

Chapter 9 L1 attrition and the mental lexicon

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Introduction

The bilingual mental lexicon is one of the most thoroughly studied domains within investigations of bilingualism. Psycholinguistic research has focused mostly on its organization or functional architecture, as well as on lexical access or retrieval procedures (see also Meuter, this volume). The dynamics of the bilingual mental lexicon have been investigated mainly in the context of second language acquisition (SLA) and language pathology. Within SLA, an important body of research is devoted to vocabulary learning and teaching (e.g. Bogaards & Laufer, 2004; Ellis, 1994; Hulstijn & Laufer, 2001; Nation, 1990, 1993). In pathology, anomia (i.e. impaired word retrieval), one of the most common disorders in aphasia (e.g., Basso, 1993; Kremin, 1994), has given rise to a considerable number of investigations, including those conducted with bi- and multilingual patients (e.g., Goral et al., 2006; Junqué, Vendrell & Vendrell, 1995; Kremin & De Agostini, 1995; Roberts & Le Dorze, 1998). Less attention to date has been paid to more subtle changes and to the evolution of the bilingual lexicon over longer time spans. It is only recently that these phenomena have been investigated in the context of research on lexical retrieval in aging (see the overview in Goral, 2004) and first language attrition.

That such dynamics of the non-pathological bilingual lexicon have not received more attention as yet is somewhat surprising, as the principal models of the bilingual mental lexicon clearly allow for a dynamic perspective. The Revised Hierarchical Model developed by Kroll and colleagues (e.g., Kroll, 1993; Kroll & Tokowicz, 2001; Kroll & Tokowicz, 2005) claims separate lexicons for each language, but does capture the bidirectional and asymmetric relations between these lexicons (Goral et al., 2006: 236). Furthermore, the links between the lexicons can vary in strength (depending on proficiency and language use, e.g., Kroll & Tokowicz, 2005: 546) indicating that there may be changes in the connections between word forms and meaning in the different languages over time (for a more detailed description, see Pavlenko, this volume).

In connectionist models like the Bilingual Interactive Activation Model (BIA, Grainger & Dijkstra, 1992 or BIA+, Dijkstra & van Heuven, 2002; for detailed descriptions, see Marian, this volume) or the Bilingual Interactive Model of Lexical Access (BIMOLA,

Grosjean, 1997), crosslinguistic links between items (such as phonetic or orthographic features, word forms, lemmas, concepts or a language subsystem) are regulated by activation and inhibition mechanisms which are dependent on frequency of use and may account for dynamic aspects of the bilingual lexicon, which can be observed in all situations of bilingual language use and development.

1. First language attrition

1.1. What is attrition?

The term *first language (L1) attrition* refers to a change in the native language system of the bilingual who is acquiring and using a second language (L2). This change may lead to a variety of phenomena within the L1 system, among which are interferences from the L2 on all levels (phonetics, lexicon, morphosyntax, pragmatics), a simplification or impoverishment of the L1, or insecurity on the part of the speaker, manifested by frequent hesitations, self-repair or hedging strategies. As such, L1 attrition may be a phenomenon which is experienced by all L2 users, from the earliest stages of L2 development. For the purpose of the present discussion, we assume the case of bilingual development which has most often been investigated in attrition research: that of late bilinguals who experience a drastic change in their linguistic habits as adults; i.e. post-puberty migrants.

Given the stability of the native language system in mature speakers, it has long been assumed that L1 attrition is an extreme and relatively rare development, which only occurs under certain specific circumstances. These include emigration to a different linguistic environment, an adaptation to this environment in most areas of daily life, an extreme reduction in L1 input and use, and the persistence of these circumstances over a prolonged time span (decades). In such a situation, it was postulated, L1 attrition might eventually 'set in', particularly when compounded by attitudinal factors such as a rejection of the L1.

More recently, it has been suggested that attrition may not be such an extreme or such a discrete phenomenon (Cook, 2003, 2005; Schmid & Köpke 2007). Drawing a line which separates the attriter from the non-attriter has proven a daunting task in the past (see Köpke & Schmid, 2004), which might indicate that L2 influence on L1 is a natural consequence of the competition of more than one linguistic system in the same mind/brain. In situations where the L2 is used more extensively than the L1 over a long period of time, these influences may merely be more pronounced and more clearly visible.

On the other hand, the process we refer to as L1 attrition is probably due to two factors: the first one is the presence, development and (eventually) dominance of the L2 system. This

factor may lead to increasing L2 interference across all linguistic levels, but it is probably something that all bilinguals experience to some degree. The ensuing change which can be observed in the L1 system has been labelled *externally induced* language change (Seliger & Vago 1991:10), as it is dependent on competition and crosslinguistic influence. Such language contact phenomena can be witnessed in all bilinguals to some extent. The second factor is the dramatic reduction in L1 use and input, which is specific to the emigrant's situation and may then lead to *internally induced* language change (Seliger & Vago, 1991:10): due to the absence of input and confirming evidence, the language system undergoes a structural reduction and simplification.

Neither factor alone would therefore lead to what we might term 'attrition proper': competition from L2 without a break in linguistic tradition (as in the case of a bilingual who continues to use the L1) or lack of exposure without competition (in the hypothetical desert-island-situation, which might lead to a kind of language 'atrophy'). It is only when both processes conspire that language attrition occurs.

1.2. Attrition and the lexicon

Although attrition effects can be witnessed across the full range of an individual's linguistic knowledge and use, the lexicon is an area of predominant interest for investigations of L2 influence on L1. It has often been suggested that this is a 'vulnerable' or 'sensitive' part of the linguistic system, where attrition manifests itself first and most extremely (Andersen, 1982; Köpke, 2002; Weinreich, 1953; Weltens & Grendel, 1993).

