The theoretical significance of research on language attrition for understanding bilingualism

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Abstract: The most important and most controversial issue for bilingualism research is the question why children are better at language learning than adults: while all normally developing children reach fully native speaker proficiency, foreign language learners hardly ever do.

Researchers disagree as to whether this age effect is due to **language-specific** neurobiological and maturational processes or to **more general factors** linked to cognitive development and the competition of two language systems in the bilingual mind. As both scenarios predict non-native like behavior of second language (L2) learners, it has to date been impossible to conclusively establish which of them actually obtains.

I propose that new insights can be provided by including first language (L1) attriters in the comparison: migrants who are using their L2 dominantly, and whose L1 is consequently deteriorating. These speakers acquired their L1 without maturational constraints, but they experience the same impact of bilingualism and competition between languages as L2 learners do. They therefore provide a source of data that is non-native for reasons which are known.

If attaining native speaker proficiency is maturationally constrained, processing strategies should remain native-like in an L1 which has become non-dominant. If the persistent problems of L2 learners are due to issues such as lack of exposure and competition between languages, attriters should become more similar to foreign-language learners than to natives.

Key words: Language attrition, Critical period, Late L2 learning

1. Age and bilingual development

Qualitative vs. quantitative differences of native and foreign language learning

One of the greatest explanatory challenges for linguistic research is the difference between languages learned from birth versus later in life: whereas all normally developing children can attain full native language proficiency, there is considerable variability in ultimate attainment among older learners of a second language (L2) and few, if any, late learners ever become fully native-like across all linguistic levels. The development of bilingual proficiency also impacts on the native language in a process which has been referred to as first language (L1) attrition: while advanced L2 learners are characterized by residual optionality in their L2 (they sometimes use language in ways which deviate from what native speakers do), they may also show similar signs of emerging optionality in their L1 (Sorace 2005; Tsimpli, Sorace, Heycock & Filiaci 2004).

With respect to L2 development, there are two competing views: one which takes residual optionality to be an indication of an underlying representational deficit, conditioned by maturationally constrained limitations to language acquisition, and one

which assumes that L2 learners can establish native-like underlying knowledge but fail to apply it consistently, due to the cognitive demands engendered by the competition between the two languages. These demands increase with age of acquisition (AOA), since the first language becomes more deeply entrenched with continued use.

These two competing views have important implications for our understanding of the human capacity for language, and in particular the degree to which the brain is specialised for language and its acquisition. However, it seems impossible at present to determine which of the two scenarios applies. This is partly due to the fact that both hypotheses make similar predictions: L2 learners are assumed to have a high proportion of non-targetlike structures at the initial stage, and to become better as proficiency increases - either because they have achieved a targetlike representation, or because they have perfected compensatory strategies (e.g. Hawkins & Tsimpli 2009; White, Valenzuela, Kozlowska-Macgregor & Leung 2004). In particular, proponents of the representational deficit account argue that "apparent target-like L2 performance" should not be interpreted to constitute "evidence for the acquisition of underlying properties of grammar" (Hawkins & Hattori 2006:298).[1] The further complication that findings from L2 speakers are invariably influenced by a number of other factors, such as typological similarity and proficiency levels (which invariably correlate with age at acquisition) renders the question about the nature of late L2 learning at present unanswerable.

The age effect in L2 development

There are two competing explanations for the correlation of AOA and ultimate attainment:

a) maturational processes which *specifically* affect the language faculty
b) *more general* development in conjunction with increasing competition from L1

The first approach assumes that at a certain age (usually taken to lie around puberty[2]) there is a biological-neurological change in the language acquisition faculty, restricting the capacity for further linguistic development. While foreign language learning is still possible, the grammatical and phonological structures of the first language have been firmly established in the mind ('crystallized'), and L2 development - particularly for those aspects which are not instantiated by the L1 - has to rely on compensatory strategies which are different from monolingual representation/processing. Entirely native-like attainment in postpuberty learners is taken to be extremely rare, if not impossible. This approach is usually associated with terms such as 'Critical Period' (Abrahamsson & Hyltenstam 2008, 2009; DeKeyser 2010; Lenneberg 1967; Penfield & Roberts 1959), 'Sensitive Period' (Harley & Wang 1997; Long 1990, 2005), 'Fundamental Difference' (Bley-Vroman 2009; Montrul 2009) or 'Representational Deficits' (Hawkins 2001, 2003; see also the papers in Snape, Leung & Sharwood Smith (eds) 2009).

