adult learners can succeed in second language acquisition as well as children if enough time and space is made for this, and if they stay as motivated as children. Another suggestion made by Bialystok refers to the discontinuity at age seven. She states that older learners (>7 years) do better than the younger ones. This pattern of results, Bialystok feels, is attributable to the fact the languages of the Chinese and Korean participants could be regarded as weak and not dominant (no information about the proficiency in these is known), consequently allowing English to function as the learner's first rather than second language, thereby making some of Johnson and Newport's points moot.

Birdsong and Mollis (2001), in their "ceteris paribus" reproduction of the study, demonstrate similar results to those reported on by Bialystok and Hakuta (1994). The research was done with more subjects (61, as opposed to 46) and learners of English were of Spanish origin, which may have had an effect on the results, as Spanish is more similar to English than Korean or Chinese employed by Johnson and Newport. Also, their mean length of stay in the United States was more than 10 years (higher than in Johnson and Newport). The outcomes obtained by Birdsong and Mollis showed that nearly all younger participants (AOA < 16 years) performed at ceiling ($r = -.24$, $p = .22$) and that there was a correlativity between AOA and performance in older group ($r = -.69$, $p < .0001$). What is more, a point in the age function where it alters was found at age 27.5 years instead of AOA = 15, as reported by Johnson and Newport (1989), or AOA = 20 in Bialystok and Hakuta's (1994) study. The age effects in the postmaturational stage as well as over the entire of span of AOA could yet again be regarded as evidence pointing to the refutation of the CPH.

Another study was carried out by Jia (1998), in which 105 L2 English speakers took part. The participants were from twelve different backgrounds, speaking L1 languages which were not related to English. They arrived in the United States between the ages of 3 and 34 and had been residents there for a time frame stretching from 5 to 32 years. The author used two grammaticality judgement tasks (oral and visual) similar to the one applied by Johnson and Newport (1989). Jia's findings, once more, demonstrate that early arrivals perform better on tasks examining L2 rules of grammar ($r = -.68$, $p < .001$). It is worth pointing out that the participants were not split into any special age groups, nor did the author seek to target the matter of discontinuity in the age function. Jia learned that there was quite a robust link between her findings and the cases of lower L1 proficiency and more fertile L2 setting in the study. From this, she deduced that biological maturation is not the exclusive cause of age

differences in second language acquisition. This conclusion, however, is not indicative of what the role of biological maturation is, after all.

Twenty eight Spanish and thirty three Chinese learners of English as a second language and a control group of natives were chosen to partake in yet one more replication of Johnson and Newport's study undertaken by Bialystok and Miller (1999). Oral and written grammaticality judgement tasks were created in a way that allowed for manipulation of the structural variations between Chinese and English. Reaction times were taken into account as well. Interestingly, proficiency in L1 was put to test to check which language was the dominant one (L1 or L2 English). Participants were separated into four age groups (AOA 1-8, AOA 9-15, AOA 16-22, AOA 23-33) following Johnson and Newport's results. In terms of accuracy, Bialystok and Miller did not discover any major differentiation among learners older than 9 years, contrary to Johnson and Newport. The significance was only shown when comparing the youngest group of AOA 1-8 years with the remaining subjects. Significant dissimilarity was also noted when juxtaposing the scores of the youngest Chinese and the native speakers groups ($t=2.47$, $p=.04$). This was not the case for the Spanish learners, though. With regard to reaction times, the key effect of age of arrival surfaced for the Spanish participants ($F=7.16$, $p <.01$), whereas it was a relationship between grammaticality, AOA and modality for the Chinese subjects ($F=4.40$, $p <.04$). Thus, at the core of the findings, according to the authors, is the inference that little or no evidence exists for a critical period for second language acquisition. Bialystok and Miller comment that suggestive of this was the effect of L1 on the younger learners as well as the absence of distinctions based on quality for task type and structure between early and late arrivals.

Flege, Yeni-Komshian, and Liu (1999) examined ultimate proficiency in English pronunciation and morphosyntax of 240 Korean nationals whose ages of arrival in the United States varied from 1-23, and who were split into 10 AOA groups. In an oral grammaticality task of 144-item subset of stimuli (128 items which caused most difficulty in previous runs were taken from Johnson and Newport study and 16 new sentences were created) a gradual worsening of accuracy in pronunciation and performance was observed with increasing age of arrival. Ignoring variables confounded with AOA revealed that age effects prevailed in the domain of pronunciation, but not for morphosyntax. The amount of education received in the United States by the subjects was believed to be a predictor of performance on rule-based items of morphosyntax, whilst the accuracy in pronunciation as well as performance on exceptional features/items of English (irregular forms) was dependent on their use of English.

Using a modified version of grammaticality judgement task DeKeyser (2000) examined 57 Hungarian learners of English with residence status in the US of at least 10 years. Non-natives were split into two age groups: AOA < 16 and AOA > 16. The analyses of the results showed significance between age of arrival and accuracy for all learners together ($r = -.63, p < .001$), but not for either early or late learners ($r = -.04$ for AOA < 16 group; $r = -.26$ for AOA > 16 group). These outcomes, DeKeyser believes, support the Critical Period Hypothesis for second language acquisition. Whether these findings demonstrate the discontinuity in the age function that is typical for a critical period was negated by Bialystok (2002). She claimed that they are in fact more in agreement with a linear decline in the ability of language acquisition in one's lifetime, and that they rather violate the CPH for SLA.

All things considered, it is evident that such ambiguous findings cannot substantiate the existence of a period for second language acquisition that is limited by maturation. The influential study by Johnson and Newport (1989) and the research on the shape of the age function that followed in response, however, demonstrate that there is a variety of reasons, others than age of arrival, which can account for the differences in performance between pre- and post-puberty learners. These include: (1) elements unrelated to age at onset of learning such as educational background, modality of tasks (oral vs. written), L1-L2 pairings, and (2) elements possibly confounded with AOA, for example use of the L2. Still, there is not enough evidence to provide concrete answers to questions such as the existence of non-linear relationship between age of onset and L2 end state, the time when offset of a critical period takes place, or whether age is the main source of gradual deterioration of L2 attainment.

