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11 The lexicon in second language attrition: what happens when the cat's got your tongue?

Kathleen Bardovi-Harlig and David Stringer

Abstract

In this chapter, we expand the conceptual framework of research on second language attrition by invoking an expansive notion of the lexicon, which, in addition to vocabulary, contains items below the word level (i.e., affixes) and above the word level (i.e., phrasal structure stored in long-term memory). Although most syntactic structures are generated and then discarded, a vast number of phrases remain fixed in memory, such that procedural knowledge of grammar may be accessed through complex lexical items. In this light, all empirical research on second language attrition to date that offers evidence for ordering effects can be shown to involve issues of access to the mental lexicon. We examine how computational and psycholinguistic models of lexical activation and inhibition might be used to explain both catastrophic loss in cases of disuse, and apparently miraculous recovery in situations of re-immersion, as lexical retrieval breathes life into syntax.

In our earlier review of research on second language (L2) attrition, we developed a model that positions L2 attrition and retention as part of the life cycle of acquisition, identifying the crucial variables that interact with the presence and absence of continued L2 input, and plotting specific trajectories for different populations (Bardovi-Harlig & Stringer, 2010). In the current chapter, we expand the conceptual framework for research on L2 attrition by proposing a pivotal role for the lexicon in empirically established sequences of loss and retention, with a particular focus on multi-word lexical entries. In the following section, we briefly review the most prevalent hypothesis of L2 attrition, the Regression Hypothesis, and argue that the empirical evidence used for its support inevitably involves elements encompassed by our inclusive definition of the lexicon, which contains bound morphology, free morphemes (including content and function words), constructions, idioms, and conventional expressions. We note that such ordering effects hold even

if these patterns of lexical attrition may be better explained by other hypotheses as yet untested in L2 attrition research, such the Activation Threshold Hypothesis (Paradis, 1993, 2004, 2007). We then consider more general L2 attrition findings that posit a difference in resilience between the lexicon and syntax, and suggest that a greater understanding of multi-word lexical entries might shed light on this distinction. In the sections that follow, we consider two avenues of thought, which together may help to explain two of the most mysterious attrition phenomena: dramatic loss in situations of disuse and dramatic retrieval in situations of re-immersion. The first line of reasoning puts together current work on phrasal syntax in the lexicon with recent investigations of the L2 acquisition of conventional expressions, in order to suggest that fragments of productive syntax are found in lexical memory. The second is that the lexicon is a network and should be explored as such. This perspective has long characterized computational and psycholinguistic models of lexical activation and inhibition, but has not significantly informed either formal theories of lexical semantics or linguistic accounts of L2 attrition. Finally, we consider attested examples of global loss and global reactivation, and consider how such phenomena might be demystified with interdisciplinary insight from linguistics, psychology and second language research.

Lexical aspects of second language attrition studies

On standard approaches to the lexicon in theoretical linguistics, elements stored in lexical memory include not only what are intuitively perceived as "words," but also bound morphology, all free morphemes (including content and function words), and multi-word units, such as idioms and expressions. In this light, the following subsection reveals a pattern visible in L2 attrition studies that have claimed empirical support for the Regression Hypothesis, in that the evidence is largely lexical in nature. It is then shown that previous findings generally indicate lexical loss without strong evidence for syntactic impairment. However, difficulties in interpreting the results of many studies suggest that a clearer understanding of the lexical interface with syntax must inform the design of future studies.

Revisiting the Regression Hypothesis

The Regression Hypothesis, which predicts that the path of attrition is the reverse of the path of acquisition (the first things learned remain longest in memory; the last things learned are the first things forgotten),

has historically been the most influential hypothesis in L2 attrition research. We consider five studies that found support for this hypothesis (Cohen, 1975; Hansen, 1999; Hayashi, 1999; Kuhberg, 1992; Olshtain, 1989), all of which arguably involve attrition of the lexicon.

Cohen (1975) investigated attrition after summer vacation in three second-grade children whose development of L2 Spanish in an immersion program had been documented via six elicitation sessions over 20 months from kindergarten to first grade. Using the children's own acquisition record to compare changes in production on an oral elicitation task before and after summer vacation, Cohen found that two of the three children showed attrition of contrasts that had emerged before vacation, such as the distinction between the verbs *ser* and *estar* "to be," gender on masculine and feminine articles, and progressive vs. simple present morphology.

Olshtain (1989) found that irregular formation of plural nouns and past-tense verbs showed regression in the speech of 5–8 year olds, where irregular forms *gave*, *ate*, *slept*, *woke up*, *feet*, *men*, and *children* became *gived*, *sleeped*, *waked up*, *feets*, *mans*, and *childs* over time, although older children (8–14) retained the irregular forms.

The Regression Hypothesis was also tested for L2 Japanese negation investigating both adult missionaries (Hansen, 1999) and adults who as children had attended Japanese schools during the Japanese occupation of Micronesia (Hayashi, 1999). Japanese negation is expressed by bound morphemes that are suffixed to the element being negated. Note that use of fully productive morphology involves lexical access to separately stored representations. Given the established acquisition sequence for Japanese negation (V-Neg → N-Neg> NAdj-Neg → Adj-Neg), the Regression Hypothesis predicts that the order of attrition would be the reverse (Adj-Neg → NAdj-Neg → N-Neg → V-Neg).[1] The production data for both populations supported the Regression Hypothesis; the last acquired combination, negation with adjectives (Adj-Neg) showed the greatest loss.