[1] Some researchers have interpreted the predictions of the representational deficit account differently, claiming that nontargetlike representations of grammar should lead to " poor performance across a variety of tasks" and imply "across the board effects" (White et al. 2004: 111f.). These interpretations were explicitly addressed by Hawkins & Tsimpli (2009), who argue that "this confuses performance with competence": apparent accuracy may *either* mean that the underlying feature has been acquired *or* that compensatory strategies (e.g. context-dependencies in the Vocabulary) allow the learners to "look like they are performing in a target-like way".

[2] It should be noted that age-related effects can vary widely across linguistic subskills. Lexical acquisition, for example, appears to be relatively unimpaired in older learners, while attaining native-likeness in some areas of phonology and syntax appears to be much rarer in late L2 acquisition. The 'cutoff' point for becoming native-like may thus vary, and be situated earlier for some subskills than for others (see Hopp & Schmid, forthc.).

On the other hand, many researchers assume that the lower ultimate proficiency found among older learners is not based on a highly specific 'dismantling' of the neurobiological prerequisite for language acquisition but on the fact that, like any other process of human learning and development, L2 acquisition is subject to cognitive aging effects such as a slowdown of information retrieval and reduced working memory capacities, making older learners less efficient than younger ones (Bialystok 1997). Furthermore, a crucial difference between L2 and L1 learners is that the former already possess linguistic representations, and can therefore "never again initiate their brain to language" (Herschensohn 2009:281). Language learning for older speakers is therefore increasingly impeded by the fact that they have a mature and deeply entrenched L1 system that the L2 - the linguistic 'newcomer' - has to compete with (MacWhinney 1987).

The controversy in the debate on the effect of age of acquisition in SLA thus centres on whether there is a **qualitative** or a **quantitative** difference between early and late L2 learners, or between L1 and L2 speakers: is it merely that older learners *do not do* as well, or is it that they *cannot*? (Long 2005:288) That the controversy is as yet unresolved was most recently demonstrated in the collection of papers which appeared in a special issue of *Studies in Second Language Acquisition* (Vol. 31, Issue 2, 2009), which pitches the two camps firmly in opposition to each other.

The age function

While it is uncontested that AOA impacts dramatically on ultimate attainment, the shape of the age-success function is under debate. Proponents of some form of specific maturational constraint on language learning have advanced evidence from studies which show a sharp drop in ultimate proficiency during a relatively short timespan around puberty, with no necessary further decline associated with increasing age of acquisition (e.g. Johnson & Newport 1989; Flege, Yeni-Komshian & Liu 1999; DeKeyser 2000, 2010.). On the other hand, a number of studies have found an age-attainment function which is not steeply sloped around puberty but rather shows a gradual decline which continues across the entire lifespan (e.g. Bialystok & Hakuta 1999; Bialystok & Miller 1999; Birdsong 2006; Hakuta, Bialystok & Wiley 2003). For those studies which do show a steep curve, this is argued to be an artefact of the interaction of age with other factors such as amount of exposure, cue strength and entrenchment (e.g. MacWhinney 1997), nature of input, motivational or educational factors and typological similarity between L1 and L2 (Bialystok 1997; Birdsong 2006:13, but see Long 2005).

Again the fact that the two views on the underlying shape of this function appear irreconcilable can be illustrated on the basis of the contributions to a recent special issue, in this case the *International Review of Applied Linguistics in Language Teaching* (IRAL, Vol. 43, Issue 4, 2005).