2.4 Exception to the 'rule'? Nativelike attainment in late learners

In this subsection we will look at a different assumption of the CPH, i.e., that no late second language learner should be able to attain a native-like level of proficiency. Evidence associated with native-like attainment in second language acquisition cannot be generalised easily, nor is it without contention.

In the past literature, the endstate of L2 acquisition in the was regarded as "lack of success" and researchers' main focus was on providing reasons for the "near-universal failure" of adults to achieve L2 level comparable to that of native speakers (Bley-Vroman, 1989). The generally accepted opinion was that the uncommon cases of native-likeness, if ever noted, would have no bearing on theory of L2 acquisition (ibid.). The percentage of

occurrence of native-likeness in the earlier studies was minimal (approximately 0-5%) and it is believed that the methodology used back then in this regard was not as scrupulous as it is now, e.g. selection of participants (Birdsong, 2006). Currently, nativelikeness amid late learners (AOA \geq 12 years) has been described in more than 20 studies with its incidence of 0% to 45.5% (ibid).

The rates of nativelikeness vary across different language domains. In morphosyntax for instance, higher rates can be observed if conditions such as specific pairings of L1 and L2, extensive L2 use, and the dominance of L2 are met (ibid.). As far as the pronunciation is considered, aspects such as high intensity of practising a target language, motivation to sound native-like, as well as training directed at L2 phonetics are often ascribed to assist in natively-like attainment (e.g. Bongaerts, 1999; cited in Birdsong, 2006). Whilst native-sounding pronunciation can be attained by an L2 speaker, it is an area where cases of native-likeness are confirmed less frequently (Birdsong, 2006).

In terms of domains of native-likeness, it is generally believed that late second language learners may succeed in certain tasks, but that they will not be able to perform like natives on a whole range of linguistic assessments. Nevertheless, quite the opposite has been shown in some recent studies.

Consider Marinova-Todd (2003) who studied end-state acquisition of L2 English in 30 late learners with AOA $>$ 16 years. The participants were of different L1 backgrounds and the minimum requirement for residence in the US was 5 years. An informal proficiency check was carried to select only highly fluent subjects, who also had to have gone through college education. There was also a control group of 30 native speakers. In nine tasks chosen for methodology, a number of linguistic components were put to test. These included pronunciation (spontaneous speech and reading aloud), morphosyntax (online and offline performance), lexical knowledge (oral descriptions) and language use (narrative and discourse). The main outcome of the study was that 3 out of 30 postpubescent learners met the native standard on all nine tests. Additionally, six other participants could not be differentiated from native controls on seven out of nine tasks.

Earlier, a similar study was carried out by Coppieters (1987) who recruited twenty one highly proficient, very well educated second language learners of French to participate in the study, which tested nine diverse features of French grammar, for instance past tenses or the placement of an adjective before or after a noun. Subjects chosen for the study were of different L1s (e.g., Italian, Korean) and on arrival in France they were older than 18 years.

They were referred to Coppieters as native-like in their oral proficiency by their friends and colleagues. The researcher followed with detailed interviews to establish that. An oral grammaticality judgement task and discussion on the structures elicited were employed as a procedure for the actual study. The task itself consisted of 107 sentences, split to take into account all the to-be-tested linguistic items. In terms of the quantitative analysis, it was found that the subjects' performance compared to native controls mean was out by no less than three standard deviations. The qualitative analysis in turn illustrated that different methods were used by non-native and native participants to process the same constructions. Based on these findings, Coppieters arrived at the conclusion that the late learners had most difficulty with constructions which were irregular or specific to French (e.g., the use of correct tenses in varying contexts). Areas regarded as those belonging to Universal Grammar (e.g., A-over-A constraint) displayed much less divergence between the native and non-native groups. None of the subjects, however, performed within the native speaker range.

Birdsong (1992) found faults in Coppieters's study relating to the task and choice of subjects. He decided to remedy the methodological problems by creating more adequate test instruments and more standardized rules for participant selection. With these changes in mind, he gathered a group of 20 English natives who began learning French after 11 years of age and who resided in France for at least three years (mean length of residence was twelve years). He tested them on seven various constructions of French grammar. Items used in the task included some of those used by Coppieters and covered aspects such as adjacency or the use of pronouns *il / elle* versus *ce / de* plus modifier. Birdsong observed a strong correlation between accuracy and age of arrival which varied quite immensely (from 19 to 48 years), and with reference to nativelike attainment, 15 out of 20 subjects completed the test and secured a place in the native speaker range. On the whole, results obtained by Birdsong proved to be rather different from those collected by Coppieters. They demonstrate that near-natives can behave more similarly, rather than differently to, native speakers.

In their investigation, White and Genesse (1996) looked at the phenomenon of subjacency and whether 89 late learners of English coming from different L1 backgrounds would be able to achieve a nativelike standard. The participants arrived in Canada in different times of their lives. Following oral interviews with two native English judges, they were split into two groups: near-native and non-native, and four subgroups depending on age. The performance of these groups was compared with that of 19 native controls. The procedure involved a timed grammaticality judgement task in which participants had to answer whether

or not a given sentence was possible in English, and a written question formation task. White and Genesee found that the near-native group did equally well as the native controls but with one exception, i.e., the extraction from non-finite Complementizer Phrases. Additionally, no main age effects were observed in the near-natives, which suggests that the age at which they started learning English does not impact on accuracy or reaction times. This was attested even when the results for the oldest group (AOA > 16 years) were contrasted with those of a native group. In turn, the accuracy and speed of performance of the non-native subjects were considerably worse in general. According to White and Genesee, the outcomes of the study illustrate that end-state attainment in a second language can in fact reach a native-like level. However, it is worth pointing out that a good number of the subjects were of L1, for example French, in which the phenomenon of subjacency is processed in a similar way to English. White and Genesee comment that surely this condition is not enough to warrant native-like attainment. They give an example of a study (Johnson, 1988), which found that late Spanish learners of English (the two languages operate alike) did not exhibit the native-like behaviour in terms of subjacency. In this respect, White and Genesee insist that controlling for native-like proficiency is of paramount importance when scrutinising matters of ultimate attainment. Still, one could conclude that White and Genesee's (1996) findings are perhaps harder to generalise because of the L1 and L2 similarity (French and English) in participants.