Hansen and Chen (2001) studied the loss of numerical classifiers by L2 Japanese and Chinese learners, with reference to the universal Numeral Classifier Accessibility Hierarchy (NCAH), which is claimed to determine the order of acquisition of appropriate semantic categories. Their findings indeed showed that attrition was generally in the reverse order of acquisition, with two telling exceptions: the classifiers

[1] Abbreviations for syntactic categories are as follows: N (noun), V (verb), Adj (adjective), Adv (adverb), P (preposition/postposition), Neg (negation), Prt (particle); phrasal projections are abbreviated NP, VP, etc.

for *books* and *bicycles*. These were acquired at a rate not predicted by the hierarchy nor by general frequency counts for conversational Japanese (Downing, 1984), but, as noted by Hansen and Chen, were evidently high-frequency classifiers in this population of missionary learners. This suggests an account in terms of frequency analysis, rather than an order determined by the nature of semantic categories.

Kuhberg's (1992) comparison of the longitudinal attrition data of two Turkish L2 speakers of German with the acquisition of L2 German by a first language (L1) Turkish speaker showed "strong reverse" patterns in L2 attrition and L2 acquisition (p. 151) and that "L2 attrition, at least for the linguistic phenomena investigated, is to a large extent the mirror image of L2-acquisition" (p. 152). Using oral production data, Kuhberg compared acquisition and attrition on fourteen points considering patterns within the categories rather than across the categories: nonmodal verbs, modal verbs, modal particles, vocabulary (except verbs), verb morphology, tense, plural, prepositions, personal pronouns, articles, syntax, complex communicative skills, patterns of speech imitation, and basic communication patterns. These data are more difficult to evaluate than the negation data (cf. Hansen, 1999) because of the breadth of the inquiry.

It should be made clear that the pattern of loss found in studies such as these is open to other interpretations than reverse order of acquisition, as important variables often remained uncontrolled. Many early-learned, best-retained elements are high frequency, so studies of regression in L2 attrition ought to distinguish frequency and order of acquisition. Similarly, attention mechanisms may be more focused at the beginning rather than at the end of a school year or a semester abroad. It is quite plausible that frequency and attention are relevant to persistence in lexical memory, such that the ordering effects might be better explained by an account such as the Activation Threshold Hypothesis of Paradis (1993, 2004, 2007), discussed in more detail below. The intention here is not to evaluate the Regression Hypothesis as such, but to illustrate that the most convincing evidence for ordering effects involves elements that are stored in the mental lexicon.

The vulnerability of the lexicon

Beyond studies that have specifically targeted the Regression Hypothesis, other research on L2 attrition has highlighted the susceptibility of the lexicon to attrition. Such evidence comes from three main sources, which we consider in turn: studies of the lexicon as *words* or *vocabulary*, comparisons of lexicon and grammar, and studies of multi-word units.

The first source of evidence involves studies of the lexicon as words. In L2 attrition studies, word knowledge is generally defined as word meaning (often tested by translation or picture identification, and occasionally by knowledge of semantic category or antonyms). This is exemplified by the variety of measures of change which focus on the word level, including the number of different words or *lexical diversity* (Cohen, 1989; Tomiyama, 2008), lexical errors (de Bot & Lintsen, 1989), total words (Cohen, 1986; Russell, 1999), type–token ratios (Tomiyama, 2008), words per unit (Cohen, 1986, 1989; Olshtain, 1986; Tomiyama, 2008), and relative frequency of grammatical classes (i.e., N, V, Adj, Adv, Prep, and articles; Cohen, 1974, 1989; Kuhberg, 1992; Olshtain, 1989). Measures of knowledge in controlled tasks include number of correct lexical decisions when learners distinguish words from nonwords (Grendel, 1993; Verkaik & van der Wijst, 1986, cited in Weltens & Grendel, 1993; Weltens, 1989), translation from L2 to L1 (Bahrick, 1984; de Bot and Stoessel, 2000), and picture identification (Tomiyama, 1999b). De Bot and Stoessel (2000) point out that testing words in isolation prevents learners from using context to determine unknown lexical content. The controlled word-recognition/recall studies measure sound (as orthography)–meaning correspondences, not sound–syntax–meaning correspondences.

Studies of the lexicon have measured the decrease in active vocabulary not only in terms of size (e.g. Russell, 1999) but of access. Based on the fact that children in longitudinal studies can give the meanings of words that had been used in previous production samples, but that have since dropped out in subsequent elicitation sessions, Cohen (1989) and Olshtain (1989) concluded that there is reduction in lexical access during production, but not a loss of comprehension, hence no loss in vocabulary. Similarly, studies that compare recognition to recall often report that recognition scores are higher. Using a lexical decision task (word/nonword) which recorded reaction time and error rate, Verkaik and van der Wijst (1986) found that while error rates remained relatively steady across two learner groups, one that had just finished instruction and one that had two years of disuse, reaction times were considerably slower in the group with two years' disuse. As Weltens and Grendel (1993) concluded, this shows that the speed of the retrieval process is more affected than the success of the process.

Problems with lexical retrieval may also underlie several findings in studies investigating attributes of fluency, including speech rate, hesitations, filled and unfilled pauses, and repetition (Russell, 1999; Tomiyama, 1999b). These same attributes of fluency are linked to difficulties in word retrieval in oral production tasks (Cohen, 1986;

Olshtain, 1986, 1989). Reduction in speed of access can cause a breakdown in fluency which resembles attrition in tasks of free production.