This is an intuitively convincing assumption: numerically, the lexicon is a much larger system than other areas of language knowledge (i.e. we know far more words than we have, for example, phonetic or morphological items). Furthermore, the lexicon is a network of items which are far less densely connected and interdependent than, for example, the phonological inventory. While relatively minor changes to the phonological or morphological system can have far-reaching ramifications which lead to an overall restructuring, the lexicon can tolerate a certain amount of change, loss or interference. A certain amount of flexibility may even be an intrinsic characteristic of open-class systems such as the lexicon.

An interesting perspective on the effects of loss in the lexical system are the computer simulations of vocabulary loss provided by Meara (2004). His models are relatively small and loosely interlocking systems of 2,500 items, each of which is connected to two other items from which it receives input, and each of which has a binary activation status ('on' or 'off'). The activation of the two other items that a particular item is connected to determines its own

activation status: once input falls below a certain threshold, the item will be deactivated.¹ A series of simulations with different ‘attrition events’ on such networks demonstrates that the loss of a certain amount of lexical knowledge can take place without dramatic consequences for the overall system: in most cases, the trajectory of loss shows an initial period of great stability, followed by a dramatic cascade where a great proportion of information is lost in a relatively short period of time, after which the (reduced) system stabilizes again.

While these findings provide food for very interesting speculations on language attrition in real life, the widely made suggestion that the lexicon is the most vulnerable area of linguistic knowledge remains problematic for two reasons. Firstly, the claim that attrition will affect the lexicon ‘first’ is unwarranted, as there are virtually no longitudinal studies which would make it possible to charter the chronology of the attritional process. Secondly, the assumption that attrition will affect the lexicon most dramatically of all linguistic areas presupposes that it is possible and meaningful to compare the degree of L2 influence or L1 reduction across linguistic systems. However, it is hard to see what measuring stick should be used to make such a comparison. How does the ‘forgetting’ of a certain number of linguistic items score in relation to the erosion of some morphological rule? We would suggest that, at the present state of knowledge, it is futile to imply comparisons across linguistic levels with respect to the speed and degree with which they will be affected by the attritional process.

1.3. Types of lexical attrition

One of the most common fallacies of research on L1 attrition is that any indication of crosslinguistic influence (CLI) is interpreted as evidence for attrition, particularly in the area of the lexicon. However, an approach that wants to distinguish L2 influence on L1, as it is experienced by all bilinguals, from L1 attrition, which is compounded by internal restructuring due to lack of input, should exercise caution in this respect, and give some consideration to what attrition is and what it is not. A very useful classification is provided by Pavlenko (2004), who proposes 5 types of CLI (see also Pavlenko, this volume):

1. *Borrowing*. The process of borrowing involves the use of L2 elements which are typically morphologically and phonologically integrated into the L1 system. This is a phenomenon which is frequent in the language of immigrants, particularly where political or social phenomena are concerned that are not identical to what the

¹ Meara acknowledges that these simulated networks are not to be confused with an accurate representation of an actual mental lexicon, but “a stripped-down, greatly oversimplified ‘lexicon’ with a tiny number of elementary properties” (Meara, 2004:138f.), which nevertheless provide interesting insights into how such a process might work.

immigrant was used to in the country of origin (see Ben-Rafael & Schmid, 2007, for examples from the spoken French of immigrants in Israel who had joined a Kibbutz). Arguably this type of CLI constitutes a semantic enrichment of the system, and cannot be taken as evidence for attrition: it is not an indication of previously existing elements no longer being available to the speaker, but of the vocabulary of the speaker (or of the immigrant community) being extended to encompass new concepts and items.

2. *Restructuring*. In the process of restructuring, existing L1 items are reanalysed according to the semantic scope of the corresponding L2 item. In other words, while the item itself remains a part of the language, its meaning is changed. Pavlenko cites the example of the Spanish verb *correr* 'to run' which is (infelicitously) used by Cuban immigrants in the US in phrases such as 'running for office' (Otheguy & Garcia, 1988, ct. by Pavlenko, 2004: 51).
3. *Convergence*. The process of convergence refers to the merging of L1 and L2 concepts, creating one single form which is different from both the L1 and the L2 one. The example quoted by Pavlenko here is color categories, where it has been shown that bilinguals can have norms which diverge significantly from the monolingual ones in both languages (Pavlenko, 2004: 52).
4. *Shift*. The process of shift describes the changing of L1 items or structures towards norms specified by the L2, for example in the area of emotion terms and scripts (Pavlenko, 2005).
5. *Attrition*. The process is characterized by the fact that the L1 system is not merely changed in the ways described above (which, as was pointed out, may often be considered an enrichment or extension of an otherwise intact overall system), but is simplified or 'shrunk' to some degree. This process may imply internal restructuring of the system by way of processes such as analogical levelling of grammatical features, loss of vocabulary and an overall reduction in complexity (see Schmid, 2004).

The terminology used above may appear to be slightly misleading, since distinguishing the *internally* induced restructuring/loss under 5 from the *externally* induced processes described under 1-4 implies that these do not constitute attrition, i.e. that changes in the L1 system which can be ascribed to language contact are not part of the overall attrition process. Actual research practice, however, usually does lump all of these processes together under the general heading of 'attrition'.

The methodological challenge which arises from this classification, then, is how to distinguish indications of the processes described under 1-4 from attrition as it is understood under 5 in the experimental practice. For example, it is often not evident from the available data whether a speaker code-switches intentionally in order to make a pragmatic or semantic point, or whether the switch is triggered by the fact that access to the corresponding L1 item has been compromised. Even if the speaker overtly indicates that she cannot locate a particular lexical item, this may not indicate that the word has been permanently lost: All speakers experience such word-finding difficulties from time to time (see Ecke, this volume).

Investigations should therefore rely not only on superficial scans of data for code-switches, borrowings and other infelicitous or non-target like use of the L1, but apply more holistic and controlled measures which may reveal a more accurate overall picture of the linguistic repertoire of the speaker.