Last but not least, Ioup, Boustagui, El Tigi and Moselle's (1994) naturalistic study investigated whether two adult learners of Egyptian Arabic (EA), an Englishwoman Julie and an American woman Laura, could attain nativelike competence in TL. The former never received any formal instruction (she could not read or write in that language), and the latter acquired the language in a tutored setting. Both had lived in Cairo for a minimum of ten years. The researchers' aim was to establish what degree of convergence there was between their linguistic performance and that of native speakers. The two subjects were tested in three domains: (1) speech production, (2) accent recognition, and (3) knowledge of grammar. On the speech production task (elicitation of spontaneous speech), eight out of thirteen native speaking judges identified both women as native speakers. Worthy of note is the fact that Julie used discourse markers and pause fillers specific to Arabic in her speech, whilst Laura did not. This probably stemmed from different learning settings. In the two tasks that tested the participants' ability in accent identification, both women performed well, with Julie achieving results closer to the natives. Laura had difficulty in differentiating between three speakers. Finally, examination of grammar consisted of three tasks: translation,

grammaticality judgement, and anaphora interpretation. On the first two tasks, both Julie and Laura's performance were similar to those of the natives on most items. On the final task, Laura, having received the formal training, was the one who scored in the native-like range, whereas Julie struggled with completing the task. Based on these findings, Ioup *et al.* inferred that the two learners, despite quite a major difference in language training, had possessed analogous competence in EA grammar and that both could pass as native speakers of that language.

To sum up, more recent descriptive studies do in fact evidence that some late learners of second language achieve native-like scores in a battery of tasks. These data can be used to argue against the clear-cut assumption of the Critical Period Hypothesis that successful learning outside maturationally bound time span should never be possible. However, descriptive studies have been criticised in terms of the scope of their findings and the validity of results (e.g. DeKeyser, 2000). As for the scope, question which await answers relate to the degree to which native-likeness is all-encompassing across different linguistic phenomena, or the degree to which the native-likeness is conditional on particular L1-L2 pairs, or the degree to which the linguistic competence in general matches the native speaker competence. As for the task, it is unclear if the tasks employed are difficult enough or challenging enough to reflect an authentic attainment, or which cues, implicit or explicit, are used by learners to perform on these tasks, or whether we can freely make generalizations once native-likeness was verified in a specific task. As Birdsong (2006) points out, there is a lot of debate about how pertinent to the theory of second language acquisition the behavioural data illustrating ultimate nativelikeness and non-nativelikeness is. How much worth is there in researchers trying to nose about for a minimal existence of non-nativelikeness and regard this as evidence for malfunctioning learning mechanisms brought about by age?

2.5 Age and L2 processing: evidence from brain-based studies

Evidence obtained from brain-based studies comes as an accompaniment to linguistic facts, shedding light on aspects vital to the question of age and L2 acquisition. The key matters relating to this data will be discussed below (for comprehensive reviews of the research please consult, e.g., Abutalebi, Cappa, and Perani, 2005; Stowe and Sabourin, 2005; the limitation of localisation papers: Green, 2005; Paradis, 2004, 2005, cited in Birdsong, 2006).

The focus of neurophysiological research is to compare the processing of L1 and L2. At the centre lies the question whether one's brain applies the same methods to deal with both languages, and / or whether the two languages are localised in identical or different areas of the brain. Three main factors that are pertinent to these comparisons have been identified and these are: the age of onset of L2 acquisition, the proficiency level of L2, and the kind of task the subjects are required to carry out. Taking into account the degree of complexity involved in a cognitive process like this (language processing), not surprisingly, most findings demonstrate interrelations between these factors (Birdsong, 2006).

Neurophysiological research employs measures such as (1) neuroimaging techniques including PET (Positron Emission Tomography) and fMRI (functional magnetic resonance imaging), and (2) event-related potentials (ERPs) (Hopp, 2007). The former measure determines the extent of neuronal activity during processing of different conditions and is signalled by variations of blood flow to specific regions of the brain. These methods are best suited for extended tasks such as listening to spontaneous speech or continuous production of words. The latter measure is used to detect a response of the brain that comes as a direct result of any internal or external stimulus. The timing of the responses is said to give a measure of the timing of brain activity or time used to process stimuli. ERP technique, however, is not as accurate as PET and fMRI in establishing the loci of brain activation. Therefore, it is predominantly employed to identify fine semantic and syntactic processes (van Boxtel, 2005). ERPs often used in language research include for instance: the N400 (linked to semantic integration processes), the P600 (related to, e.g., syntactic integration, disambiguation or reanalysis), the LAN (associated with morphosyntactic incongruity) or ELAN (linked to word category violations) (Hopp, 2007).

Evidence obtained from brain-based studies provides assistance in discovering whether neurophysiological changes in the brain in the prepubescent period can explain the common trend that early learners surpass late learners in performance. Supporting the Critical Period Hypothesis for L2A, one could assume that the neural system constructed for and involved in L1 processing becomes no longer accessible for late L2 acquisition. Therefore, if different areas of the brain are activated for first and second language processing, strong maturational effects should be manifest in brain-based studies.

2.5.1 Age of acquisition and proficiency in neuroimaging studies

Early language production studies which evaluated pre- and postpubescent bilinguals illustrated that different cortical regions were activated during L2 processing. Kim, Relkin, Lee, and Hirsch (1997), for instance, using the fMRI technique examined twelve participants on a covert speech production task in which, quite naturally, a variety of language components (e.g., semantics, access to lexis, syntax) as well as abilities not related to language (e.g., memory) are engaged. The participants were not screened for proficiency. The key finding of the study was that late learners partially activated different brain regions (L1 and L2 located in different sections of Broca's area, but the same sections of Wernicke's area), whereas early learners displayed overlapping activation in both regions for L1 and L2.

Such results could suggest a negative correlation between later age of acquisition and nativelike patterns in brain response. This assumption, although persuasive to an extent, was not verified in later investigations that manipulated the variable of the proficiency level in L2 (Birdsong, 2006). Consider for example, the Chee, Tan and Thiel (1999) study which evidenced that brain activation pattern did not differ for both languages in adult learners. A comparison was drawn between early (age of L2 acquisition < 6 years) and late (age of L2 acquisition > 12 years) Mandarin-English bilinguals living in Singapore and considered highly fluent in both languages. A word generation task used in the procedure showed that the brain response in the left prefrontal cortex was alike for L1 and L2 in both groups. Apart from the proficiency level which appeared to have been a stronger predictor of the extent of similarity between the two groups than age of L2 acquisition, the task type was also seen as a factor that may have influenced the results (Abutalebi *et al.*, 2001, cited in Boxtel, 2005).

