Entrenchment and language attrition

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Abstract

In cognitive linguistics it is assumed that the strength of entrenchment of linguistic knowledge in human memory has a direct impact on the way that such knowledge is structured and processed: more deeply entrenched knowledge will be represented more holistically and processed more automatically. At the same time, this view implies that linguistic knowledge may erode if certain memory traces are not used for longer periods of time. This process of deterioration is called language attrition, but it is unclear how exactly this erosion will proceed, and to what extent it can be explained solely on the basis of the degree of entrenchment of linguistic constructions.

The present contribution reviews evidence on language attrition relevant to the perspective of entrenchment. We discuss to what extent factors such as the frequency and context of use impact on language attrition, and how different aspects of language are differentially affected by the attrition process due to, for example, the frequency of an item or crosslinguistic similarity. We conclude that attrition takes place at the intersection of a range of complex processes: while the strong entrenchment of the first language especially in later second language learners can explain the often minimal amount of attrition found in these populations, findings suggest that instead of the overall degree of entrenchment and L1 use it is an interplay between entrenchment and the differing ability of bilingual speakers to inhibit the L2 that impacts the amount of first language attrition.

1. Introduction

The term *language attrition* refers to the process of change, reduced accessibility or deterioration of linguistic knowledge of an individual speaker who had demonstrably acquired this knowledge at some earlier point in time. This process occurs when the language in question has come to be used less frequently or not at all, in favour of some other, later-learned language. This link between the reversal of development of linguistic knowledge on the one hand and the frequency of use of the language on the other makes attrition an ideal field to investigate from a cognitive linguistic point of view.

In cognitive linguistics, frequency of use is viewed as a fundamental factor driving individual linguistic development. Foundational to this assumption is the idea that learning a language makes use of the same cognitive processes that also underlie other types of learning, and that linguistic knowledge is thus acquired with the help of domain-general learning mechanisms. This entails that factors such as the recency, frequency or context of stimuli (e.g., Anderson, 2014) play a role in the construction of linguistic knowledge by each individual speaker, just as they do in other learning situations.

One central concept in this regard is entrenchment. Applied to individual linguistic development, entrenchment refers to the process (and the result, see H.-J. Schmid, this volume) of strengthening a speaker's representation of linguistic knowledge through repeated processing, in comprehension as well as production. Importantly, this development operates on the level of specific instances of language use that a speaker takes part in. Every time a speaker processes, i.e. interprets or produces, a linguistic structure, this adds to earlier memories of linguistic events and strengthens the representation of what is shared among these instances of language use. When the different instances share specific linguistic constructions such as words or idioms, this will entrench lexically specific representations, while more abstract overlap in linguistic form or function will lead to more schematic representations. Building up linguistic knowledge is thus seen as a usage-based, bottom-up process: abstract linguistic knowledge, such as knowledge of thematic roles, word classes or syntactic patterns, is based on the knowledge of specific constructions and emerges from the commonalities between these (Langacker, 1988, 2000).

In first language (L1) acquisition, this has the effect that children tend to start out with fixed word combinations and use grammatical constructions that are tied to specific lexical material (item-based constructions, see overview in Tomasello, 2003). A child who can use different verb forms in one linguistic context might not yet be able to use the same forms in other contexts (e.g., Pine, Lieven & Rowland, 1998; Pizzuto & Caselli, 1992; Tomasello, 1992). Which constructions are used in that way is closely related to the frequency of the

constructions and the form in which they occur in the input (e.g., Rubino & Pine, 1998). Similar frequency-based effects that can be explained with different degrees of entrenchment have also been observed in second language (L2) learning (see overview in Ellis, 2013). The concept of entrenchment, in cognitive linguistics, is thus closely linked to frequency, and constructions "are variably entrenched depending on the frequency of occurrence" (Langacker, 1987, p.59).

Since language attrition is the result of a substantial decrease in the frequency of use of a language (in production as well as comprehension), entrenchment - understood as both the process and the result - is a potentially powerful concept for predicting and explaining its cause and development. Even more importantly, attrition could provide an additional perspective for verifying and validating the hypotheses that cognitive linguistics in general make about linguistic knowledge and about the role entrenchment. These hypotheses should hold true not only for contexts of acquisition and use, but also of maintenance and deterioration in the face of non-production and the absence of input. In spite of this, there are to date no studies taking an explicitly cognitive linguistic approach to language attrition. This is particularly surprising since the prediction that the disuse of linguistic structures will have a negative impact on their degree of entrenchment (and consequently on linguistic knowledge) is already expressed in early and foundational texts for cognitive linguistic approaches, such as Langacker (1987, p. 59, p. 100). Studying language attrition should thus be an integral part of the cognitive linguistic endeavour.