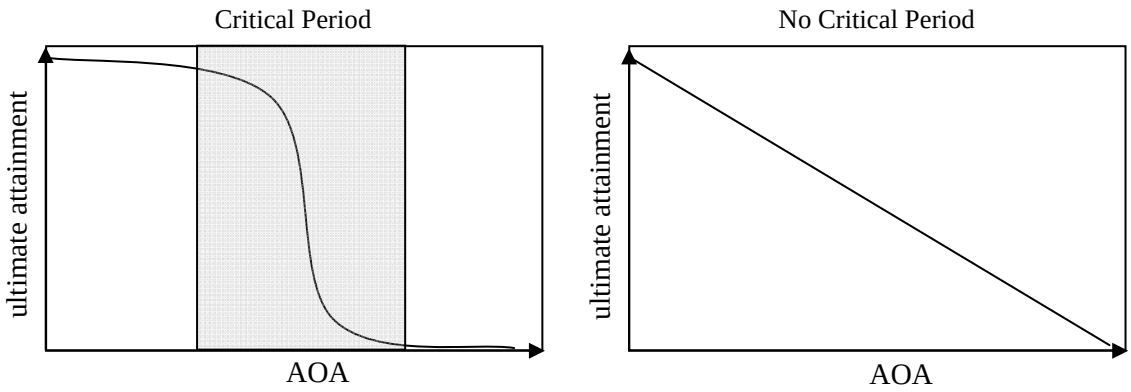

Fig. 1: Two views on the shape of the AOA/ultimate attainment function

The impact of AOA on linguistic knowledge/processing

While many of the debates which centre specifically on the existence of a Critical Period are based on general measures of linguistic proficiency, the nature of the differences between L1 and L2 (qualitative or quantitative) also plays a key role in research on the specific architecture of linguistic knowledge as well as on online processing and its neurobiological correlates. One of the questions asked with respect to post-puberty L2 learners is whether the underlying representations of the L2 system and the cognitive processes L2 speakers apply to using and understanding language are **essentially different from** or **essentially the same as** those of L1 speakers.

The chief problem in this respect is that, as was pointed out above, ultimate proficiency is invariably highly correlated with the age of first exposure in any bilingual population. This implies that in studies which do report age-related differences in processing strategies (e.g. Weber-Fox & Neville 1996), it is unclear whether these are the outcome of the age at which L2 learning began or simply an effect of the lower proficiency of the older groups. On the other hand, investigations of highly advanced bilinguals tend to find that proficiency is a more important predictor of the similarity of natives and late bilinguals than AOA (e.g. Hahne 2001; Herschensohn 2009). This echoes Long's (2005) question of whether older speakers *do not* or *cannot* reach native-like levels.

The controversy about qualitative vs. quantitative differences between native and foreign language learners therefore concerns the question whether highly advanced L2 learners 'mimic' L1 behaviour, but base it on different underlying representations or processing mechanisms, or whether they can acquire linguistic representation and processing strategies which are indistinguishable from those of L1 speakers. The two competing views will be referred to as the 'difference' or the 'identity' hypothesis. Their assumptions are summed up in table 1.

While investigations of L2 development almost invariably reveal differences between populations (native speakers vs. foreign language learners), it is extremely difficult to establish whether these are the outcome of AOA or of confounding factors, such as typological distance between L1 and L2, amount of input and proficiency levels. In other words, it is unclear whether these characteristics merely mark an intermediate stage in the developmental path to becoming truly native-like, which all L2 learners ***might*** follow to the end but, for various reasons, few of them ***do*** - or the end-stage which, due to maturational restrictions is actually the limit of their potential.

Table 1: Approaches to SLA based on 'difference' or 'identity' with respect to native speakers

	Difference	Identity
underlying knowledge	post-puberty L2 learners have a 'representational deficit' for some grammatical structures which are not instantiated by their L1 (e.g. Hawkins & Chan 1997; Smith & Tsimpli 1995)	L2 learners (of all ages) can have target-like grammatical representations which they occasionally fail to map to the surface structure of the utterance, due to increased competition from L1 (e.g. Lardiere 1998; Prévost & White 2000)
processing	post-puberty L2 learners' processing strategies are 'shallower' and less detailed than those of native speakers (e.g. Clahsen & Felser 2006)	L1 and L2 speakers (of all ages) employ essentially the same processing mechanisms. Bilingual speakers' processing is slower and less efficient due to the higher cognitive cost of coordinating two linguistic systems (e.g. Frenck-Mestre, Foucart, Carrasco & Herschensohn 2009; Hopp 2008)

It is therefore impossible to resolve the issue of the difference between early and late language learning with research that is confined to the comparison of monolinguals versus bilinguals. Instead, a different population of bilingual speakers should be invoked, consisting of individuals who

- have acquired the language under investigation implicitly and as monolinguals during childhood, and therefore
- possess native grammatical representations and processing strategies for this language

but who

- experience the same competition from another language as L2 learners,
- have to exercise the same control associated with bilingual processing, and
- show optionality in the application of grammatical rules similar to the L2 populations investigated in SLA research.

Such a population can be found in speakers who were raised in a monolingual environment, but who emigrated at some point in their lives and use the language of their environment on a regular (or predominant) basis. I therefore propose that the focus of investigation should be shifted from *L1* vs. *L2* to *dominant* vs. *non-dominant* languages, that is, that research shold include the lesser-used language of bilinguals who have acquired this language in different settings and at different ages. This approach allows for a comparison of L2 learners on the one hand and speakers who have acquired a language as their L1 during childhood but ceased to use it in daily life on the other. Such a population can be found in speakers who were raised in a monolingual environment, but who emigrated at some point in their lives and use the language learned in emigration on a regular (or predominant) basis. The linguistic development observed in such contexts has been termed first language attrition.