However, as Birdsong (2006) cautions, one should be careful when making generalisations about the extent of similarity between early and late learners found in production research, as that aspect is subject to variation from study to study. He also underlines the fact that the concept of "production" can refer to a number of different tasks, such as word repetition, word and sentence generation, and cognate and noncognate naming (*ibid.*).

Like production studies, research that concentrates on comprehension of language seems to lack a common quality on which to make a comparison. However, certain consistency can still be observed. There are three studies that investigated story listening (Perani, *et al.*, 1996; Dehaene *et al.*, 1997, Perani *et al.*, 1998). Perani *et al.* using a PET

technique and Dehaene *et al.* using an fMRI technique tested late bilinguals (Italian-English and French-English respectively) with proficiency in L2 at a low level. The findings of both studies demonstrate that the activation of the brain for L2 was different compared to L1. Yet, a subsequent PET study run by Perani *et al.* (1998) with highly-proficient bilinguals produced contrary results. The brain response for early Spanish-Catalan (age of L2 acquisition < 4 years) and late Italian-English (age of L2 acquisition > 10 years) was similar. According to Abutalebi *et al.* (2001: 186, cited in van Boxtel, 2005), these findings indicate that there is “considerable plasticity in the network that mediates language comprehension in the bilingual brain.” In addition, it is the level of proficiency, not the start of L2 acquisition that once again appears to predict which areas of the brain are activated.

In this context, an fMRI study that produced interesting results was conducted by Wartenburger *et al.* (2003). Three groups of Italian-German speakers of varying proficiency level were tested on semantic and syntactic violations. The participants were assigned to groups depending on the age they started learning the L2 as well as the proficiency level (i.e., early acquisition (from birth) and high proficiency, late acquisition and high proficiency, and finally late acquisition and low proficiency). In the grammaticality judgement tasks employed, the subjects were asked to read Italian and German sentences. In terms of syntax, the test items were either grammatically correct or contained errors relating to, for example, number, gender or case. In terms of semantics, the role reversal was used to test the violations. Brain activation patterns were measured for each condition and the outcomes for L1 and L2 contrasted. The authors of the study found that age of L2 acquisition correlated with performance in syntax, but not in semantics. When syntactic items were investigated, the greater amount of brain activity in Broca’s area and subcortical regions for L2 was observed in late learners together. No differences specific to any language were noted in the bilingual group. As far as proficiency is concerned, differences in the strength of brain response were observed in both conditions, with semantics being affected to a larger extent. Once more, disparities in brain activation were more visible during L2 rather than L1 processing.

To summarise, the results of neuroimaging studies on late L2 acquisition do not appear straightforward enough to reveal basic differences in brain activation during L2 and L1 processing. Data gathered, demonstrate that factors such as proficiency level, in the first place, and age of L2 acquisition impact on the degree of brain activity in the language-sensitive areas. What is more, semantic processing seems to cause fewer difficulties than

syntactic processing. This may indicate that the latter requires more effort, which, in particular, could be the case when L2 speakers with low proficiency level are considered.

2.5.2 *Age of acquisition and proficiency in ERP studies*

Generally speaking, ERP studies investigate whether learners of a second language elicit identical time-related responses as native speakers. The inferences drawn from this ERP research carry certain resemblance to those of neuroimaging studies. As Birdsong (2006: 26-27) adeptly sums up, “the ERP literature relating to the When of language processing is consistent with the fMRI and PET literature that speaks to the Where question”. To clarify, the temporal measurements for highly proficient L2 learners do not normally differ a great deal from the natives, even in cases of late age of onset of L2 acquisition, e.g., 12 years and more (*ibid.*).

Consider, for instance, a study by Hahne and Friederici (2001) which indeed demonstrates certain similarities between the two groups in that the proficiency level does in fact influence the patterns of brain’s activation during processing of syntax. Late Japanese learners of German (AOA 18-31), with a rather low proficiency level (an average of self-estimated proficiency came to 3.5 on a six-point scale, where 1 indicated no knowledge and 6 native-like competence), had to determine whether or not the sentences presented to them were semantically and/or syntactically correct. While all the participants evoked the N400 in the semantic condition, the ERP data, i.e., an early left anterior negativity and delayed P600, were absent during the processing of syntactically incorrect items. Interestingly, the pattern of results for the correct sentences in the L2 group were similar to the pattern of results for the incorrect sentences in native speakers, implying that the methods employed by late learners to comprehend a correct sentence are similar to those used by native speakers in the processing of incorrect syntactic items (Hahne and Friederici, 2001).

One of the earlier studies by Weber-Fox and Neville (1996) examined temporal neurophysiological variations during processing of syntax and semantics in 61 Chinese-English bilinguals, who resided in the United States for at least five years. The participants, separated into five groups based on their age of arrival (AOA 1-3; 4-6, 7-10, and > 16) rather than proficiency, were asked to read sentences and judge whether or not they were grammatically correct. Sentences contained syntactic and semantic anomalies, violations of specificity constraints on *wh*-movement and those of subadjacency. The results demonstrate that

all subjects with age of arrival less than eleven years performed to a native-like standard when semantic violations were considered. The N400, however, appeared later for the older AOA groups (11+). For the syntactically incorrect items, a linear decline in performance was observed with increasing AOA. A delayed P600 was found for the AOA 11-13 group, whilst for the learners older than sixteen it was absent, an outcome that Weber-Fox and Neville ascribe to both age at which the L2 acquisition started and amount of exposure. The ELAN that was present in monolinguals was not elicited in L2 learners, which the authors believe, was attributable to a small number of subjects in learner groups. Interestingly, latest research has shown that ELANs are not always found in native speakers' tackling syntactic violations, and thus the consequences of not obtaining ELANs in L2 learners in native versus non-native assessments are not fully comprehensible (Hopp, 2007). Finally, Weber-Fox and Neville interpret the lower level of proficiency in late arrivals to be the result of the differences relating to the nervous system; however it may as well be that they are the cause of these differences, discounting age of arrival for a moment.