At the same time, it is clear that frequency of use is not the only factor at work in language attrition. Language attrition occurs when a speaker uses the language undergoing attrition less often due to shifting to another language, e.g. as an effect of the emigration to a different linguistic environment. Often, this also entails a change of the dominant language from the L1 to the L2. The age at which the use of the L1 was reduced and the presence of a competing L2 system in the speaker's mind therefore play an important role in attrition as well. Language attrition is thus a process that is inextricably linked with bilingualism and involves a complex interplay of different factors, which makes it difficult to assess the exact role these aspects play in language attrition. However, it has recently been proposed that a comparison of L1 attriters with monolingual native speakers and advanced L2 users could have the potential of disentangling the relative contributions made by factors such as frequency and contexts of use, age at learning, and competition between languages (M. S. Schmid, 2014). In such an approach, bilingual development is seen as a holistic process involving all linguistic knowledge and not isolated to either the acquisition (and limits

thereof) of L2 knowledge on the one hand, or the deterioration or maintenance of the L1, on the other.

As mentioned above, so far there has not been any research on language attrition taking an explicit cognitive linguistic approach. Applying the concept of entrenchment to previous research and interpreting the results from a cognitive linguistic point of view therefore requires some caution. In the context of attrition, entrenchment can most directly be operationalized as frequency of (reported) productive and receptive language use (often assessed for different contexts and situational settings) or as external corpus frequency, for example in assessments of lexical diversity. The first thus refers to the activation and ongoing entrenchment of the attriting language as a whole, the latter is a proxy for the relative degree of entrenchment of specific words (requiring the methodological leap discussed by H.-J. Schmid, this volume, p. XY). With few exceptions (such as Pavlenko's studies of semantic fields, Pavlenko, 2004, 2010) attrition studies have not looked into lexically specific constructions and confined themselves to measuring overall vocabulary size and diversity, while for grammar, abstract categories and general word-order phenomena have generally been the focus of the investigations.

Specific hypotheses from a cognitive linguistic point of view regarding the effect of entrenchment in language attrition are therefore difficult, apart from the prediction that frequency of use will play a role for the amount of attrition if the fact that the attriting L1 has been entrenched from birth does not supersede effects of decreasing frequency of use. A model on linguistic processing that draws on the concept of entrenchment and possibly allows more specific hypotheses about attrition is MacWhinney's (2011, 2008) Unified Model, which has its roots in the Competition Model (Bates & MacWhinney, 1982; MacWhinney, 1987).While originally aiming at explaining the acquisition of linguistic knowledge, for hypotheses about attrition the model has the advantage that it takes into account both L1 and L2 development, and that it allows for linguistic transfer in both directions (MacWhinney, 2008, p. 351).

In this model, as the L1 is acquired first, L1 knowledge is assumed to be deeply entrenched and represented in local cortical maps (MacWhinney, 2011, p. 215). This local organization is "more and more difficult to reverse or modify" (MacWhinney, 2008, p. 344) with increasing age and decreasing plasticity of the brain. As the robustness of L1 knowledge accumulates with use, "later retrievals can be spaced farther and farther apart" (MacWhinney, 2011, p. 216). This means that attrition effects should be stronger the earlier the switch from the L1 to the L2 occurred, and minimal when the L1 has been spoken for a long time and is

still occasionally being used. In the case that the switch from L1 to L2 started early enough, however, at a point before L1 knowledge had "'crystallized' in the brain[s]" (Hernandez, Li & MacWhinney, 2005, p. 224), even a complete forgetting of the L1 is possible. An fMRI study by Pallier et al. (2003) who found exactly this pattern in Korean children adopted in France when they were between 3 and 8 years old is cited as supporting evidence (Hernandez et al., 2005, pp. 223-224).