2. Research designs and findings

Research on language attrition has always been characterized by strong interdisciplinarity. This is reflected in the somewhat eclectic collection of research tools that have been borrowed from various other research fields and applied more or less rigorously in the hope that they may be suited to detect attrition. Despite the indisputable progress made with respect to methodological questions over the past decade (see for example the contributions in Schmid et al., 2004) methodological inconsistencies still abound. This is why this section will present an overview of the most important tasks that have been used with respect to lexical aspects of L1 attrition, focusing on methodological aspects, theoretical assumptions and findings.

2.1 Verbal fluency

2.1.1 Method

The verbal fluency task (VFT) is one of the most popular tools in language attrition research, partly as it is very simple to administer across languages, since it does not use linguistic material which would have to be adapted. A further advantage is that it has been reported to be highly reliable in a variety of populations (Roberts & Le Dorze, 1998). In the VFT, the subject is invited to produce as many words as possible from a particular semantic category (e.g. animals, clothes, food) during a period of time usually lasting 60 seconds. An alternative is to elicit words based not on semantic but on formal criteria, by asking the respondent to produce words which begin with a certain letter (e.g. the letter *p*, *l* or *t*). The

instructions, typically, are as follows: ‘I would like to see how many different animals (or words starting with the letter *p*) you can call to mind and name for about a minute. Any animal will do. For instance you can start with *dog*.’

The responses are recorded and all words which are part of the given category and language are counted as correct responses. The score is the total number of correct responses produced during the 60-second period. Formal verbal fluency is usually found to be slightly more difficult than semantic verbal fluency; it gives rise to more variation within normal populations (Roberts & Le Dorze, 1998) and seems to be more sensitive to aging effects (Evrard, 2001: 182).

2.1.2. Assumptions

The VFT is used to measure the rate of lexical retrieval. This task has frequently been applied in neuropsychology for the assessment of lexical performance in aphasia (Goodglass & Kaplan, 1983; Nespoulous et al., 1986), dementia (Martin & Fedio, 1983) and to assess the effects of aging in monolinguals (Cardebat et al., 1990) and bilinguals (cf. the reviews in Goral, 2004). In the context of multilingualism, the verbal fluency task is assumed to reflect the dominance pattern of the languages (Gollan, Montoya & Werner, 2002; Roberts & Le Dorze, 1997). However, it has been shown that lexical productivity is largely dependent on category choice: in semantic verbal fluency some categories (e.g. animals, clothes) obtain higher results than others (e.g. toys, tools or weapons) since those categories contain more items, and more frequent ones, than others (cf. Evrard, 2001; Sabourin, 1988). Similarly, in formal verbal fluency tasks, the recommendation is to choose a frequent word-initial consonant (this criterion, of course, varies across languages, but is relatively easy to assess on the basis of standard dictionaries).

2.1.3 Findings from attrition studies

The VFT has been used in a number of studies on L1 attrition. The format of the task used most often in attrition studies is semantic, in particular the categories animals and fruit and vegetables (Keijzer, 2007; Schmid, 2007; Waas, 1996; Yağmur, 1997: 91). Ammerlaan (1996: 94f) used three different semantic and three different phonological criteria for each language.

Generally speaking, language attrition is a research area where findings are often ambiguous and unsatisfactory. In this context, the VFT appears at first glance to be quite a rewarding tool, since it has (so far) invariably produced significant findings: attriters have

lower scores than control groups (Keijzer, 2007; Schmid, 2007; Waas, 1996: 110; Yağmur, 1997: 91), and they perform better in their L2 than in their L1 (Ammerlaan, 1996: 112).

However, the initial enthusiasm in view of these results is often tempered when the findings are investigated in more detail: while between-group differences are clear-cut and easy to detect, all attempts to account for within-group variation have failed so far. Waas (1996) and Yağmur (1997) tried to establish whether there was a correlation between the L1 VFT results on the one hand and the attitudinal component (which Waas measured on the basis of 'ethnic affiliation' and Yağmur by means of a Subjective Ethnolinguistic Vitality Questionnaire) on the other, but neither correlation was significant. Schmid (2007) assessed the impact of the frequency of exposure to and the use of the L1 in various settings, equally to no avail. Similarly, it appears that educational level is a factor which plays a minimal role for this task in the context of L1 attrition: Yağmur (1997: 77) and Dostert (2007) found that educational level was not a strong predictive factor on the VFT. This is an interesting result, since more metalinguistic tasks, such as the C-Test, are typically strongly dependent on individuals' education levels.

Furthermore, while in fact being a highly specific test of lexical retrieval, the VFT has often been interpreted along the lines of a measure of overall proficiency. This overgeneralization of VFT scores is unwarranted because they are not necessarily related to measures in other linguistic domains. Schmid (2006) demonstrated a very weak correlation between VFT and lexical diversity and fluency (accounting for less than 10% of the variance observed across the sample), and Yağmur (1997) did not find any correlation between the VFT and the scores on the syntactic test (a relative clause formation task).

In other words, the VFT may indeed be able to detect differences in speed of retrieval between attrited and non-attrited populations. However, it is very difficult to draw any conclusions as to what these differences relate to. If attriters are consistently outperformed by control subjects, but if their performance is unrelated to the frequency of exposure to and use of L1, or to their attitudes towards L1, then what causes attrition in the first place? Additionally, VFT studies with bilingual populations in general have shown that bilinguals may be less fluent than monolinguals in each language, both in semantic and in formal fluency (Gollan et al., 2002; Rosselli et al., 2000). There may therefore be an effect of the L2 on the L1 which all bilinguals experience to some degree, and which impacts on their performance on the VFT. It is unclear to what degree the poorer performance found in attriters can be ascribed to this general bilingualism effect, and to what degree it is the outcome of language attrition.