In an ERP study with late learners of Dutch, Sabourin (2003) investigated processing of grammatical gender and gender agreement in that language. The participants were of three different L1 backgrounds (14 German speakers, 8 Romance speakers, and 9 English speakers) with a varying length of exposure to Dutch. All were screened for proficiency to ensure the selection of only highly-proficient learners. The grammaticality judgement task examined finiteness (infinitives vs. participles) and subject-verb agreement and the subjects' score was between 76% and 100%. Nevertheless, as van Boxtel (2005) rightly points out, the way in which both finiteness and subject-verb agreement are morphologically marked can be learnt by rote without difficulties, which is hard not to agree with. Additionally, this kind of marking is present in the L1s used in this study. Thus, exhibiting the ability to do well on such a task does not automatically signify that the level of proficiency is high.

In the actual ERP experiment, all three groups evoked native-like P600s and LANs (late frontal negativities) in the subject-verb agreement, although they were slightly delayed and of smaller extent in L2 participants. However, the groups differed when the ERP data were analysed for gender agreement task. While German speakers displayed more or less native-like N400 and P600 responses, the Romance speakers elicited a LAN, and the English speakers showed almost no effects at all. Sabourin's conclusion is that language processing to a native-like standard can only be feasible for items of grammar that are present and alike in both L1 and L2, which is not the case in her study. Gender is marked differently across the

languages concerned, for example, Romance distinguishes masculine and feminine genders, but German has a neuter gender apart from the two already mentioned. Effects of L1, though, are not observed in the processing of subject-verb agreement, which is consistently present in all the languages. Lastly, however, the problem with proficiency measure as well as the fact of not incorporating the participants' knowledge of gender into electrophysiological study cannot be omitted in this discussion, as they suggest that L1 alone cannot be unquestionably associated with divergences found between L1 groups.

Finally, in a more recent study investigating morphological errors in participles (regular and irregular) and plural forms, Hahne, Mueller and Clahsen (2006) show that highly-fluent Russian learners of German performed like natives on a task of reading sentences containing the items such as participles and plurals; the same ERP patterns were elicited. Previous research carried out with native speakers (Hopp, 2007) illustrated that diverging ERP data is produced with regard to incorrect regular inflection (LAN and P600) and overregularized irregular forms (N400). Hahne *et al.* (2006) demonstrate that L2 learners evinced a P600 and a LAN in terms of morphosyntactically regular inflection, i.e., incorrect participles, but a P600 alone for the plural forms. The authors speculate that the lack of LAN in the latter case can be ascribed to the morphological intricacy of plural form formation in German.

To summarise, the ERP studies that focus on the comparisons of semantics and syntax and the processing of anomalies relating to these domains do provide evidence that supports the outcomes of brain imaging studies. In particular, they demonstrate that even low-proficient L2 learners have considerably less problems with noting violations in semantics than in syntax, where the latter is potentially brought about by less efficient processing. Yet, Hopp (2007) reports that recent studies carried out with highly-proficient postpubescent learners do in fact evidence that the patterns of ERP responses observed for them in syntactic processing can mirror the ERP data present in natives. Similar conclusions can be drawn from morphosyntactic studies, however L1-TL pairings (Sabourin, 2003) and the matter of how complicated an item of morphosyntactic agreement is (Hahne *et al.* 2006) seem to have an impact on how convergent the brain responses are.

Taken together, the results from both brain imaging and ERP studies only partially agree with the Critical Period Hypothesis, in that at the onset of acquisition, L2 and L1 appear to be localised in different brain regions and the methods involved in processing of the two are also dissimilar. But, as the proficiency of L2 improves, the processing of that

language as well as its loci in the brain becomes more native-like. In this respect, Birdsong (2006) refers to the “convergence hypothesis” proposed by Green (2005) (cited in Birdsong 2006: 27), which states exactly the latter. Yet, when one considers separate domains of language, processing is not so alike. For example, the degree of non-convergence is less pronounced in semantics than it is in syntax, which relies more on the level of proficiency. Inflectional morphology seems to be affected by L1, in turn.

In the remaining part of this paper, we are going to focus on L2 ultimate attainment at the syntax-morphology interface, specifically the inflectional morphology.

Chapter 3

Ultimate attainment at the syntax-morphology interface:

The problematic case of inflectional morphology

It has become apparent from studies of endstate grammar with advanced or near-native speakers is that grammatical components which are located at the interface between syntax and other cognitive domains often show “residual first language (L1) effects, indeterminacy or optionality” (Sorace, 2000; 2003; 2005; cited in Sorace and Filiaci, 2006: 340). However, no data supporting optionality in syntax itself have been produced (*ibid.*). Descriptive studies considered in the previous chapter already highlight certain variations across the domains of language. White and Genesee (1996), for instance, who concentrated on syntax alone show that a substantial number of near-natives perform in the native speaker range. However, studies which investigated several constructions, e.g., Coppieters (1987), Johnson and Newport (1989) and their later replications, demonstrate that late L2 learners display some variability in areas such as inflectional morphology or syntax-semantics coordination. This state of lacking unity between successful acquisition of syntax and not-so-successful acquisition of the interfaces at L2 endstate has been referred to as the Interface Hypothesis (Sorace and Filiaci, 2006). In line with the hypothesis, “narrow” syntax can be fully learnt by L2 learners, albeit the process may be subjected to considerable delays on development. In turn, features that involve syntax-other domain interface may not be acquired in their entirety. It has been observed that the Interface Hypothesis applies in other aspects of language, for example, bilingual language acquisition, L1 attrition or diachronic language change (*ibid.*), but these are not the focus of this paper and will therefore not be considered here.

The hypothesis is not a model of second language acquisition or L2 endstate, but it provides assistance in identifying areas of divergence in adult L2 acquisition of grammar (Hopp, 2007). In order to determine which interfaces do display non-convergence, the hypothesis has to take account of limitations on L2 attainment, which can be classed in terms of their “nature” (representational and computational), “cause” (impairment, inefficiency, and L1 interference) and the “domain” of where they apply (grammatical modules/submodules and interfaces) (Hopp, 2007). As far as the nature of such constraints is concerned, representational deficit theories presume that lack of convergence can be found in non-target-

like representations in grammar, whilst computational accounts suggest that the problem lies in the computation of grammar (ibid.). Impairment refers to a particular element of grammatical or procedural structure, which is different from that of natives as a result of a critical period. Inefficiency relates to mechanisms in computation which are not as automatic as in natives. L1 interference means that L1 has an impact on how grammatical knowledge is represented or computed. It is likely that the three causes operate at the same time in producing divergence (ibid). In terms of domains, any cause could have an impact on any of the modules or their submodules, on how they interact at the interfaces, or on how different grammatical knowledge is used in on-line settings.