The second source of evidence for the vulnerability of vocabulary comes from comparisons between words and grammar, in which the former is often claimed to show more attrition than the latter (Kuhberg, 1992; Tomiyama, 1999a, 2008). However, at least some of the comparisons consist of lexicon-as-words to grammar-as-morphology, although morphology has traditionally been considered to reside in the lexicon. For example, Tomiyama (1999a) concluded that morphological attrition was less evident than attrition of vocabulary, defined as lexical retrieval difficulty, in the oral production of an 8-year-old returnee to Japan during the first 19 months after return. In a broader comparison of lexicon and syntax in the production of two L2 child speakers of German (ages 7 and 9) who had returned to Turkey, Kuhberg found that German word order was retained until the very end of the study, surpassing the retention of morphology. In addition, he reported slower speech, more frequent deviations in the use of verb forms, articles and prepositions, increasing lexical difficulties with verbs and other word classes, lexical switching to Turkish, and mixing of Turkish verb stems with German morphology. Although Kuhberg concluded that his findings support the position that the lexicon shows greater attrition than grammar, he also noted that specific aspects of morphology are affected by attrition earlier than the open-class lexicon.

Some studies have reached the opposite conclusion, claiming that the lexicon is more resilient than grammar. However, the findings of these studies resist straightforward interpretation. In documenting later stages of attrition, Tomiyama (1999b) reported that the child's lexicon stabilized while syntax deteriorated over the course of multiple sessions involving narrative retells. The use of embedded sentences in these elicited production tasks decreased from session 9 to session 22 over four years, whereas word knowledge, defined as picture identification scores, was maintained over four years. It is not clear that this finding demonstrates syntactic attrition: the decrease in numbers of embedded clauses gives no precise information concerning knowledge of syntax, and could possibly be a result of processing difficulties caused by impaired lexical retrieval. In a more recent study, Tomiyama (2008) found that in the L2 English of a 7-year-old and a 10-year-old lexical productivity (measured as words/clause) was maintained, but we note that learners told the same story seven times during the attrition period. In line with the general understanding of the relative vulnerability of

vocabulary, she also found that grammatical complexity was well maintained, in contrast to marked attrition in lexical diversity (which she termed "lexical complexity"). A further study to claim better lexical than grammatical retention was Moorcroft and Gardner (1987), which we discuss below.

The third kind of evidence sometimes used to point to the relative fragility of the lexicon derives from research on multi-word units in memory, although here the results are more mixed. Berko-Gleason (1982) suggested that researchers should undertake "a study to see if routinized or automatized language enjoys special status, e.g., are numbers especially retained" (p. 23), but the attrition or retention of routines and multi-word units has yet to be explored systematically. Nevertheless, longevity in memory has been observed in production data, not only for numbers, but sequences like days of the week and months, songs, emotionally laden phrases such as curses, idioms, and also social routines such as *How do you do?* or *Oh my goodness!* (e.g., Berman & Olshtain, 1983; Kuhberg, 1992; Moorcroft & Gardner, 1987; Olshtain, 1986, 1989). Berman and Olshtain (1983) reported that L1 Hebrew-speaking children who have returned from English-speaking countries generally retain the use of fixed expressions. The children used chunks such as *first of all*, *I'm crazy about*, and *that's a bore*, and social fillers such as *well I guess*, *you're welcome*, and *have a nice time*. In oral production data similar to that collected from children by Olshtain (1986, 1989), Kuhberg (1992) also reported that "basic communicative routine expressions" survived (p. 148).

Verb-particle combinations have proven easier to study than social expressions given their frequency of use and predictable occurrence. In contrast to the retention reported for social expressions, however, verb-particle combinations show some degradation following target-like attainment, including substitution of the target particle with another (*take off (shoes)* → *take out (shoes)*); omission of particle resulting in a bare verb (*put on* → *put*), and the replacement of the verb-particle combination with a single verb (*turn off* → *close*) (Olshtain, 1986, 1989).

Moorcroft and Gardner's (1987) claim of better lexical than grammatical retention is based partly on their study of multi-word units in tests which included oral and written open-ended questions administered to L2 French Grade 9 students before and after summer vacation. They included idioms as a category of analysis in the production data, although, as seen from their examples, many strings are not idioms based on a conventional understanding of the term. They included "weather" (no examples were given, although this was the

largest subset in the idiom category), age (*il a sept ans*; literally "he has seven years"), use of articles (*il a les yeux bleus*; literally "he has the blue eyes"), and partitive constructions (*j'ai peur de*; literally "I have fear of"). Although Moorcroft and Gardner classified idioms as "grammatical structure" (Table 2, p. 333; pp. 331–332), they repositioned them as "vocabulary" in discussing the results. They observed, "idioms differ from the other grammatical elements tested in that they are fixed forms. As such, they can be compared to vocabulary, and, like vocabulary, they are not forgotten, at least not over a short period of time" (p. 336). The findings resist broad generalization due to (i) the short period of disuse (3 months), (ii) the open format of the test items which allowed participants to respond differently, and (iii) the categorization of materials (e.g., article use was categorized under "idioms," and then idioms were classified with vocabulary, so that article use was treated as vocabulary).

In contrast, Bahrick's (1984) controlled test of idioms yielded no long-term retention for either idiom recall or recognition by L2 learners of Spanish, instead showing noticeable decline. The idiom recall test asked for translation of L2 Spanish idioms into L1 English; the idiom recognition test was a multiple-choice translation from L2 to L1. Idioms included *hace mal tiempo* "it's bad weather," *hasta la vista* "see you later," *en vez de* "instead of," *sin embargo* "however," *tal vez* "perhaps," and *desde luego* "of course." (We note that these may not all be "idioms" by a strict definition, but they are all lexically stored.) The recall of English translations for Spanish idioms was similar to the recall for individual Spanish words; but the recognition for Spanish idioms showed more pronounced and continuous decline than the recognition for individual Spanish words. Bahrick attributed the low scores for recognition in part to task construction in which the multiple-choice options for some frequent Spanish idioms included a cognate "foil" that misdirected the respondent, e.g., the multiple choice item for *sin embargo* "nevertheless" offered the English word *embargo* as one of the distracters (Appendix A). In addition, we note that for this item at least, the first distracter contained a literal translation of *sin* "without," creating a second distraction. Both choices are arguably unnatural, as they would be unlikely to be an issue in natural contexts of recall and production. A comparison of retention of idioms in recognition and recall tasks (Bahrick, 1984) with production data (Moorcroft & Gardner, 1987) reveals conflicting findings with much stronger declines found by Bahrick (although these could be due in part to task effect) in contrast to the retention found by Moorcroft and Gardner.