The latest version of the Unified Competition Model (MacWhinney, 2011) lists several factors supporting and endangering the acquisition, development and maintenance of linguistic knowledge. They are originally formulated with L1 and L2 acquisition in mind, but may be applied to the context of L1 attrition as well. The most important risk factors, i.e. factors contributing to L1 attrition seem to be disentrenchment, negative transfer and isolation. Disentrenchment refers to the fact that the neural connections storing L1 knowledge may be weakened as a consequence of disuse, while negative transfer refers to possible negative L2 influences on the L1. The third factor, isolation, is a social factor: the less contact there is with the language community in question, in this case the L1 community, the more strongly this favors attrition.

At the same time, support factors may counter L1 attrition. Isolation may be prevented by participation in the (local) L1 community or by distance communication (to which there were considerable financial obstacles in the communities most often studied in the context of attrition, namely speakers who emigrated in the fifties, sixties and seventies, but in this age of email, Skype and budget flights is cheap and easy). Negative transfer may be counteracted by positive transfer, i.e. transfer from an L2 that is similar to the L1 and in this way supports L1 maintenance. Finally, the central risk of disentrenchment can be warded off by resonance. When an L1 word is activated, its activation spreads to other L1 words and thus strengthens the connections between L1 forms, making it more robust against intrusion from the L2. This mutual activation is inherent when processing input (Hernandez et al., 2005, pp. 221-222), but also occurs in the active use of language.

Taken together, this means that L1 attrition should be weakest for speakers who emigrated late in life, speak an L2 that is similar to the L1 (supporting positive transfer), still use the L1 occasionally (in reception or production, leading to resonance and entrenchment), and are active in their L1 community (preventing isolation). Specific factors supporting entrenchment and local organization – and thus L1 maintenance – explicitly mentioned are reading (if the writing system reflects the phonology of the language), inner speech, and thinking in the language in question ('internalization'; Hernandez et al., 2005, p. 222;

MacWhinney, 2008, p. 362; MacWhinney, 2011, p. 221). Speakers with these characteristics should thus suffer comparatively less attrition.

What kind of errors can be expected in L1 attriters? Generally speaking, linguistic transfer is expected to happen on the level of individual constructions, not across the board (MacWhinney, 2008, p. 352). Also, in L2 learning, transfer is initially expected for unmarked forms and only later also for forms that are marked in the L1. In language attrition, as the attriting language is deeply entrenched, this would probably mean that once attrition starts, marked forms should be affected first. Starting from these assumptions, the following development might be expected: In the area of the lexicon, which is the least entrenched (MacWhinney, 2008, p. 363) and thus the most prone to attrition, words with specialist meanings such as subordinates (MacWhinney, 2008, p. 349) should show transfer first. In syntax occasional L1 word order violations in some constructions may be expected, but no wholesale transfer of L2 sentence patterns, and here also the process will start with marked syntactic alternatives such as topicalization constructions (MacWhinney, 2008, p. 352). The area of morphosyntax is generally less prone to transfer (MacWhinney, 2008, p. 352-353), as those features often do not have direct correlates in the other language. For example, the gender system of German should remain intact in L1 German attriters with an L2 that does not morphologically encode gender (MacWhinney, 2008, p. 353). Finally, phonology is the most entrenched of all linguistic areas and transfer should be marginal (MacWhinney, 2008, p. 363).

With this background in mind, the present contribution will now turn to the findings from investigations of language attrition. Going into all of the areas mentioned above is beyond the scope of this paper, and testing the hypotheses is made difficult by the fact that L1 attrition studies have been carried out on the basis of theoretical assumptions that differ from those presented above. Also, not all of the topics above have been researched equally well. Therefore, will restrict ourselves to two key areas that might tell us something about the role of entrenchment: the impact of frequency and context of L1 use and the impact of the frequency of lexical items vs. similarity of items in L1 and L2.

2. 'Use it or lose it'? The impact of frequency and context of L1 use

The prediction that "continued experience with L1 keeps the language entrenched" (Paradis, 2009, p. 134), i.e. that language attrition is the result of language disuse and that continued

Comment [X2]: HJS: As the notion of hyponym is relative and transitive, it is not quite clear what is meant here. "Dog" as a hyponym of "animal"? "Collie" as a hyponym of "dog"?. One reference point would be basic-level categories. Can this be made more precise?

RS: Changed in accordance with MacWhinneys original formulation and with Prototype theory terminology

Comment [X3]: HJS: You could mention that going into all these areas and probing all these predictions ges beyond the scope of this paper and therefore, for reasons to be explained, you focus on these two key areas.