2.2 Picture naming and matching

2.2.1 Method

Tasks investigating lexical retrieval by means of picture stimuli fall into two categories: those that investigate recall and those that investigate recognition. In both cases, subjects are presented with a series of pictures (usually black-and-white line drawings; a set of standardized pictures for this purpose is presented by Snodgrass & Vanderwart, 1980). In the retrieval task (picture naming), the subject is asked to name the word as quickly as possible. In the recognition task, the name of the item either has to be identified in forced choice, or the subject is asked to indicate whether the word presented together with the picture is the accurate name for the object in the picture.

Such tasks typically measure two things: accuracy and response time. Accuracy is relatively unproblematic to establish (a pilot study among the target population can be helpful in eliminating problematic pictures and identifying target responses). If reaction time (RT) is to be measured, it is advisable to use specialized equipment and software which can accurately gauge the interval between presentation and response. However, sophistication of measuring methods in picture naming and matching experiments in language attrition research varies considerably. One study used an untimed task (Schoenmakers-Klein Gunnewiek, 1998), while two others measured the interval with a hand-held timer (Isurin, 2000; Soesman, 1997). In Ammerlaan's (1996) study, the onset of the picture presentation was marked by means of a beep which, together with the response, was taped so that the interval could later be measured. To date, in attrition research, fully appropriate and reliable means of measuring by the use of specialized soft- and hardware, including a voice-key, have only been used by Hulsen (2000).

2.2.2. Assumptions

The naming of a picture, object or line drawing triggers at least three steps: (1) analysis of the structural characteristics of the object or the picture; (2) activation of the semantic representation; (3) activation of the corresponding phonological representation. All three steps have been shown to be liable to selective impairment in different kinds of pathologies (see Gérard, 2004, for a review). Qualitative analysis of errors occurring in such tasks allows the identification of the locus of the failure either at the semantic level — where an inappropriate (or partially inappropriate) semantic representation may be activated — or at the form level

— where difficulties in activating the corresponding phonological form may arise.² Alternatively, Ferrand (1997) claims that naming consists of the selection of a linguistic form corresponding to a visual representation and does not necessarily involve the activation of the corresponding semantic information. Although the first view is probably more common, both views may account for the major findings from bilingual lexical retrieval and access studies. The most robust effects observed in such investigations, i.e. frequency and cognate effects, have been located at the form rather than the semantic level (Jescheniak & Levelt, 1994). Frequency effects have been explained in terms of activation threshold as a function of frequency and recency of an item's activation (Paradis, 2004). Accordingly, more frequent lexical items are easier to activate. Cognate effects are clearly located at the phonological (or orthographical) form level, since cognates may have very different meanings in the two languages. Facilitation effects have been explained by the cumulative effect of their frequencies, similar to what is observed in intralingual homographs or homophones (Jescheniak & Levelt, 1994).

Matching tasks are frequently conducted with the same material as naming tasks and are supposed to be easier since the phonological form only has to be recognized and associated with the picture and not 'actively' retrieved. According to Paradis (2004), matching tasks are easier to accomplish than naming tasks even in cases where the activation threshold of an item is higher due to low frequency, lack of use or pathology. Recognition of items involves external stimulation and thus requires fewer neurological impulses than retrieval of items where the only stimulation is internal semantic or visual representation.

2.2.3. Findings from L1 attrition research

Picture naming and/or matching tasks have been used in both quantitative (Albert, 2002; Ammerlaan, 1996; Hulsen, 2000; Schoenmakers-Klein Gunnewiek, 1998; Soesman, 1997) and qualitative (Isurin, 2000; Olshtain & Barzilay, 1991) investigations of L1 attrition. Among the quantitative studies, Albert (2002), Hulsen (2000) and Schoenmakers-Klein Gunnewiek (1998) established a reference group of unattrited native speakers against which findings were compared, while Ammerlaan (1996) and Soesman (1997) investigated within-group variation, comparing more and less attrited speakers.

Most of the quantitative investigations listed above classify their stimuli as high- and low-frequency (with the exception of Albert, 2002), and as cognate or non-cognate in L1 and

² Problems which occur in the first step, and are not linguistic in nature, are outside the scope of this review and will not be treated here.

L2 (with the exception of Soesman, 1997). Some apply further criteria, such as single-stem vs. compound items (Ammerlaan, 1996; Hulsen, 2000), morphological similarity (measured in number of syllables, Ammerlaan, 1996) and so on. Albert (2002) used a timed picture naming task in L1 where compound nouns were primed by their L2 counterparts.

High-frequency items were found, without exception, to be retrieved faster (where a timed setup was used) and more accurately than low-frequency ones. With respect to cognates, overall findings are slightly more ambiguous: while Ammerlaan and Hulsen found a facilitating effect in cognates, Schoenmakers-Klein Gunnewiek's results are inconclusive as to the role of similarity. A case-study of a 10-year-old Russian orphan in the process of forgetting her L1 (Isurin, 2000) even found that cognates were more difficult to retrieve, however, as this study is based on the observation of a single subject and the number of cognate and non-cognate items in the stimuli was not controlled, these results may not be generalizable. In Albert's (2002) priming experiment, cognate status of each part of the compounds was the main variable, with the result that cognates with similar meaning in both languages facilitated naming, whereas *faux amis* increased both error rates and RTs.

Olshtain & Barzilay (1991) investigated naming in the context of narrative speech by means of *Frog, Where Are You?* (Mayer, 1969), a picture-based booklet frequently used in linguistic research to elicit spontaneous descriptive and narrative speech (cf. Berman & Slobin, 1994). They found much larger variation in words used to express infrequent specific nouns (such as 'pond', 'deer', 'gopher', 'jar' etc.) for a group of Americans living in Israel than for the American control group. Yağmur (1997) obtained similar results with the same material for Turkish immigrants in Australia.

The overall findings suggest a long-term effect of emigration on both reaction times and accuracy in lexical retrieval: in Soesman's (1997) data, the best results were achieved by those immigrants who had the shortest length of residence and the largest amount of contact with the L1 in daily life. Hulsen (2000), who investigated three generations of immigrants, found an increase in reaction times and a decrease in accuracy across generations. Interestingly, the overall reaction times in her first generation of subjects did not differ from those of the control group, but their responses were significantly less accurate, and there was greater interindividual variation in response time.