Rethinking the lexicon–grammar divide in L2 attrition studies

The studies discussed above, whether specifically investigating the Regression Hypothesis, or more generally examining the relative vulnerability of the lexicon, collectively indicate that a simple distinction between a fragile lexicon and a robust syntax is rather too simple. First, even within single studies, it is clear that the lexicon is not undifferentiated with respect to attrition. Berman and Olshtain (1983) showed that some aspects of the lexicon were retained by English L2 speaking children returning to an L1 Hebrew-speaking environment, whereas other lexical features showed attrition. Child returnees were observed to appropriately use chunks such as *first of all* to structure discourse and expressions for social interaction. In addition, high function or emotional items were also retained. In contrast, lexical loss was most extreme in daily vocabulary for items or events that were typical in Israel (relating to school, sports and recreation, and household events) and invariably referred to in Hebrew. This was plausibly due to interference: access to these items may have been blocked by high activation of the Hebrew analogues, in line with the predictions of Paradis (2007, see below).

Second, a closer look at the comparisons of lexicon and grammar reveals that what many studies describe as "grammar" is in fact inflectional morphology, which is also stored in the lexicon. Kuhberg (1992) observed, "Not only is the attrition of vocabulary considerable, but also that of basic grammatical categories (plural; present tense endings of verb morphology; genitive, dative and accusative cases)" (p. 152), and "Comparing morphology, lexicon and syntax, it must be pointed out that, in the data, certain aspects of morphology are affected earlier by attrition than lexicon. Syntax, at least in its basic patterns, remains intact longest" (p. 150). Yoshitomi (1999) suggested that such comparisons are vacuous in L2 attrition as loss of an item in the lexicon (or access to an item) cannot be compared directly to the loss of a rule of grammar. We consider research into the attrition of grammar relevant to our inquiry in all cases where syntactic properties are encoded in lexical entries. In the studies discussed above, lexical elements that determine aspects of syntax included morphology such as classifiers (Hansen & Chen, 2001), negative suffixes (Hansen, 1999; Hayashi, 1999), irregular nouns and verbs (Olshtain, 1989), and multi-word units such as idioms (Bahrick, 1984; Berman & Olshtain, 1983; Moorcroft & Gardner, 1987).

It is striking that studies providing supportive evidence for sequences of attrition all implicate lexical knowledge in some way, which suggests

that the nature of the lexicon itself must be re-examined if we are to interpret L2 attrition data. In the following section, we briefly examine recent work on lexical representation and L2 acquisition of multi-word units that suggests a more complex and intriguing relationship between lexical memory and syntax than has previously been assumed in the L2 attrition literature.

Creative syntax in lexical memory

At least since Bloomfield (1933), mainstream linguistic theory has traditionally regarded the lexicon as a list of morphemes that may be combined only following insertion into syntax. However, there are reasons to believe that relations between the lexicon and syntax are more complex. In this section, we consider the nature of multi-word lexical entries in light of recent research on representation and L2 acquisition, in order to deepen our understanding of lexicon–syntax relations in L2 attrition, and conclude that a considerable part of lexical memory is devoted to the storage of phrases, sentences, and texts, the recall of which involves active syntax. We draw on independent research by Jackendoff (1997b, 2002), who argues that the vast number of fixed expressions we commit to memory, subsuming compounds, collocations, idioms, clichés, and quotations "is of about the same order of magnitude as the single words of the vocabulary" (1997b, p. 156), and Bardovi-Harlig (2006, 2009), who provides empirical evidence for syntactic development in the pragmatic use of conventional expressions.

The lexicon in Parallel Architecture

In elaborating his theory of Parallel Architecture, Jackendoff (1997b, 2002) has taken issue with several assumptions in mainstream generative theory: (i) that fixed expressions are a marginal phenomenon, outside "core grammar" (Chomsky & Lasnik, 1993); (ii) that lexical items enter the syntactic derivation by means of insertion, substituting a syntactic node X^0 with phonological material; (iii) that semantic interpretation is necessarily post-syntactic and compositional; and (iv) that information in lexical entries is non-redundant. To this end, he cites a range of linguistic phenomena, from affixes through phrasal projections to whole sentences and even texts that must be stored in long-term memory even though they often involve productive syntax. The examples below show how by extending Emonds' (1972) original observations of the existence of discontinuous idioms with NP as an open variable (1), a broad class of constructional idioms can be identified, with other open

variables. In (2), V is open, while NP and Prt are fixed; in (3), V and PP are open, while the NP is fixed (the *way*-construction); in (4), V is open, NP specifies a time period, and the Prt is fixed (the *time-away* construction); and in (5), the analysis is extended to resultatives.[2]

(1) a. take NP to task (*take to task NP). (Emonds, 1972, p. 549)
    b. bring NP to a head (*bring to a head NP).
(2) a. {talk/drink/read} one's head off. (Jackendoff, 2002, p. 173)
    b. {argue/cry/sing} one's heart out.
(3) a. Paddy {whistled/danced} his way to the station. (Stringer, 2005, p. 352)
    b. Paddy {*whistled a tune / *danced a jig} his way to the station.
(4) a. Bill slept the afternoon away. (Jackendoff, 1997a, p. 534)
    b. We're twistin' the night away.
(5) a. Wilma watered the tulips flat. (Jackendoff, 2002, p. 175)
    b. Clyde cooked the pot black.