RS: Transition has been made clearer

exposure and use will lead to language maintenance, is one of the most basic and prevalent assumptions underlying attrition research. At first glance, there seems to be a solid underpinning of this idea in research on memory and accessibility which is closely linked to the notion of entrenchment: we know that in order to activate any given memory trace, a certain amount of neural energy is needed (see Takashima and Bakker, this volume). This variable has been referred to as the Activation Threshold (Paradis, 1993, 2004), and its value is determined by two factors: frequency and recency. Every time an item of information is retrieved from memory, this process of access causes a reduction in the Activation Threshold (AT), making it easier to access again the next time. Items that are used or encountered frequently consequently have a lower AT than rare ones. Over periods of disuse, the AT gradually increases, so that even items that had been very frequent at some time but not been activated over a long period will require more energy to access again (Paradis, 2004). Note that this is the exact neurolinguistic correlate of cognitive linguistic statements on entrenchment such as the ones by Langacker quoted above, and compatible with the memory processes assumed by the Unified Model. Also, effects of an interplay between frequency and recency of use have been reported repeatedly (see the overviews in Ellis 2012, Pfänder & Behrens 2016). The idea of an AT therefore predicts a straightforward and more or less linear impact of factors such as the amount of L1 use in the emigration situation and the length of residence on the degree of attrition an individual experienced, modulated only by the frequency of the linguistic item or structure affected by the attritional process.

It is probably because this hypothesis is so apparently straightforward and so intuitively evident that for many years it was assumed to be virtually axiomatic. As a consequence, frequency of use was very rarely included as a predictor in attrition studies. This is partly due to the inherent difficulties of measuring this construct: Unlike other factors involved in the attritional process, such as length of residence or age at emigration, language use cannot be observed independently and objectively, but has to be measured based on self-assessments. Early studies attempted to do this by means of a single, binary or scaled, variable, but failed to identify any clear-cut effects on the outcome variables (e.g. de Bot, Gommans & Rossing, 1991; Jaspaert & Kroon, 1989; Köpke, 1999).

These findings led to the assumption (Köpke & M. S. Schmid, 2004) that an experiential factor as complex as that of language use (often called language exposure in these studies, but usually referring to both productive and receptive language use) could not meaningfully be reduced to a single variable, such as the percentage of time that speakers estimate spending on using L1 vs. L2 (Köpke, 1999) or a Likert-Scale frequency estimate (de Bot, Gommans &

Rossing, 1991), let alone a binary predictor such as the native language of the spouse (Jaspaert & Kroon, 1989) or the question "do you speak language X" with a yes/no answer (Ammerlaan, 1996). The Language Attrition Test Battery (M. S. Schmid, 2011) thus developed a multifactorial questionnaire for the assessment of linguistic habits across a range of interlocutors and contexts (the questionnaire is available in several languages at www.let.rug.nl/languageattrition/SQ). The items included in the questionnaire cover different modalities (speaking/listening, reading/writing, as well as inner language in a variety of contexts such as counting, praying and cursing) and language modes (bilingual, intermediate and monolingual mode). Schmid & Dusseldorp (2010) report a multifactorial analysis of data obtained by this instrument which resulted in a range of subscales or compound predictors with good internal validity. These compound predictors have since been replicated and applied in a number of investigations of the attrition of various languages and fall into clusters related to language mode in interactive contexts on the one hand and passive exposure, inner language and attitudinal factors on the other.

The Principal Component Analysis (PCA) conducted by Schmid & Dusseldorp (2010) revealed three subsets of variables related to the frequency of use of the L1 in informal, everyday settings with other bilingual speakers: use of the L1 with the partner or spouse, with children (or grandchildren) and with friends. While there was no strong internal correlation between these factors (probably due to the fact that they were dependent on the presence of suitable bilingual speakers across the three settings, a factor that is largely outside the control of the individual speaker), it was hypothesized that they would all pertain to a similar kind of speech setting – crucially, one that corresponds to the description of "bilingual mode" in Grosjean's (2001) model of bilingual interaction, a context where both languages are highly active and code-switching is frequent and situation-appropriate. A second cluster of factors pertains to interactions in contexts where code-switching is not appropriate, namely the use of the language in L1-organizations such as churches and clubs (where the mixing of languages is often frowned upon) or with friends or family members back in the country of origin. Thirdly, the use of the L1 for professional purposes – i.e., in what Grosjean, 2001, terms the "intermediate mode", a formal setting where external stimuli keep the L2 at an extremely high level of activation, but where code-switching is situationally inappropriate – remained separate in the analysis from any of the other interactional variables. Two more largely attitudinal sets of predictors emerged, one of which also comprised receptive language use through reading, music, TV and so on, while the other was associated with feelings towards

both languages, cultures as well as towards language maintenance and transmission (M. S. Schmid & Dusseldorp, 2010, pp. 139ff.).