Ammerlaan (1996) and Hulsen (2000) went on to present the same stimuli to the subjects in a picture matching experiment subsequent to the picture naming task, in order to test whether those items which subjects had been unable to recall might be recognized. In a forced-choice task (with the correct word plus five distractor items), Ammerlaan found that

subjects were still unable to identify the correct item in one-third of the cases which they had been unable to recall. Hulsen, who presented the picture together with one word and asked subjects to indicate whether it was the correct item or not, found that her first generation immigrants did not perform differently from the control group on this task. Schoenmakers-Klein Gunnewiek (1998), who used different items in the naming and in the matching tasks, found no overall difference between her experimental groups and the control group. Similarly, Jaspaert & Kroon (1989) found no attrition with a vocabulary test where the subjects had to give a definition or translation of a number of low frequency L1 words.

In sum, picture naming tasks appear to be a valid measure for detection of lexical retrieval difficulties among attriters, as indicated by the loss of accuracy and increased reaction times. Lexical recognition appears to be less prone to attrition: the only study which found a group effect in a matching task (Ammerlaan, 1996) includes a group of participants who emigrated at a younger age as those investigated in the other studies (from 6 years onwards); and age proved to be an important predicting variable in this study. This suggests that attrition may affect recognition skills only in the most severe cases: it has recently been pointed out that the effects of the so-called Critical Period may be much stronger and more clear-cut in L1 attrition than in L2 acquisition (Köpke & Schmid, 2004: 20). Attrition in speakers for whom input in the L1 is dramatically reduced before puberty (e.g., children of migrants) or even ceases entirely (e.g., international adoptees) has been shown to be on an entirely different scale from what can be found in older migrants (for an overview and discussion see Köpke & Schmid, 2004: 9f.).

On the other hand, longer latencies in picture naming alone are not necessarily a sign of attrition. Bilinguals have repeatedly been shown to be slower than monolinguals in such tasks (Mack, 1983; Mägiste, 1979) and reaction time is frequently taken as a measure of language dominance. More recent studies, however, have evidenced increased response times in naming even with bilinguals being tested in their dominant language (see Gollan et al., 2005; or the review in Michael & Gollan, 2005). So, once again, limits between 'normal' bilingualism and attrition appear to be fuzzy.

2.3. Spontaneous speech

The role of free data in investigations of language attrition is a rather controversial one. On the one hand, it is argued that using language spontaneously is what people do naturally. If the goal of an investigation is to judge to what degree language attrition is a 'real' phenomenon that might impact on people's lives and their ability to communicate, then

millisecond differences in reaction times in a picture naming task may be of little relevance, irrespective of their value for psycholinguistic-theoretical investigations of language processing. On the other hand, phenomena that occur in free speech are difficult to quantify and interpret (Schmid, 2004).

Spontaneous speech is a less targeted and specialised method of elicitation than the ones mentioned above, in that it allows the analysis of large and varying areas of the linguistic repertoire (Schmid 2004) For the purpose of the present overview, however, the application of spontaneous speech for investigations of the mental lexicon will be focused on.

2.3.1 Method

The first issue to be decided by any investigation that wishes to use free data is: how free? To what degree is it possible to avoid the observer's paradox and obtain truly naturalistic data? There are cases of investigations of L1 attrition which have recorded naturally occurring conversations between potential attriters (Ben Rafael, 2004; Brons-Albert, 1993; Jarvis, 2003) or children at play (Bolonyai, 1999; Schmitt, 2001), but most often, the data used are semi-structured (often autobiographical) interviews (de Bot & Clyne, 1994; de Bot, Gommans & Rossing, 1991; Gross, 2004; Leisiö, 2001; Søndergaard, 1996), picture descriptions or re-tellings of picture-book stories (Köpke, 1999; Yağmur, 1997) or film retellings (Dewaele & Pavlenko, 2003; Keijzer, 2007; Pavlenko, 2004; Schmid, 2007). Two case studies (Hutz, 2004; Jaspaert & Kroon, 1992) and one group study (Laufer, 2003) also investigate 'spontaneous' written production in written correspondence or in a composition task.

The second issue is what aspect of the spoken data obtained in this manner is to be analyzed. In this respect, the classification of CLI phenomena proposed by Pavlenko (2004, see above) is extremely relevant: The speech of most bilinguals will contain immediately visible and noticeable phenomena indicating her processes 1-4 (borrowing, restructuring, convergence and shift). Many investigations have therefore focused on code-switching, code-mixing, code-merging and other types of interferences or 'errors', classified according to various criteria, e.g. more formal borrowings vs. semantic transfer (Hutz, 2004).

It has been argued, however, that accounts of such phenomena may not provide an accurate and holistic picture of an individual's L1 proficiency: for some speakers, using L2 items may be a communicative strategy, which may have many purposes (such as flagging a bilingual identity, or expressing concepts which are felt to be L2-specific). Other speakers may make an effort not to code-switch because they disapprove of mixing languages, while

for others still, such switches may indeed signal a retrieval problem in the L1. Any large-scale investigation of language attrition will find that these strategies vary considerably across informants; but they may not be an indication of L1 proficiency at all unless clear instructions had been given to avoid switches.

It has therefore been proposed that investigations of free data should not only focus on error analysis but attempt to include phenomena that will be less susceptible to communicative strategies. For the purpose of investigations of the mental lexicon, two measurements are of particular relevance: lexical diversity and fluency.