Going beyond idioms, whether of the constructional type above or fixed idioms with no open slots (*bury the hatchet, kick the bucket, corner the market*), Jackendoff (1997b) discussed a striking variety of other types of fixed expressions, including eight different types of compound (e.g., N-N: *dream sequence*, [A-N]-N: *frequent-flyer program*); names of people, places and organizations (e.g., *Clint Eastwood, International Red Cross*), clichés (e.g., *look on the bright side, the face of an angel*), titles of songs, novels and television programs (e.g., *All You Need Is Love, Lady and the Tramp*), as well as quotations (e.g., *beam me up Scotty, you ain't seen nothin' yet*) most of which are taken from his *Wheel of Fortune* Corpus.[3] He estimated that over a ten-year-period, this television show presented about 10–15,000 such puzzles, with little or no repetition, and with no sense that it will ever run out of new material (p. 154). These items are

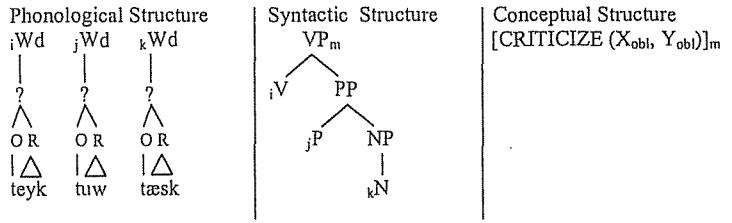
[2] It should be noted that while all the examples of idioms with fixed NP/PP/AP/Prt and V as a free variable must be encoded as constructions on any account, the case of resultatives is more complicated and more controversial. Jackendoff's flat structure representation offers the same linear account for both depictives (*The artist painted the model nude*) and resultatives (*The artist painted the statue red*). For a more complex account, expressing causality and result in the syntax, see Ramchand (2008).

[3] This is provided in the Appendix to Jackendoff (1997b). The *Wheel of Fortune* is an American television game show in which contestants are asked to guess well-known words and phrases, presumably almost all of which are stored in the lexicon of the average speaker of American English.

all instances of correspondences between phonological, syntactic, and semantic structure stored in long-term memory.

On the parallel-processing account, an operation *Unify* links outputs from the representational modules of phonology, syntax, and conceptual semantics. As such, fixed expressions can be accommodated in the lexicon in the same way as words, that is to say as stored links between phonological, syntactic and semantic structures. The simplified lexical entry for (1a) *take to task* involves the correspondences below (adapted from Jackendoff, 2002, p. 170).

(6)



The pre-subscripts show the linking between phonological structure and syntactic structure (henceforth PS–SS correspondences), while the post-subscripts show the linking between syntactic structure and conceptual structure (henceforth SS–CS correspondences); this linking is necessary as idioms do not have word-by-word mapping. Thus it is at the level of the VP, in this case, that a lexical correspondence is made to CS. Jackendoff leaves open the mechanism by which the second obligatory semantic argument is mapped onto an NP in syntax (plausibly through classical subcategorization).

It is important to stress two observations with regard to such structural lexical entries. First, there may be varying degrees of redundancy in syntax–semantics correspondences. In the above example, the linking between SS and CS is strictly at the VP level (there is no *taking* or *task* involved). However, in semantically transparent phrases that are stored in long-term memory, the linking will remain tied to various levels of syntactic composition. In partially transparent idioms, there may be linking at more than one level. The fixed expression *The buck stops here* is linked at the level of the sentence by everyone who understands the meaning of the expression; the item *stop* is presumably also linked directly; however, even if the meaning of *buck* is not transparent to all speakers (i.e., equated with *blame* or *responsibility*), it may be processed without any particular meaning, or associated with a different meaning. This does not prevent entirely appropriate use of the phrase, due to the redundancy in linking the whole fixed expression at the higher level.

A second observation is that this approach does not reduce the whole of language to a set of constructions – most sentences, including the one you are reading, are not stored in long-term memory, but are creatively constructed online in working memory. A crucial question is what *must* be stored, and what *can* be stored (Jackendoff, 2002, p. 152). What must be stored is not controversial, and is generally understood as being any word or phrase whose meaning cannot be derived compositionally. It is the question of what can be stored that makes the implications of this line of inquiry so pregnant with possibility. Any utterance can be memorized, and many of our daily social interactions are rife with fixed expressions, both idiomatic and compositional. Estimates of how much first language natural discourse is formulaic range from 20 percent (Peters, 1983) to as high as 59 percent (Erman & Warren, 2000). Even adopting a more conservative estimate, this suggests that access to the lexicon in the course of normal speech necessarily involves the stimulation of unconscious syntactic processing routines, thus providing a bridge between sound–meaning correspondences in declarative memory and procedural knowledge of syntax. We now consider how this expanded notion of the lexicon can inform our understanding of second language acquisition and attrition, with specific reference to the role of conventional expressions. Contrary to standard assumptions in the L2 literature, such expressions are not always memorized "chunks," but are shown to be actively constructed syntactic representations subject to change over the course of development.

Conventional expressions in the acquisition of L2 pragmatics

Recent research in interlanguage pragmatics has investigated the issue of the grammar of formulaic sequences in second language development. Bardovi-Harlig (2009) adopted the term *conventional expression* to describe those social formulas that are routinely used in particular discourse contexts by native speakers, and that serve as both input and targets for second language learners. Adopting this term avoids the potential confusion of the more widespread term *formula*, which is used in a variety of different senses, and carries a (usually implicit) claim that such sequences are "stored and retrieved whole from memory at the time of use, rather than being subject to generation or analysis by the language grammar" (Wray, 2000, p. 465). It is desirable to avoid making this a priori psycholinguistic claim when the nature of such sequences is precisely the object of investigation. The findings of Bardovi-Harlig (2009) constituted the first major documentation of

changes in the grammar of conventional expressions over the course of second language development, and thus allow us here to revisit the issue of representation in memory, retrieval, and online syntactic construction.