M. S. Schmid & Dusseldorp (2010) then explored the predictive power of the compound factors calculated on the basis of the PCA for the scores that 106 L1 attriters of German achieved on a range of formal linguistic tasks as well as for lexical diversity, accuracy and fluency in free speech (when background factors such as age, length of residence and education were controlled for). Interestingly, the only factor that emerged as significant was the use of the L1 for professional purposes. This finding corresponds to an analysis that M. S. Schmid (2007) conducted on the same data, where the language use variables had been clustered exclusively on the basis of Grosjean's (2001) language mode model: Here, too, L1 use in settings where both languages are highly active but code-switching is situationally inappropriate emerged as the only significant predictor. In particular, both of these studies suggest that the type of L1 use that will arguably make up for the largest proportion of overall use – informal conversations within the family or with friends – does not play any role whatsoever for diversity, accuracy or fluency in L1 attrition.

This result is so unexpected that one might be tempted to ascribe it to some kind of quirk in the data at hand. Note, however, that the investigation comprised what can be considered a fairly large sample of 106 bilingual speakers who were shown to differ significantly from a monolingual reference group – matched for age, sex and education – across all of the outcome variables considered. What is more, the design used in these two studies has been replicated in a number of PhD investigations in various linguistic settings (Cherciov, 2010, on Romanian-English bilinguals; Dostert, 2009, on English-German bilinguals; Keijzer, 2007, on Dutch-English bilinguals; Lubińska, 2011, on Polish-Swedish bilinguals; Varga, 2012, on Hungarian-Danish bilinguals and Yılmaz & M. S. Schmid, 2013, on Turkish-Dutch bilinguals). None of these investigations found an impact of predictors related to amount or type of language use. Professional L1 use was again the exception, but not all of the studies had large enough numbers of speakers to whom this factor applied (professional opportunities, for example, for which Hungarian is required being rather limited in Denmark). The only investigation which found a significant correlation is Opitz (2011), who calculated one compound attrition measure composed of the z-scores across all her tasks and one overall compound measure of L1 use. While these two variables correlated moderately ($r = .545$; Opitz, 2011, p. 300), no other background variables were partialled out in this analysis and the differential impact of different types of exposure and use was not assessed. So this particular finding is somewhat difficult to interpret.

All in all, it therefore seems that the notion that there should be a straightforward correspondence between 'frequency of L1 use' on the one hand and 'amount of L1 attrition' on the other, as has often been suggested, is too simplistic. M. S. Schmid (2007) suggests that there may be a kind of 'saturation threshold' in the development of the monolingual native speaker: The linguistic experience of someone who has been immersed in the L1 environment up to adolescence or adulthood (as was the case for the participants in all of the investigations listed above) is much more intensive than that in any other system of knowledge that we possess, as we arguably engage with it in some form or other at every waking moment (and a good deal of the time when we are asleep). Once the saturation threshold has been reached, further exposure and use (refreshment of the neural trace) may therefore no longer be necessary to maintain knowledge. This assumption is in line with the predictions made by MacWhinney (2011) and Hernandez and MacWhinney (2005) cited above, and it also receives support from several of the speakers in M. S. Schmid's sample who state not to have used their first language at all for several decades, but still retain native or near-native fluency, accuracy and lexical diversity (see also M. S. Schmid, 2009, for an extreme case). It seems thus that the simple frequency of L1 use by itself is not a sufficient explanatory concept for the degree of L1 attrition, and that L1 knowledge may possibly stay entrenched regardless of the amount of L1 use. Instead, it might rather be the type and quality of L1 use that can partially account for the differences between L1 attriters. Accordingly, M. S. Schmid proposes an alternative explanation which is based not on activation frequency but on inhibitory mechanisms (see below section 4).

3. Frequency of lexical items and cross-linguistic similarity

A second entrenchment-related prediction for language attrition is that less frequent items should be prone to attrition effects and accessibility problems earlier than more frequent ones (e.g. Paradis, 2007, p. 121). From a cognitive linguistic point of view, this prediction should apply to both lexically specific items and more abstract constructions; L1 attrition studies however have applied this hypothesis most often to lexical knowledge.