The concept of lexical richness and diversity focuses not only on the size of the active vocabulary at a speaker's disposal, but also on how this is deployed in actual discourse. Traditionally, this was measured by the type-token ratio (TTR), which simply calculated how many words a speaker had used in total (types), and how many of these were different lemmata (tokens). More recently, it has been shown that this measure is not stable if applied to data samples of varying length: TTRs decrease in longer text samples. A measure of lexical diversity which compensates for this factor, called 'D', has therefore been proposed by Malvern and Richards (2002; also Richards 1987).³

The second measurement of relevance here is fluency. Fluency in both native and non-native speakers is a complicated and controversial concept (see the overview in Cucchiarini, Strik, & Boves, 2000), however, it has most often been linked to the frequency and distribution of phenomena such as speech rate, hesitations, filled pauses, repetitions and self-repairs (e.g. Lennon, 1990; Möhle, 1984). Nakuma (1997a,b) argues for a combined rate of communicative competence through which individual attrition levels could be measured, and which is calculated on the basis of speech rate, pause duration, repetitions and gap filling as well as the more 'traditional' measures of errors, syntactic complexity etc. A further factor which should be taken into account, however, is that the distribution of hesitation markers might change not only quantitatively but also qualitatively during the attrition process: It has been proposed that native speakers employ hesitations predominantly for purposes of macro-planning, that is, information retrieval and inference, while micro-planning issues of converting this information into actual linguistic output are largely automatized (Kess, 1992; Levelt, 1989). While both attriters and non-attriters can be expected to employ hesitation phenomena for macro-planning purposes, micro-planning should have become less

³ The calculation of D is less straightforward than that of the simple TTR, but for text samples which have been coded in CHAT format according to the CHILDES conventions (<http://chilides.psy.cmu.edu/>), D can be calculated with the help of the freely downloadable program CLAN.

automatized for attriters, and more intra-constituent hesitation markers should therefore be found (e.g., Yukawa 1997).

2.3.2 Assumptions

For the most part, the investigation of the occurrence, nature and distribution of ‘error’-phenomena in the speech of attriters (or bilinguals in general) has been theory-neutral. Most of the studies followed the general CLI hypothesis investigating the claim that the lexicon is more vulnerable to interference from L2 than other linguistic domains (see overview in Köpke & Schmid, 2004).

Predictions as to lexical richness are very similar to the ones made with respect to picture naming above: it is assumed that language attriters consistently underuse their L1, and that this non-activation and inhibition will lead to a higher activation threshold. This will be particularly the case with respect to less frequent lexical items, so that the prediction is that attriters will not only have a reduced lexicon, but one that consists mainly of items that are frequent in unattrited speech.

Investigations of fluency present an interesting perspective, as in L2 learners, these phenomena develop towards the native speaker norm as the L2 system develops (Towell, Hawkins, & Bazergui, 1996). It is possible that more detailed investigations of hesitation or self-repair phenomena might indicate specific areas of linguistic knowledge in general and the mental lexicon in particular which become problematic in the process of attrition.

2.3.3 Findings from investigations on L1 attrition

2.3.3.1 Errors

Investigations of errors in free spoken data collected from language attriters often attempt to assess the relative degrees of ‘erosion’ of the overall system across linguistic levels. Of relevance here is the assumption – first made at a very early stage of attrition research – that the lexicon is the most vulnerable area (Andersen, 1982). Some evidence for this assumption is provided by analyses of different errors types in natural conversations (Brons-Albert, 1994; Jarvis, 2003), in picture descriptions (Köpke, 2002), and in written correspondence (Hutz, 2004). On the other hand, a longitudinal case study of a corpus of letters by Jaspaert & Kroon (1992) suggests that lexical attrition is less prevalent than generally expected. However, as

this study provides no comparative baseline, either from other linguistic domains or from investigations of other populations, this is a claim that remains difficult to substantiate.⁴

More specific predictions regarding lexical errors can be made within particular frameworks or models of language learning or the mental lexicon. The 4-M Model (Myers-Scotton & Jake, 2000) predicts a hierarchy wherein content morphemes are more vulnerable to attrition than ‘early system morphemes’, such as gender, which is directly elected when a noun is accessed. These in turn are more vulnerable than ‘late system morphemes’, such as case or plural, which are contextually activated. Investigations among both adults (Gross, 2004) and children (Schmitt, 2004) seem to provide support for such a prediction. Adopting Levelt's (1989) Speaking model, Brons-Albert (1994) analysed speech errors involving compounds with varying degrees of cross-language transparency and concluded that typologically similar languages, such as German and Dutch, are linked at the form level with respect to morphological and phonological representations. With the exception of these studies, however, to date most approaches to lexical errors in attrited speech have remained descriptive (e.g. Hutz, 2004; Jaspaert & Kroon, 1992).

2.3.3.2 Diversity

Investigations of lexical diversity in free speech are rather scarce to date. The earliest study which included an assessment of the development of type-token ratios (TTRs) is de Bot & Clyne (1994). In this study, the TTRs calculated on the basis of free spoken data collected from L1 German immigrants in Australia were contrasted with earlier data from the same sample, collected two decades previously. No difference was found between the measures at the two points in time. This, however, does not preclude the possibility that lexical diversity had suffered at some earlier point in time, and that a comparison against a non-attrited baseline might reveal differences. Laufer (2003) similarly investigated the development of lexical diversity (in this case in written production) across the emigration span. She contrasted data from three groups of Russian immigrants to Israel with different emigration spans, and concluded that with increased length of residence the percentage of high frequency words increases, while overall type-token ratios decrease.

Two investigations of L1 German long-term immigrants to the US and the UK (Schmid, 2002, 2004) and to Anglophone Canada and The Netherlands (Schmid, 2007), which

⁴ The question of how to quantify and qualify the amount of attrition is relevant here: Jaspaert & Kroon observe that 5 percent of the main verbs in their corpus have undergone interference. Whether or not this should be considered ‘substantial’ remains an open question.

contrasted type-token ratios against a non-attributed baseline, revealed a significant decrease between the experimental and the control groups. Interestingly, the former study, an investigation of three groups of immigrants with different overall proficiency levels in L1, found that lexical diversity was the only area in which the group with the highest proficiency level differed from the control group, while their performance on various other morphological and syntactic measures appeared largely unimpaired. This finding provides some corroboration for the assumption that the lexicon is the area of the linguistic system which will be affected earliest and most drastically by attrition.