2. First Language Attrition

The term 'First Language Attrition' (L1A) refers to a gradual decline in native language proficiency among migrants. As a speaker uses his/her L2 frequently and becomes proficient (or even dominant) in it, some aspects of the L1 can become subject to L2

influence or deteriorate. L1 attriters, like L2 learners, display optionality and variability on a range of structures for which nonattrited monolingual native speakers show deterministic behaviour (Sorace 2005; Tsimpli et al. 2004; Schmid 2002). In the context of attrition, however, there is strong evidence that this optionality is *not* indicative of representational deficits: the same individuals do not appear to encounter recurring problems with the same kinds of grammatical phenomena in different speech situations or on different tasks (Schmid 2009). This suggests that problems of L1 attriters are due to momentary conflicts between the two linguistic systems and not indicative of a structural change to underlying linguistic knowledge (that is, to an emerging representational deficit of any kind).

This assumption is in line with a range of investigations of L1 attrition which argue that this process may affect interface phenomena (e.g. the distribution of overt and null subjects in pro-drop languages) but will not touch the narrow syntax (e.g. Tsimpli et al. 2004; Montrul 2004, 2008).

The age effect in L1A

While attriters are reliably outperformed by native speakers on a range of tasks measuring overall proficiency (Schmid & Dusseldorp 2010), there is an astonishingly small range of variability and low incidence of non-targetlike use in data even from speakers who claim not to have used their L1 for many decades (in some cases upwards of 60 years, e.g. de Bot & Clyne 1994; Schmid 2002), provided they emigrated after puberty: the most strongly attrited speakers still tend to compare favourably to very advanced L2 learners (Hopp & Schmid, forthc.; Schmid 2009). If, on the other hand, environmental exposure to the L1 ceases before puberty, the L1 system can deteriorate radically (Köpke & Schmid 2004).

There are few studies of L1A specifically investigating the impact of AOA. However, converging evidence suggests an age effect which is stronger and more clearly delineated than the effects which have been found in SLA research. Two studies which consider pre- and postpuberty migrants (Ammerlaan 1996, AOA 0-29 yrs; Pelc 2001, AOA 8-32 years) find that AOA is one of the most important predictors of ultimate proficiency, while a number of studies which investigate the impact of age among postpuberty migrants fail to find any effect whatsoever (Köpke 1999, AOA 14-36 yrs; Schmid 2002, AOA 12-29 yrs; Schmid 2007, AOA 17-51 yrs). A range of studies conducted by Montrul on Spanish heritage speakers in the US as well as Spanish-English bilinguals with varying levels of AOA also suggests that the L1 system of early bilinguals may be similar to that of L2 speakers, while later learners pattern with monolinguals in their L1 (e.g. Montrul 2008, 2009). These findings indicate strongly that early (pre-puberty) and late (post-puberty) exposure to an L2 environment have a differential impact on possible fossilization and/or deterioration of the linguistic system.

A recent investigation, focussing specifically on the age effect in L1 attrition, lends further substantiation to the assumption of a qualitative change around puberty: Bylund (2009) investigates the L1 of 31 Spanish speakers who emigrated to Sweden between the ages of 1 and 19 years and concludes that "there is a small gradual decline in attrition susceptibility during the maturation period followed by a major decline at its end (posited at around age 12)" (Bylund 2009:706).

The strongest indication that an L1 can be extremely vulnerable to attrition if exposure ceases before puberty, on the other hand, comes from a study of Korean adoptees in France reported by Pallier (2007). This investigation could find no trace of

L1 knowledge in speakers who had been between 3 and 10 years old when they were adopted by French-speaking families (but see Hyltenstam, Bylund, Abrahamsson & Park 2009). One might raise the objection that there was a more radical break in L1 use for these adoptees than for the participants in other studies. However, there is at least one population of older attriters, reported on by Schmid (2002), who are comparable in this respect: German-Jewish adolescents who were sent to England and the USA on the so-called Kindertransporte in 1939, and taken in by English-speaking foster families. While these speakers do exhibit what appear to be the strongest indications of L1 attrition reported on by investigations of postpuberty migrants, they are all still capable of conversing fluently in their L1, and the most advanced attriter in this study still compares favourably with an advanced L2 learner of German on a range of grammatical features (Schmid 2009).