The lexicon is often assumed to be the most vulnerable part of the linguistic repertoire, i.e., the part that will be affected first, fastest, and most dramatically by any attritional process (M. S. Schmid & Jarvis, 2014, p. 729, for an overview). These predictions are in accord with MacWhinney's Unified Model (see above). There are solid theoretical and empirical grounds

also from other fields of linguistic investigation underpinning the *a priori* assumption that the lexicon is more prone to change in a language contact situation than other aspects of linguistic knowledge, and that non-use will lead to loss. For example, Paradis (2007) relates the lexicon's presumed vulnerability to characteristics of different memory systems and their role for language: Declarative memory (which is assumed to underlie semantic knowledge and to be non-modality-specific) is thought to be more susceptible to L2 transfer and to forgetting in general than procedural memory (on which, in Paradis' framework, grammatical knowledge and other predominantly or fully automatized processes are based) (Paradis, 2007, p. 127). Schmid and Köpke (2008) furthermore refer to volume, frequency and interconnectedness effects: The mental lexicon contains more information and less connections than, for example, the phoneme inventory, which typically consists of a limited number of items that are used extremely frequently and exist in a densely connected network. This implies that, while small changes in a closed-class system will quickly ramify across the entire network, the lexicon can tolerate and absorb a certain number of changes. This is mirrored in the resilience found in models of the self-organizing cortical maps assumed by the Unified Model that still responded properly even when a particular unit in the map was destroyed (MacWhinney, 2008, p. 344). Findings from language shift and language death also indicate that lexical borrowings from the surrounding language and loss or inaccessibility of items in the disappearing one are among the most common phenomena (e.g. Dorian, 1973; 1978).

Although existing findings, interpretations, claims, and assumptions regarding the lexicon's elevated susceptibility to cross-linguistic interference, non-use and attrition are interesting, the difficulty of establishing a common basis of comparison between different linguistic levels makes it very difficult to evaluate predictions that refer to differential attrition rates and effects (M. S. Schmid & Köpke, 2008). For example, is it really possible to make a meaningful comparison of the number of words a person might have 'lost' and the amount of phonetic drift that has taken place in their linguistic repertoire? A well-designed longitudinal investigation across the first few years of the incubation period might conceivably be able to demonstrate that an individual attriter is experiencing attrition effects in the lexicon at a stage where other linguistic levels are, as yet, unaffected. To date there are no such studies charting the earliest years of attrition. However, recent findings demonstrating phonetic drift in the L1 of beginning L2 learners within the first six weeks of an intensive language course (Chang, 2012) make it unlikely that lexical attrition should indeed be the primary phenomenon: just like later L2 learners (where this has been demonstrated repeatedly, starting with Flege 1987), they showed a drift of voice onset times and formant frequency (F_1 and F_2) in their L1

towards the L2 norms in some sounds. This finding is surprising from the point of view of the Unified Model where the L1 phonology is viewed as the most entrenched of all linguistic areas (MacWhinney, 2008, p. 363) and no phonetic attrition other than possibly a loss of fluency or a change in pausing patterns (as in M. S. Schmid & Beers Fägersten, 2010) would be expected.

That notwithstanding, the lexicon can potentially offer interesting insights into the role of frequency of reinforcement for the maintenance/attrition of linguistic knowledge. In this context, two hypotheses formulated by Andersen (1982) remain valid:

> An LA [language attriter] will have a smaller number and a smaller variety of lexical items available to him than a comparable LC [linguistically competent individual] in the same language. […] An LA's lexical repertoire will match his recent (and prior) experience with different domains of use and semantic areas. His lexicon will be most impoverished in those areas where he has had little or no experience. He will exhibit greater numbers of gaps in those areas where he has no recent experience in comparison with other areas where he has had recent experience using the language. […] What lexicon the LA has retained will be of common, highly-frequent, unmarked lexical items; the gaps will be of less-common, low-frequency, highly-marked items. (Andersen, 1982, p. 94)

Again, this prediction tallies perfectly with both entrenchment approaches such as the Unified Model and the Activation Threshold Hypothesis.