On the other hand, Dewaele & Pavlenko (2003) report that the data produced by a group of L1 Russian speakers on a film-retelling task did not differ from those elicited from a monolingual group of Russian speakers, either in lexical diversity⁵ or in overall productivity. However, the group investigated had a comparatively short emigration span (between 1.5 and 14 years, with the majority of speakers having lived in the US for 3-8 years).

Taken together, the results presented above indicate that lexical diversity is indeed a feature of language use which may gradually show some decline in the attritional process, but which may also stabilize again at a later stage: no decline was found in the very early (Dewaele & Pavlenko, 2003) or very late (de Bot & Clyne, 1994) stages, while Laufer (2003) and Schmid (2004, 2006)⁶ do find significant decrease, which in the former case appears to be related to emigration length.

2.3.3.3. Fluency

The development of fluency indicators, such as speech rate, hesitation phenomena etc. is one of the more radically under-researched areas of language attrition. A case-study of 3 young attriters of Japanese (Yukawa, 1997) reports variable findings as to the development of hesitation markers, with only two of the three speakers showing a slight increase towards the end of the attrition period (between 5 and 16 months). The only investigation which systematically compares the frequency of pauses, filled pauses, repetitions and retractions (self-corrections) between attriters and non-attriters is Schmid (2007). She reports a significant difference between her two experimental groups, L1 German speakers in Anglophone Canada and The Netherlands, on the one hand, and the control group on the other on all of these measures except filled pauses. With respect to this latter phenomenon, the

⁵ Dewaele & Pavlenko (2002) calculated lexical diversity on the basis of the Uber-formula proposed by Dugast (1980) in order to compensate for varying text length.

⁶ Similar results are obtained in L2 attrition, e.g. in Japanese returnees where reduced diversity seems to be related to age (Fujita, 2002; Reetz-Kurashige, 1999; Yoshitomi, 1999).

Canadian group behaves very similar to the control group, while the average number of filled pauses in the Dutch group is almost twice as high. Preliminary results in a reanalysis of older data (Köpke 2007) also suggest reduced fluency in attriters (Germans in France and Anglophone Canada) compared to control subjects.

Given these findings, and the results reported by Dewaele & Pavlenko (2003), who found no difference in overall productivity between the attrited group and the control group, it appears vital to conduct further investigations on fluency markers in attrition. Here it should also be taken into account that it may not be wholly appropriate to investigate each of the measures enumerated above separately: while an increase in each separate phenomenon may indicate a reduction in overall fluency, there may also be high degrees of individual differences: one speaker may have the tendency to pause and reflect when she experiences retrieval difficulties, while another may repeat the previous word several times or prefer a filled pause. It may therefore be profitable to look at the combined incidence of hesitation markers per speaker, taking into account the positions in the sentence at which these markers occur, since these may provide indications of where particular grammatical problems are located (Schmid & Beers Fägersten, *forthc.*).

2.4. Judgment tasks

2.4.1. Methodology

The last group of tasks involve judgements of semantic distinctions, usually on verbs, as these tend to show more language-specific usage than other lexical items, such as nouns. In particular, such judgments have investigated idiomatic verb use (Altenberg, 1991), metaphoric verb sense and opaque expressions (Pelc, 2001) and collocations used with verbs (Laufer, 2003). The expressions to be judged are presented within the context of a sentence in writing (Altenberg, 1991; Laufer, 2003) or in two modalities, orally and in writing (Pelc, 2001). Both binary acceptability ratings (Laufer, 2003; Pelc, 2001) and preference indications on a five-point Likert-scale (Altenberg, 1991) have been used. Additionally, Altenberg (1991) conducted a post-test interview where she invited the participants to comment upon their own judgments.

2.4.2. Assumptions

It is generally supposed that semantic aspects of vocabulary use as reflected in metaphorical or idiomatic verb use and collocations are indications of the structure of the mental lexicon. Hence, any change in use can be taken as evidence of structural changes in

the mental lexicon as a consequence of attrition. In other words, these tasks are aimed at capturing phenomena that fall under Pavlenko's (2004) categories of restructuring or convergence (see above). Following this rationale, it is possible to distinguish changes in the structure of the mental lexicon that have been completed (resulting in a permanent change with stable performance) and others which are still ongoing (resulting in variation of performance). Unfortunately this latter point has not yet been addressed by attrition studies.

2.4.3 Findings

The first study to apply this type of semantic judgment in an attrition context was Altenberg's (1991) case study of two German-English bilinguals. While these two subjects gave non-target-like judgments in a number of cases, the post-test interviews indicate that judgement tasks (which are generally supposed to be offline tasks and as such less sensitive to performance effects) are far from reflecting stable competence: in many cases, the participants indicated surprise at their judgement when they were confronted with their answers. This variation in semantic judgements indicates that attrition might affect linguistic confidence, so that attriters become somewhat insecure with respect to native norms of their L1.

Altenberg's initial impression that the accuracy of semantic judgments might be affected by the process of language attrition are confirmed by quantitative investigations of Greek-English (Pelc, 2001) and Russian-Hebrew (Laufer, 2003) bilinguals. Laufer's (2003) analysis of collocation judgements is based on the claim that "when an incorrect collocation is judged correct, the reason is likely to be a change in the way words have become related to other words in the mental lexicon" (p. 20).

The issue of what judgment tasks actually measure, and what interpretations and conclusions they allow, is highly controversial (cf. the discussion in Altenberg & Vago, 2004). Among the most frequently expressed critiques is that these tasks might reflect metalinguistic skills rather than linguistic proficiency, and that these metalinguistic skills are less prone to attrition (de Bot et al., 1991). However, Köpcke and Nespoulous (2001) showed that (grammaticality) judgement tasks may be more sensitive in detecting attrition than online production tasks. Concerning semantic distinctions — which are the most frequently investigated aspect of lexical representation within the context of attrition — these assumptions appear to be corroborated by the findings reviewed above.