The focus of the rest of this chapter will be on L2 ultimate attainment at the syntax-morphology interface, in particular on inflectional morphology. A discussion of a few representative studies will follow in order to ascertain the scope and the causes of divergence in the relevant area. Models of L2 ultimate attainment linked with syntax-morphology interface will also be covered.

3.1 The problematic case of L2 inflection

The exploration of the link between underlying syntax and overt morphology (syntax-morphology or syntax-lexicon) has been long-established, however not expressed in interface terms (White, in press). A matter that aroused special interest relates to the fact that L2 learners often display variability in their spontaneous production of inflectional morphology and function words, leaving those out, or incorrectly substituting one type for another. Specifically, items such as bound morphemes which express, for instance, tense, verbal agreement, case, gender, as well as closed-class items, for instance, auxiliaries, determiners, complementizers, appear to cause ongoing problems for late L2 learners. Early research on the order of acquisition of morphemes (see Zobl and Liceras, 1994, for review) suggests that the course of acquisition is slow and rather gradual. What is more, target-language inflection is the second most difficult concept to acquire by L2 learners after phonology (e.g. Long, 1990) and a strong candidate for fossilisation in adult L2 speakers (referred to as “persistent selective fossilisation” in Hawkins, 2000; “stable optionality” in Sorace, 2000).

Recent studies, including those carried out within the Universal Grammar context¹, also note the phenomenon of unpredictable employment of inflectional morphology and function words (White, 2003b). Although the matter of this kind of variability is not controversial, there is little agreement as what the exact causes of this issue are, and specifically whether or not this fact is indicative of impairment to the interlanguage grammar. Linguistic theories that presume full access to Universal Grammar in second language acquisition, might suggest that the process of language learning should be reasonably errorless and that success should apply in all domains, including morphology. But, considering the ongoing issues that the learners display with regard to inflection, certain researchers have interpreted these problems as evidence against the functioning of Universal Grammar in the course of L2 acquisition (Clahsen 1988; Meisel, 1991; cited in White, 2003b).

In recent literature, however, two rather different perspectives have been entertained to account for late L2 learners' unsystematic use of morphological inflection. According to the first view, the inconsistency in the provision of inflection is explained in terms of grammatical representation. More specifically, it is claimed that this variation is a sign of either (1) a developmental phenomenon, in accordance with which some abstract categories or features are initially absent from interlanguage grammar, but are later acquired; or (2) some sort of major impairment to grammar, or deficit. Several researchers in L2A have supported this view (e.g. Meisel, 1991; 1997; Eubank 1993; 1994; Eubank *et al.* 1997; Beck, 1998; cited in Ionin and Wexler, 2002).

In contrast, other researchers argue that abstract features and categories do exist even in the early grammar of L2 learners and that the underlying syntactic information is not impaired. What happens is that a connection between relevant parts of grammar may be somehow impaired, causing the learner's failure to retrieve the necessary morphological information even when it was previously learned. Haznedar and Schwartz (1997) have referred to this as Missing Inflection Hypothesis, which later has been termed as Missing Surface Inflection Hypothesis (Prévost and White, 2000). Lardiere (2000) makes a case for mapping problems between abstract syntactic elements and the corresponding surface morphology (for explanation of the difference between surface and abstract morphology, please consult White, 2003b: pp. 180-181). Hawkins (2000) thinks that this signifies issues

¹ A detailed discussion of generative framework is outwith the scope of this dissertation and therefore will not be considered.

with computation, rather than representation. Depending on which of the views have been regarded as predominant, various inferences about the nature of inflectional variability in adult L2 acquisition have followed.

3.1.1. Mapping problems at the interfaces: tense and verbal agreement

The main focus of the late research has been on tense and agreement morphology, which also assists syntactic functions, such as licensing nominative cases on subjects and governing verb raising, that is moving finite verbs across adverbs, negation and in questions (Pollock, 1989, cited in Hopp, 2007). Inconsistent use of overt inflection as well as notably accurate performance on syntax have been accounted for in a number of studies.

In child L2 acquisition, the differences between verbal inflection and diverse syntactic structures were reported by Haznedar and Shwartz (1997) and Haznedar (2001) on the basis of L2 English production data from a four-and-a half Turkish-speaking child, Erdem. The authors investigated the suppliance of inflected and uninflected verb forms, copula and auxiliary *be*, null subjects, and case on subject pronouns over a period of 18 months. Analysed material demonstrated several distinct features. Erdem frequently did not provide regular past tense inflection as well as third person singular on lexical verbs; he very rarely omitted subjects and consistently assigned nominative case (e.g., *I* instead of *me*) to subject pronouns. What is more, the level of provision of items such as the copula, overt subjects and nominative subjects was high even early on in the data; however, inflection for agreement and tense continued to be unsystematic right through the whole 18-month period. Erdem appeared to instinctively know of some syntactic requirements of English (e.g., subjects must be overt). Although he generated many non-finite forms in his speech, his correct use of subjects occurred well in advance of uniform production of overt morphology in obligatory contexts. Haznedar (2001) also provided strong evidence for the suppliance of subject pronouns alone, which is indicative of the fact that the case checking mechanism was being employed. The authors argue for the absence of the Optional Infinitive (OI) stage in Erdem's L2 English acquisition and suggest that Tense is not underspecified in the grammar of this child (Erdem produced correct utterances with inflected forms in Turkish). It is claimed that Erdem's uninflected items in English are finite with Missing Inflections (MIs).

The above study shows morphological variability in a learner who is still in the developmental stages of second language acquisition (see also a study of twenty Russian-

speaking children acquiring English by Ionin and Wexler, 2002). Lardiere (1998a,b) demonstrated that this sort of difference between overt morphology and underlying syntax can also be present in some endstate grammars. She investigated L2 oral and written English of Patty, an adult L1 Chinese speaker. Patty was born in Indonesia, but her parents were of Chinese background and spoke two Chinese languages. Patty acquired Indonesian, which underwent attrition after she moved to China for about 25 years, but considers the two Chinese languages her mother tongues. Patty was 22 when she emigrated to the United States. She attended college, received ESL instruction and later completed her bachelor's and master's degree in accounting.