In order to test and evaluate these predictions, a number of studies (comprising the same set of PhD theses quoted above: Cherciov, 2010; Dostert, 2009; Keijzer, 2007; Lubińska, 2011; Opitz, 2011; Varga, 2012; Yılmaz, 2013) assessed global attrition effects. Both formal tasks (such as verbal fluency of picture naming) and lexical diversity in free speech were investigated in these studies, with somewhat varying findings. M. S. Schmid & Jarvis (2014, p. 732) point out a pattern in the results: Significant differences between attriters and controls consistently only emerge in populations larger than 25 speakers (while the increase of disfluency phenomena in free speech, which may also be an indication of lexical access problems, appears to be somewhat more robust to smaller sample sizes). They conclude that the lack of a significant difference in those studies investigating smaller populations may be a Type II error, due to the relative subtlety of the process of change (in itself an argument

against the pervasive notion that the lexicon is the part of the linguistic repertoire which is 'most vulnerable' to attrition).

M. S. Schmid & Jarvis (2014) then attempt to assess the impact of corpus frequency on lexical attrition, in order to test the hypothesis that attriters will retain only "common, highly-frequent, unmarked lexical items" and show gaps where "less-common, low-frequency, highly-marked items" are concerned, as predicted by Andersen (1982, p. 94). In two speech samples from a population of 106 attriters of German (who had been residing in an L2 English or L2 Dutch environment for an average of 37 and 34 years, respectively) and 53 monolingual controls, they investigate the distribution of more and less frequent lexical items (based on their distribution in both the speech samples at hand and the COSMAS II corpus[1]). For lexical frequencies based exclusively on their own corpus, they do find a slight but significant tendency of attriters to overuse more frequent and underuse less frequent items. This tendency, however, all but disappears when lexical frequency is based on the much larger COSMAS II corpus. For L1 attriters immersed in an English-speaking environment, there is still a significant difference, but effect sizes are extremely weak (η^2 between .04 and .01; M. S. Schmid & Jarvis, 2014, p. 739), while for L1 attriters in a Dutch environment there are no significant differences from the controls at all. Extralinguistic factors, such as frequency of use of the L1, played no significant role for any of these frequency measures.

The finding that the attriters with Dutch as L2 showed no difference to the controls while the attriters with English as L2 did is interesting, as it suggests that the large proportion of cognates that the Dutch and the German language share may make it easier for the Dutch L2 speakers to maintain their lexicon (the authors also demonstrate that these speakers, but not the L2 English speakers, overuse lexical items that are similar in their two languages as compared with the monolingual controls, M. S. Schmid & Jarvis, 2014, p. 740). This finding tallies with the predictions made on the basis of the Unified Model, as positive transfer is one of the factors proposed to be supporting the maintenance of linguistic knowledge. From a cognitive linguistic point of view, such a positive effect should also occur with larger and less lexically specific constructions such as idioms or grammatical constructions (e.g., word order). To date, there are no attrition studies specifically investigating this; however, in a review of several studies on errors in attriters, M. S. Schmid (2013) compares the number of syntactic errors in L1 German attriters with Dutch or English as L2. While both languages are closely related to German, the similarities shared with Dutch in the syntactic domain are far

[1] Corpus Search Management and Analysis, maintained by the *Institut für deutsche Sprache* at Mannheim and based on ca. 5.4 billion word forms.

greater than those shared with English. In spite of this, both groups of attriters showed the same amount of syntactic errors in their L1 in their free speech (Fig. 1 on p. 101). This runs against the expectations formulated above. However, further studies looking into the effects of positive transfer for other constructions than words are needed to allow firm conclusions.

Taken together, the findings suggest that there may indeed be a slight role of frequency of reinforcement for lexical attrition. However, it is clear that predictions such as the one by Andersen quoted above strongly overstate the case: While the use of very low-frequency words by the attriters in the studies above was slightly reduced overall as compared to the controls, they still did avail themselves of that part of their linguistic repertoire.

4. Entrenchment, inhibition and cognitive control

Investigations of L1 attrition often express the authors' surprise at the degree to which the native language of migrants can be maintained, apparently largely intact, over many decades, and the findings reported above show that this maintenance is not influenced dramatically by the amount to which the language remains in use. This stability contrasts starkly with findings of first language maintenance and loss among younger migrants or heritage speakers, who often possess a knowledge of their first language that is dramatically impoverished and more similar to that of foreign language speakers than of natives (see e.g. Montrul, 2008; M. S. Schmid, 2013). In particular, findings from international adoptees have shown that the birth language can be forgotten almost entirely, and that whatever traces of the linguistic experience are retained in memory are likely confined to the phonological level and do not extend to, for example, syntax or the lexicon (Hyltenstam, Bylund, Abrahamsson & Park, 2009; Oh, Au & Jun, 2010; Pallier et al., 2003; Pierce, Klein, Chen, Delcenserie & Genesee, 2014; M. S. Schmid, 2012; Zhou & Broersma, 2014).