3. Discussion

The findings presented above reveal that the mental lexicon was found to be consistently affected by the language attrition process. These findings are striking in the context of investigations of attrition on other levels of linguistic knowledge, such as the grammatical or phonological system, which typically find very little change (at least in post-puberty migrants, see Köpke & Schmid, 2004). They do suggest that the lexicon — or at least its semantic aspects which have been mainly studied — may indeed be more susceptible to change than other areas of language. To what degree that susceptibility is indeed specific to attrition, as opposed to bilingual development, remains an open question.

It is noteworthy that many of the areas in which investigations of language attrition have detected differences between experimental and control populations tally with differences which are often observed in bilinguals in general: more tip-of-the-tongue phenomena (see also Ecke, this volume), weaker results in VF, and longer RTs in picture naming (e.g. Gollan et al., 2005; Michael & Gollan, 2005). Two alternative explanations of the differences observed between bilinguals and monolinguals with respect to lexical retrieval have recently been proposed:

- (a) cross-language interference arising directly from competing lexical representations across languages
- (b) weaker links between semantic and phonological representations due to the fact that bilinguals use the words of each language less often compared to monolinguals (Michael & Gollan, 2005: 395-397).

Interestingly, this classification reflects the two processes that from a more structural point of view have been labelled *internally* vs. *externally* induced change, and as such have played an important role in accounts of language attrition. From a psycholinguistic perspective, too, attrition has been interpreted on the basis of the two cognitive processes of L2 influence on the one hand and lack of use on the other (Köpke, 2004: 17): The Activation Threshold Hypothesis (Paradis, 1993, 2007; see also Gürel, 2004; Köpke, 2002) predicts that non-use of the L1 will raise activation thresholds in this system, leading to both L2 interference and weaker links.

On the basis of the similarity of results based on observations of bilingual populations in general and of attriting populations in particular, it can be speculated that the same mechanisms (mainly related to processing costs) may assert themselves in diverse situations such as the simultaneous processing of two or more languages, L2 influence on L1 and language attrition. It is therefore possible that the process of restructuring of the L1 which we perceive as attrition in long-term immigrants is a gradual one which starts far earlier than

previously assumed. We should even entertain the possibility that the onset of attrition coincides with the onset of bilingualism; that bilinguals know and use language in a way that is fundamentally and irreversibly different from that of monolinguals (Cook, 2005).

Two methodological issues arise from this assumption:

- a) Studies of bilingualism in general, that usually seek to investigate highly proficient bilinguals, should allow for the possibility that some of their findings on the apparent processing costs of bilingualism are, in fact, due to the presence of attriters in the sample.
- b) Studies of language attrition will have to re-assess the selection principles for control group subjects: comparing monolingual controls with bilingual experimental subjects may yield a distorted picture. While the practical difficulties in establishing a baseline of active bilinguals against which attriters can be compared are daunting, such reference groups are indispensable.

One theoretical implication of this is that models of the bilingual mental lexicon should more systematically be discussed with respect to their capacity to account for dynamic variation over time. Consider for example the Modified Hierarchical Model (Pavlenko, this volume): the size of the boxes corresponding to L1 and L2 words, L1- and L2- mediated concepts and shared representations may vary according to dominance patterns within bilingual development. But most importantly, the variation in the strength of the connections between L1 and L2 words on the one hand and L1 and L2 words and concepts on the other — one of the most interesting aspects also distinguishing the Revised Hierarchical Model (e.g., Kroll & Tokowicz, 2005)— should be able to account for even subtle changes in these dominance patterns, with an additional link between L1 words and the conceptual representations shared by L1 and L2 getting stronger within the attrition process.

A further important methodological issue is *task dependency*. L2-dominant bilinguals in general, and language attriters in particular, appear to be experiencing traffic from L2 to L1 in two main areas with respect to the mental lexicon:

- *retrieval and access modalities* (slower and perhaps less accurate, e.g., fluency task, naming task, hesitation and fluency phenomena in spontaneous speech)
- *restructuring* of the mental lexicon (judgments, errors in spontaneous speech or in naming tasks)

Both these processes are a reflection of the structure of the mental lexicon and show that processing and control issues may assert themselves differently, depending on the task at hand. In this respect, interesting findings are presented by Jarvis (2003) in a case study of a

Finnish woman in the US. In this study, a qualitative analysis of deviations observed in spontaneous speech (natural conversation) shows that the majority of these deviations were lexico-semantic or idiomatic in nature. When the same structures were elicited in a more formal film retelling task, the subject did not reproduce her own errors. However, in a more metalinguistic judgement/correction task, she accepted 9 out of 15 of the deviant structures she had produced spontaneously (but not in the more formal film retelling task). This variation between tasks within a single subject indicates that task choice is an important issue in attrition research.

Regrettably, research on attrition has not yet been conducted with what is probably the most popular paradigm in research on lexical access: the lexical decision task (see recent research reviews, e.g. Dijkstra, 2005). The reason for this is that the focus of attrition studies is generally on production, which many theoretical frameworks (e.g., the Activation Threshold Hypothesis) assume to be more vulnerable to attrition than receptive skills. As the lexical decision task has been shown to provide intriguing results for bilingual populations, it is quite likely that this tool may be sufficiently sensitive to give insights into the more subtle dynamics of the bilingual mental lexicon as evidenced by attriters.

In conclusion, it appears possible that attrition is merely the emerging part of the iceberg of bilingualism. The more subtle effects of L2 influence on L1, which are probably experienced by all bilinguals, usually remain under the waterline and cannot be detected except by targeted psycho- and neurolinguistic investigations. The chief benefit of two decades of research on language attrition, then, is to point out the particularities of the bilingual — who, as Grosjean (1989) so famously noted, is not two monolinguals in one person.

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