In given social contexts, native speakers predictably use conventional expressions such as *Nice to meet you*, *No problem*, *(I'm) sorry I'm late*, *I'm just looking* (while shopping), and *I gotta go* (on the telephone). Conventional expressions are by definition situationally dependent and community-wide in use (Myles, Mitchell, & Hooper, 1999). In order to investigate the relationship between L2 recognition and production of such phrases, Bardovi-Harlig (2009) conducted two tasks: (i) an aural recognition task testing knowledge of 60 expressions, and (ii) an oral production task eliciting responses to 32 scenarios. Participants included 122 learners of English from a variety of L1 backgrounds, placed in four levels of an intensive English program, and 49 native speakers of English, subdivided into peers and teachers. The oral production task yielded 5,504 responses (172 participants × 32 scenarios). That the selected conventional expressions tested were in fact what native speakers typically say in the circumstances described was experimentally confirmed. Of primary relevance to our concern in this chapter is the syntactic variation that emerged over the course of development. For example, consider the following scenario in the production task.

(7) You made an appointment with your teacher. Unfortunately, you arrive five minutes late for the meeting. Your teacher says, "Hello. Come on in."
You say:

In such contexts, native speakers reliably use the conventional expression *(I'm) sorry I'm late.*[4] In attempting to construct this target expression, learners reveal that they are not simply retrieving a formulaic chunk, but are creatively combining elements in syntax, often resulting in forms of the type illustrated in (8), reflecting interlanguage syntax, or of the type exemplified in (9), which are grammatically acceptable

[4] This could be analyzed in one of two ways by native speakers. One possibility is that it could be two sentences idiomatically combined. While this is arguably not a legitimate derivation in syntax, several types of fixed expressions are syntactically deviant, as noted by Jackendoff (2002), for example *all of a sudden*, *by and large*, *up to your room with you*, *one more beer and I'm leaving*. Alternatively, this could simply be a standard matrix and embedded clause with a null complementizer, of the same form as *She was sorry (that) she was late*. It is also possible that different native speakers have different representations for the same surface form (McCawley, 1979, pp. 239–240).

in the target language but are not the preferred expression stored in memory by native speakers.

(8) a. I'm sorry for late.
b. I'm sorry for I'm late.
c. I'm sorry about late.
d. I'm so sorry about my late.
e. I'm so sorry to being so late.
f. I'm sorry because I late.

(9) a. Sorry for being late.
b. I'm sorry to be late.
c. I'm sorry to come late.
d. Sorry for coming late. (Bardovi-Harlig, 2009, p. 777)

The results also show development over the four levels of proficiency tested. In one "late" scenario, both lexical items *sorry* and *late* were used at a rate of 76 percent at the lowest level, and 96 percent at the most advanced level. The specific expression *(I'm) sorry I'm late* was used at 17 percent at the lowest level, 31–32 percent at the intermediate levels, and 48 percent at the most advanced level. Other conventional expressions such as *I'm just looking* (while shopping) showed similar patterns of development.

These data provide support for and allow for a refinement of Jackendoff's (1997b, 2002) lexical representations in Parallel Architecture, which were illustrated in example (6). It seems plausible to assume that despite the range of syntactic variation in learners' attempts to converge on the target formula *(I'm) sorry I'm late*, many share a target-like conceptual structure, stored in long-term memory. Thus, over the course of development, the linking between the highest structural levels of SS and CS representations essentially remains unchanged, despite the meaning not being idiomatic, while allowing for developmental changes within the syntax. The syntactic representation itself may be generated by either interlanguage or target-like principles of combination, and may exhibit variation even within individuals. Representational modularity also allows for the converse situation – there could be a change in the conceptual representation of a fixed expression that learners have mastered syntactically, as they realize that the precise semantic interpretation is not what was first assumed. In short, the kind of pragmalinguistic development described is insightfully captured in a model that distinguishes the independent generation of syntactic and conceptual structure, and in which well-formed utterances depend on correspondence rules between the outputs of representational modules.

What's in a word? A closer look at sound–meaning correspondences

Following our consideration of studies cited in support of the Regression Hypothesis, we speculated that a common denominator was the activation of the lexicon, as opposed to the implementation of the implicit knowledge involved in syntactic processing. However, this reconsideration of the nature of the lexicon allows us to refine our analysis. For many attrition studies, one-word retrieval paradigms were employed which test only sound–meaning relations (PS–CS correspondences). These correspondences are entirely arbitrary in a Saussurean sense, and of little relevance to linguistic computation. No L2 study of lexical attrition to date has specifically explored syntax–meaning relations (SS–CS correspondences) or full sound–syntax–meaning relations (PS–SS–CS correspondences), which are of primary concern to those interested in the language faculty. That an English learner of French can appropriately name or select a picture with grapes or pasta does not indicate "acquisition" of these lexical items. In order to use such words in sentences, learners must specify *raisin* "grapes" as a mass noun and *pâtes* "pasta" as a count noun, contrary to their English analogues. They must acquire the knowledge that *raisin* is masculine and singular, and that *pâtes* is feminine and plural. Otherwise, these nouns cannot be used appropriately in combination with either determiners, quantifiers, adjectives or verbs, and cannot be substituted by matching pronouns. As is well known, to acquire lexical entries for verbs is even more complex, and involves infinitely more than being able to say "yes" on a picture-matching task. The *Shorter Oxford English Dictionary* (1993) uses over three-and-a-half thousand words to define the verb *put*. Clearly, as argued by Bloom (2000, Ch. 2), acquisition of a word occurs incrementally with multiple exposures. Finally, we must note that lexical entries above the word level are still more complex. For example, stimulation of the conventional expression *I'm just looking* involves syntactic knowledge of pronouns, case assignment, contraction, adverbial modification, use of an irregular light verb, encoding of semantic verb class, and appropriate use of aspectual morphology.