Lardiere's data was naturalistic, with Patty having been recorded on three different occasions; first recording was taped when she was 32 years old, after ten years of residence in the US, and later after nine years. The last recording was done about two months after the second one. Lardiere's first study (1998a) examined the rate of provision of L2 English past tense morphology and this data was juxtaposed with Patty's performance on the distribution of pronominal case. The second study (Lardiere, 1998b) focused on the rate of provision of verbal agreement marking in contexts other than past and the position of thematic verbs relative to Neg and clause-internal adverbials.

Lardiere found that little change was observed in Patty's provision of inflection between the different times of recordings, which implies that her interlanguage had fossilised. The data illustrated disparities between morphological marking and the syntactic repercussions of finiteness and agreement. In the first study (Lardiere, 1998a), Patty appeared to have acquired marking of case of English pronouns that is licensed by syntactic finiteness features, but did not succeed in providing the corresponding past tense inflection systematically. The recordings demonstrated that whilst the suppliance of past tense marking was very low (approximately 34%) in all three recordings, the provision of nominative and accusative pronouns was flawless (100% accuracy). The analyses in the second study (Lardiere, 1998b) also showed that the subject's agreement marking on verbs was mostly absent. Particularly impoverished was Patty's third person singular marking with thematic verbs, with the suppliance of 0% to 4.76% in the obligatory contexts. When the auxiliaries (*do*, *have* and *to be*) are considered together with the results for the third person singular marking, the percentages do increase importantly, but they never reach 100%. In terms of verb placement with respect to adverbs and negation (linked with a syntactic finiteness feature), Patty exhibited 99% accuracy. The results clearly suggested that verb-raising in

Patty's L2 English was not an option. Lardiere understood these outcomes as the evidence for the suggested dissociation between the knowledge of abstract syntactic properties and surface morphology. Patty's excellent performance on case marking was taken to indicate that she successfully learnt the distinction between [+fin] and [-fin] and that Tense was completely specified for finiteness in her L2 English syntax regardless of the fact that the level of past tense inflection provision in her speech was low. The fact that Patty disallowed verb-raising in English (again in spite of inconsistent nonpast agreement marking on verbs) led Lardiere to deduce that the subject succeeded in the acquisition of the L2 functional categories, features or feature strength.

Prévost and White (2000) also make a case for a mapping problem between abstract syntactic features and surface morphological forms. In their study with learners of French and German, they have put forward the Missing Surface Inflection Hypothesis (MSIH) (following Haznedar and Schwartz, 1997; Lardiere, 1998a, 1998b; and Prévost and White, 1999), according to which "variability in adult L2 performance does not reflect a deeper lack of functional categories or features associated with tense and agreement. Rather, L2 learners have difficulties with the overt realization of morphology" (Prévost and White, 2000: 104). The authors examined their hypothesis by looking at the spontaneous longitudinal production data from four adult learners. The two learners of French, Adbelmalek and Zahra, were of Moroccan Arabic background and the other two learners of German were native speakers of Spanish (Ana) and Portuguese (Zita). All the subjects' first contact with the target language was on their arrival in a given country. Adbelmalek and Zahra were first recorded following a residence in France of one year, at which point their proficiency was deemed limited. They were recorded at regular intervals (more or less once a month) for the next three years. The recordings of the two learners of German were initially taped three months into their stay in Germany, and later regularly for almost two years. Ana was the only one who attended German classes and was considered to have more exposure to that language than Zita.

Prévost and White's predictions relating to finiteness and agreement were that (1) non-finite verbs would serve as replacements for finite items, but not the other way round; (2) a finite verb can only occur before negation, and never after a negator, a preposition, auxiliary, or modals; and (3) finite verbs would display correct agreement. The authors' findings revealed that considerable majority of verbs in non-finite environments were correctly non-finite, with Ana's 92.8% on one end, and Zahra's 98.7% on the other (p. 114). Greater variation was observed in terms of non-finite verbs being overused in [+fin] contexts,

where the percentages ranged from 10.5% overuse in Ana to 25.9% in Zahra and Abdelmalek's data (p. 118). The instances of overuse of finite verbs in non-finite positions was significantly lower for three out of four subjects. Ana was the exception, as the contrast between her overuse of finite and non-finite forms was a lot less distinct. Whilst the results for Zita, Zahra and Abdelmalek were in harmony with the first two predictions, the case of Ana remained ambiguous in this respect.

As far as the verbal agreement marking is concerned, the outcomes demonstrated that agreement was accurate between, approximately, 88.1% of the time (Ana) and 95.8% of the time (Abdelmalek). Inflected items alone were taken into account in this analysis here, thus the results reflect what percentage of the agreement supplied was correct, rather than the degree to which the agreement was there. In that case, the third prediction is arguably corroborated.

Prévost and White (2000) endeavour to articulate the mapping problem between features and surface morphology by adopting Distributed Morphology (Halle and Marantz, 1993), in line with which an inflected item is thought to be linked with grammatical features such as tense, person, number and gender. In the course of insertion of lexical items, the features of such an item ought to be in agreement with the features of the terminal node in the syntax. The most important thing is that whilst the formal features in syntax are fully specified, those of lexical items can be not specified or underspecified in certain respects, for instance, for finiteness. Therefore, it is likely that a lexical item with missing or partially specified features is matched with a fully specified syntactic node, especially where no other lexical item with more specified features is there to compete. During acquisition, the features become more specified in the process of learning of inflectional concepts, and the default forms are employed less often. These are not eliminated totally, as cognitive demands in late L2 learners are bigger:

[...] even when more fully specified forms are acquired, they do not necessarily always 'win' in the competition for lexical insertion, so that underspecified forms continue to surface. This suggests that access to the more fully specified lexical entries is sometimes blocked. That is, even when a form specified for the relevant features has been acquired, it becomes temporarily irretrievable from the lexicon. We speculate that this might be due to processing reasons or to communication pressure, in which case one might expect the problem to affect different kinds of language use differentially. (Prevost and White, 2000: 129)

Hence, it seems that non-target-like employment of inflectional morphology should be determined by the computational demands of the given situation or task.