All available evidence on the age effect for L1 attrition therefore indicates that the development of susceptibility displays a curved, not a linear, function, as depicted in Fig. 2 below. This suggests that in native language learning there is indeed a Critical Period effect, and that full development of native language capacities necessitates exposure to L1 input for the entire duration of this CP. This is in line with investigations of delayed language learning in congenitally deaf children (e.g. Mayberry & Lock 2003, McConkey Robbins, Burton Koch, Osberger, Zimmerman-Philips & Kishon-Rabin 2004) as well as with largely anecdotal accounts of feral children (e.g. Curtiss 1988).

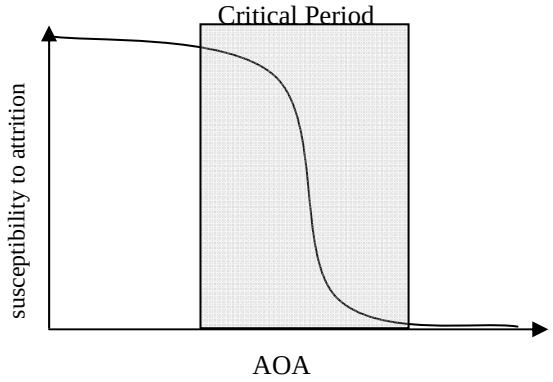

Fig. 2: The impact of AOA on the susceptibility of the L1 system to attrition

Based on this evidence a distinction needs to be made between populations living in an L2 environment, according to the age from which this was the case:

- L1 attriters: speakers who moved to an L2 environment after age 12
- Incomplete acquirers: speakers who moved to an L2 environment before age 12
- Heritage speakers, who were born in an L2 environment to migrant parents

(see also Montrul 2008; Schmid 2009).

The marked differences between incomplete learners and L1 attriters further suggest that attrition effects do not develop solely as a function of the entrenchment of the L1 due to longer exposure. This impression is corroborated by findings which show that, for post-puberty attriters, the amount of use which an individual makes of their L1 across a range of situations has low impact on proficiency levels, performance on formal tasks, and lexical diversity and fluency in free speech (Tsimpli et al. 2004; Schmid & Dusseldorp 2010; Schmid 2007)[3].

[3] Similar findings have been obtained across a range of ongoing or recently completed PhD studies, e.g. Cherciov in progress, Dostert 2009, van der Kooi in progress, Yilmaz in progress

3. Conclusion

L1 attriters have acquired their first language in the same way as the monolingual populations used as a baseline for comparison in investigations of L2 speakers. Among both attriters and L2 learners, overall proficiency has been observed to differ from that of native speakers, and a higher optionality in the application of target rules has been found. However, while for L2 speakers the reason for this variable performance (underlying representational deficit or problems in online integration of linguistic knowledge) is highly controversial, there are clear indications that no representational deficit obtains for L1 attriters (Schmid 2009). Including such a population in the bilingual equation can therefore make one of the unknown variables known: these speakers have native-like underlying representations in combination with competition from a highly active and strongly entrenched L2 system.

Extending the comparison to include incomplete learners further renders the question of whether there is a qualitative change in the capacity to establish native-like knowledge of a language around puberty empirically testable: If there are representational deficits or differences in processing for post-puberty bilinguals, L1 attriters should be most similar to a monolingual reference group, since their acquisition was unconstrained by the CP. L2 speakers and incomplete learners should also pattern together, revealing their underlying difference in knowledge and processing. If, on the other hand, a more general bilingualism effect, conditioned by the limitation of available cognitive resources, entrenchment of linguistic knowledge and proficiency level is responsible, L1 attriters, incomplete learners and L2 speakers should all differ from largely monolingual native speakers, and this difference should be modulated by factors such as amount of exposure to the non-dominant language and proficiency in that language.

Such a comparison therefore has the potential of providing insight into the nature of bilingual language acquisition and processing, by allowing us to disentangle the impact of crosslinguistic influence vs. underlying representations. This may open a new line of investigation for questions about what is commonly (albeit somewhat misleadingly) referred to as the 'Critical Period' (CP) in language learning: Should L1 attriters differ from monolinguals in the same way as L2 users do, that would therefore provide compelling evidence for a bilingualism effect and against theories which assume L2 acquisition to be governed by a critical period and L2 knowledge to be fundamentally different from L1 knowledge.

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