Although this suggests a potential gold mine in essentially uncharted territory for attrition research, previous studies of the breakdown or retention of simple sound–meaning correspondences may nevertheless have interesting implications for more linguistically oriented studies of attrition. For example, the loss of a link between sound and meaning implies lack of access to syntactic information in the entry, such that a problem in declarative memory has a domino effect

rendering inaccessible the relevant implicit syntactic processing routine. Conversely, the reactivation of a link between sound and meaning might automatically restimulate any linked syntactic information, without such procedural knowledge ever becoming conscious.

The consideration of the lexicon as a network allows us to take this idea to another level. Just as PS–SS–CS correspondences are linked within lexical items so that stimulation of any pairing can stimulate a third representation, lexical items themselves are linked in complex networks, ultimately forming the lexicon of a language in an individual mind. While most empirical research on the spreading of activation and inhibition in bilingual lexical networks has focused on temporary effects in particular situations, with states of linguistic knowledge being constant, the question arises of what happens over long stretches of time when one language is continually activated, and the other continually inhibited. A further question concerns reactivation of lexical items after long-term disuse. If each lexical item has multiple links in the system, might re-stimulation of many items have a cascade effect throughout previously suppressed representations? L2 attrition research has yet to address such questions, but may be informed by previous work in computational modeling and psycholinguistics. The following section considers examples of such work with potentially far-reaching implications of our understanding of both attrition, and recovery from attrition.

Losing one's inhibitions

Theories of lexicon-as-network have principally been developed in computational linguistics and in psycholinguistics. In this section, we consider both perspectives and briefly describe some models of activation and inhibition which might be profitably applied in research on L2 attrition.

The interconnectedness of the lexicon

In computational linguistics, Meara (2004) specifically addressed the relevance of lexical networks for attrition, although his insights have yet to be taken up in empirical L2 attrition research. To illustrate his point, he offered a highly simplified computational model of a 2,500-word lexicon in which all words have links to two other words, and all of which are either activated or non-activated. Some words are activated only following activation of both linked words, while others are activated by only one linked word. While the model is an abstraction rather than a representation of an actual mental lexicon, it succeeds in provoking

thought about examining the "loss" of one word as an entity unrelated to any others. The deactivation (or attrition) of one word has effects on other words throughout the system. Meara maintains that successive deactivation of individual items weakens the structure of the lexicon as a whole. Thus, attrition events can build up silently within the system, with the result that it may look like one event can create an avalanche.

Another significant challenge from Meara (2004) is to consider how the number and types of words are chosen for inclusion in a task. The number of words should be considered in relation to the estimated vocabulary size. Meara (2005) reports that 250 words is the upper limit for a single session test for most respondents. Short tests are not likely to provide a good representation of the lexicon, as attrition in such cases could be under estimated. This may be illustrated by Weltens' (1989) finding in which the lowest score attained in a test of 40 words was 31/40 (77.5 percent) after four years of disuse, whereas the participants reported by means of self-assessment that they had experienced greater lexical attrition even by two years of disuse. It could very well be that the learners had a more representative sense of their vocabulary loss than the recognition test revealed.

One way to resolve the lexical sampling issue is to conduct longitudinal studies in which attriters are engaged in the same production tasks over time, as part of the general model of assessment proposed by Bardovi-Harlig and Stringer (2010). When participants complete a task in subsequent data collection periods and particular lexical items (morphemes, words, and fixed expressions) cease to appear, they are identified for further study. Such production tasks might involve conventional elicitation techniques, simulated role play, or, more ambitiously, audiovisual recordings of authentic social interactions.

Models of activation and inhibition

The question remains of the mechanisms by which attrition or reactivation can spread through the lexicon in situations of L2 disuse or re-immersion in an L2 environment. Possible answers to this question may be found in the literature on the role of inhibition in language choice in bilinguals. In Green's (1998) influential Inhibitory Control (IC) model, lexical nodes are marked with language tags, which identify the word as being, say, French or Hungarian. During language production by bilinguals, those words carrying the non-target language tag are subject to reactive inhibition. Thus, while lexical analogues in both languages are initially activated, activation of the non-selected items is subsequently suppressed. Due to this initial activation, the lexical

nodes of the non-selected language interfere during processing, even though phonological activation appears to be restricted to the selected lexical item. The idea of inhibition linked to language tags lends itself straightforwardly to cases of global L2 attrition, on the assumption that continuous inhibition of all items with a particular tag eventually leads to more permanent suppression of the language.

In contrast to the IC model, which involves a simple access procedure but a complicated retrieval process involving degrees of inhibition, La Heij (2005, p. 290) characterizes his own proposed model as "complex access, simple selection." In this model, activation rather than inhibition is the key to lexical access – the preverbal message contains all necessary information, including affective and pragmatic features, to specify a single word uniquely. Language code is part of this information, so that choice of L1 or L2, and choice of register within these codes, directly affects activation level. The idea of complex preverbal messages in this model could be developed for application in L2 attrition research with or without language tags. On the assumption that lexical items lack precise translation equivalents (Stringer, 2010), a complex access process might suffice to pick out unique lexical entries using only phonological, syntactic, and semantic information.