According to Prévost and White (2000), pertinent grammatical features of the terminal node in the syntax are acquired by second language learners through first language, Universal Grammar or L2 input, however, the corresponding lexical items might not have been completely learnt. The authors suggest that non-finite and finite forms are specified in adult grammars as [-fin] and [+fin] respectively, but that the non-finite item may be inserted into a node carrying the [+fin] feature in the interlanguage grammar, as an L2 grammar contains mismatching features. Conversely, finite items are fully specified and thus occur in finite contexts. Taking this into consideration, one can assume that no syntactic deficit does exist in L2 grammars.

As mentioned earlier, Lardiere (2000) regards this divergence between the syntactic features and varying morphology as a problem in mapping syntactic features to corresponding morphological forms, to which, again, Prévost and White (2000) refer to as the Missing Surface Inflection Hypothesis. These two explanations are different, however, in a sense that the researchers presume unlike fundamental causes of the morphological variability in L2 learners, i.e., representational differences in morphology (Lardiere, 2000; 2005) and computational problems in mapping properties at the syntax-morphology interface (Prévost and White, 2000). Lardiere (2000, 2005) states that ongoing problems with L2 inflection signal non-target-like competence in morphology, that is underspecified representation or divergence in the featural composition of markers in morphology.

Morphological competence includes, most obviously, the knowledge of which forms 'go with' which features. But consider what additional kinds of knowledge are required: What are the conditioning factors and are these phonological, morphosyntactic, semantic, or discourse-linked? Are certain forms optional or obligatory, and what constitutes an obligatory context? In which domains are various features expressed, in combination with what other features, and why is supposedly the same feature expressed in some domains in some languages but not others? (Lardiere, 2005: 179)

Lardiere believes that issues with feature assembly in morphology ought to be demonstrated mainly in more intricate form-to-function mappings and illustrate diverse L1 effects.

Considering the two accounts, it seems that there is still certain amount of ambiguity with regard to the nature of mapping problems at the syntax-morphology interface. It is not clear whether this divergence between syntax and morphology also applies to endstate L2 speakers whose languages did not undergo fossilisation, or whether the type of first language has any influence on the mapping problems, or whether all learners are affected in the same way. Research on gender marking and gender agreement (e.g. Sabourin, 2003;

Francheschina, 2005) appear to provide evidence that inflectional morphology can be ‘shaped’ by L1; but the question of how or to what extent L1 representations or computations can manipulate the issue of mapping is still to be answered. White (2003a) makes an assumption that if the inflectional morphology is present in L1, then the L2 learners become more sensitive and uses overt inflections in the target language. However, it is hard to establish whether this sort of ‘alertness’ makes the acquisition of L2 inflection easier on the whole, or whether L1 effects specifically apply to only certain properties of TL morphology. Another issue to take into account is that different morphological structures can cause different problems for learners. Consider for example the fact that Patty (Lardiere, 1998a; 1998b) did a lot worse on third person singular marking than on her past tense marking. Prévost and White (2000) in light of their Missing Surface Inflection Hypothesis suggest that processing pressures are the major causes of variability in inflectional morphology. However, they demonstrate no psycholinguistic data in favour of their assumption, so the exact use of defaults and whether they surface for all sorts of inflectional morphology is yet to be explored. Bearing these in mind, the account that unsystematic production of morphology is attributable to computational problems in retrieval of lexical items, is rather post hoc (White, 2007) and thus the above hypothesis cannot make predictions with regard to the scope of problems with L2 inflection (Hopp, 2007).

To summarise, ‘mapping’ accounts presume that the non-convergence at the syntax-morphology interface is mostly due to either morphological competence or the computation of form-function mappings. The ongoing problems in determining (Lardiere, 2000; 2005) or retrieving (Prévost and White, 2000) the arrangement of inflectional features, are claimed to be prevalent at the L2 ultimate attainment. These approaches appear to better encapsulate the differences in performance on syntax and morphology than the grammatical representation account that was briefly mentioned at the beginning of this chapter. The ‘mapping’ explanations concentrate on the systematic regularity of the issues of L2 inflection, rather than on drawing comparisons between the performance of L1 and L2 speakers in their assertions. Nevertheless, the ‘mapping’ accounts still have to investigate the exact nature (properties and processes) of syntax-morphology interface, the function of mother tongue, and whether interfaces other than the one under scrutiny here have anything to do with the issue of mapping.

Chapter 4

Conclusion

This paper constitutes a modest attempt to address the issues relating to age effects in second language acquisition at L2 ultimate attainment. Particular attention was paid to the syntax-morphology interface, and specifically to the morphological variability in L2 learners. Our main aim was to examine performance similarities and differences between adult native and adult non-native speakers in a variety of literature.

From the data relating to the Critical Period Hypothesis, which certainly informed much language acquisition research, it can be concluded that critical periods have their origins already in developmental biology and their constraints also extend, to a certain degree, to human language acquisition, both first or second language learning. It has been found that different domains of language are affected in different ways, some more than others.

Studies on the shape of age function produced mixed results, and therefore they did not clearly support a period in L2A that is maturationally bound. The prominent study by Johnson and Newport (1989) and the research that followed in response, however, showed that there is a variety of reasons, others than age of arrival, which can explain the differences in performance between pre- and post-puberty learners. Some of them were: educational background, modality of tasks, L1-L2 pairings, etc. Yet, there was not enough evidence for non-linear relationship between age of onset and L2 end state.

Descriptive studies demonstrated that some late learners of second language did attain target-like-ness in a series of tasks, thereby contradicting the assumption of the Critical Period Hypothesis that successful learning outside maturationally constrained time span should never be possible. However, these studies received criticism relating to the scope of their findings as well as tasks employed.

The outcomes from brain-based data were in harmony with the Critical Period Hypothesis only to a certain extent, in that at the start of acquisition, L2 and L1 appeared to be localised in different brain regions and the methods involved in processing of the two were also unlike. However, this changes with increasing L2 proficiency.

Lastly, in terms of the syntax-morphology interface and adult L2 learners' persistent problems with L2 inflection, the 'mapping' account appeared to better explain the morphological variability. However, a number of questions still remain unanswered.

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