These findings do suggest that there is a point in linguistic development, situated substantially later than the age (typically between ages 2 and 6) at which individual grammatical features are usually taken to become target-like, at which the memory for the native language becomes in some way consolidated or 'crystallized' (Hernandez et al., 2005, p. 224). Before this age, it is susceptible to change under conditions of massive input from another language and to erosion due to reduced input, while afterwards it becomes largely impervious to such matters. This suggests an important role for entrenchment not only for language acquisition but also for the consolidation of linguistic memory.

After this age, it appears that rehearsal is no longer required to maintain native linguistic knowledge and keep it accessible. What appears to be more important is the online competition between a bilingual's different language systems. The mechanism invoked by M. S. Schmid (2007) to account for the protective function that L1 use for professional purposes has for L1 maintenance thus relies not so much on the activation but on the inhibition of knowledge: Migrants who use their L1 for work-related purposes (e.g. language teachers, secretaries or administrators in businesses with international links, translators and interpreters, but also staff members in restaurants or shops catering to certain cuisines or backgrounds) do so in a setting in which all kinds of stimuli keep the second language at a very highly active level. They usually have to use both languages frequently in the course of their working day, but keep them separate and avoid mixing, involuntary switching, and crosslinguistic interference. The massive practice they have at this inhibitory mechanism (for both their languages) may make it easier for them to perform the tasks usually employed in attrition investigations.

Interestingly, this suggestion, first made by M. S. Schmid in 2007, is very much in line with recent work in the context of what has been termed the 'bilingual advantage' – the finding that long-term bilinguals often outperform monolinguals when it comes to tasks measuring executive function and cognitive control. This is usually ascribed to the fact that the effort which goes towards both maintaining and keeping separate more than one linguistic system in daily life can result in enhanced domain-general cognitive control and executive function (for recent overviews see Baum & Titone, 2014; Bialystok, Craik, Green & Gollan, 2009; Valian, 2015). However, the bilingual advantage appears to be modulated by many factors and it is, as yet, unclear which specific phenomena linked with the bilingual experience are conducive to its formation. One factor which has been mentioned in this context is the extent to which individual bilinguals separate their languages in daily use: There is substantial research demonstrating that all of a bilingual's languages are active at any given point in time during speech production, but that the activation of the language not currently in use can vary from minimal (single-language/monolingual mode) to very high (dense code-switching situation/bilingual mode) (e.g. Green & Abutalebi, 2013; Grosjean, 2001). It has been assumed for some time that bilinguals who rarely code-switch ('non-switchers') benefit more in terms of cognitive control/executive function than 'fluent' or 'dense' switchers (Green, 2011), since non-switchers have more practice in exerting language control in order to minimize the activation of the non-target language and so prevent switches or interference between their languages (Green, 2014). This suggests that patterns of language

use and language mixing may not only impact on the maintenance or attrition of the first language, but have wider implications for overall mechanisms of domain-general cognitive control.

5. Conclusion

The present contribution has attempted to show ways in which current investigations and findings from the area of first language attrition can benefit cognitive linguistic approaches and theories of entrenchment. We have tried to argue that the loss, deterioration or change of linguistic knowledge is the other side of the coin of its acquisition, establishment and entrenchment and, as such, its study should form an integral part of the cognitive linguistic endeavour. However, while it is often implicitly or explicitly evoked in theoretical treatments, language attrition has never yet been explicitly addressed within the empirical work on usage-based and entrenchment-oriented approaches. Investigating attrition has the potential to elucidate the importance of factors such as the frequency of overall use and the frequency of items or constructions in memory consolidation, as well as for the development of domain-general cognitive functions. We have shown that the entrenchment of L1 skills and the related processes of retention or forgetting of linguistic items does not depend in a straightforward or linear way on frequency-related predictors, but on a complex interaction of factors, including age and patterns of language use. More specifically, the process of attrition might not only be impacted by the entrenchment of the L1 knowledge, but also the ability of the speaker to inhibit the L2 knowledge.

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