Perhaps the psychological model of lexical access that melds best with the linguistic literature on attrition is the Activation Threshold Hypothesis (ATH) developed by Paradis (e.g. 1993, 2004, 2007). According to this hypothesis, an item is in an active state once it receives a sufficient number of neural impulses; this level of stimulus is termed its activation threshold. Subsequent activation of the item lowers the threshold, granting gains in speed of access. The selection of a particular lexical item in both monolingual and bilingual retrieval requires that it has a higher activation level than any competitors. Inhibition is a central construct in this model. In order to guarantee a sufficiently high level of activation, competitors must be inhibited, along the lines suggested by Green (1998). According to Paradis, "attrition is the result of long-term lack of stimulation" (2004, p. 28). Thus, while intensive exposure to a language leads to a lower activation threshold, lack of use leads to an inexorable rise in the activation threshold. The ATH claims that recency and frequency combine to determine the activation threshold: "The activation of a word or any other item (i.e., the amount of impulses needed to activate its neural substrate) will fluctuate as a consequence of it recency and frequency of use (and to some extent the recency and frequency of use of its immediate network and its entire subsystem)" (Paradis, 2004, p. 29). In applying this model to situations of attrition, one is not forced to choose between a language-wide

tagging stem and local semantic networks; rather, it could be construed as the kind of psychological model that Meara's (2004) computational model set out to emulate, with activation spreading through increasing numbers of interrelated items producing the potential avalanche effects discussed earlier.

Combining the ATH with a strict distinction between declarative and procedural memory systems, Paradis (2007, pp. 121–122) makes the following predictions for L1 attrition, which, *mutatis mutandis*, also apply to L2 attrition: (i) language disuse leads to language loss; (ii) the most frequently used elements of L2 will replace their L1 counterparts; (iii) production is more vulnerable to attrition than comprehension, as the neurological mechanisms involved require a higher level of activation; (iv) elements dependent on declarative memory, such as "vocabulary" (e.g., the PS–CS correspondences discussed above), are more prone to attrition than those dependent on procedural memory, such as phonology, syntax, and "the lexicon" (i.e., SS–CS correspondences); (v) declarative items are more vulnerable to interference (attrition by substitution); and (vi) pragmatics and conceptual representations are also prone to attrition. Strong support for these predictions is found in the lexical studies of L2 attrition discussed earlier. Thus, differential attrition effects in production and comprehension were found by Cohen (1989) and Olshtain (1989), the predicted difference between vocabulary and syntax was found by Kuhberg (1992) and Tomiyama (1999a, 2008),[5] and high-frequency fixed expressions appear to persist more than general vocabulary (e.g., Berman & Olshtain, 1983; Kuhberg, 1992; Moorcroft & Gardner, 1987; Olshtain, 1986, 1989). The findings of Berman and Olshtain (1983) regarding the marked attrition of daily vocabulary relating to school, sports, and household events, in contrast to language-particular fixed expressions and emotionally charged items, provide further evidence for this model.

In her review of attrition in the context of heritage language learning, Montrul (2008) finds evidence for the ATH in the work on lexical attrition by Hulsen (2000) and Olshtain and Barzilay (1991), but notes that in studies that examined syntax, the only areas of syntax affected were those subject to transfer effects, such as pronominal binding in adult L1 attrition of Turkish with L2 English (Gürel, 2002), or impersonal passives in adult L1 attrition of Dutch with L2 English (Keijzer, 2007). Otherwise, knowledge of syntax remained relatively robust. Rather than being differentially affected, it may even be that certain aspects of

[5] As discussed earlier, Moorcroft and Gardner (1987) and Tomiyama (1999b) claim the opposite, but their results resist straightforward interpretation.

(L1) syntax and phonology are impervious to attrition (Montrul, 2008, p. 89).

The ATH also makes an interesting prediction regarding the difference between open- and closed-class items. Functional morphology (e.g., articles, plurality, agreement, tense) is often viewed as inherently problematic in L2 acquisition, leading some to suggest a stage with undefined syntactic feature values (Herschensohn, 2000) and others to posit an extended process of syntactic feature reassembly (Lardiere, 2009). On the Regression Hypothesis, one might expect late-acquired functional morphology to be susceptible to early attrition; however, on the ATH, these items are stored in procedural rather than declarative memory, making them *less* vulnerable to attrition. Interestingly, in Keijzer's (2007) Dutch–English study mentioned above, there was remarkably little L1 attrition of productive morphology. In L2 attrition, the open-class/closed-class distinction remains to be systematically investigated. In short, the predictions made by the ATH regarding the lexicon are largely supported by empirical studies of attrition, with further investigation required for functional morphology and syntax.

In this section, we have explored interconnectedness in the lexicon in terms of the potential for the spreading of either activation or inhibition through semantic networks, keeping in mind the question of long-term effects of frequent activation or continuous inhibition. Such spreading arguably takes effect throughout a specific language lexicon, either explicitly through a tagging system, or by specifying a language code in the preverbal message, or perhaps implicitly through multiple activation of items with myriad connections, leading to an avalanche effect. Research in this vein may further understanding of the mechanisms involved in the kinds of blanket loss and extensive recovery discussed in the following section.

Catastrophic loss, miraculous recovery: what happens on the ferry to Boulogne?

Research on attrition or reactivation of the lexicon *as a system* is thin on the ground, but we briefly summarize two empirical studies that attempted to document global loss and global recovery. Oller *et al.* (2007) provided tentative but suggestive evidence from L1 attrition research that for children, massive exposure to an L2 results in general inhibition of L1 vocabulary in production, though not (at first) in comprehension, in line with the ATH. They administered a battery of tests to children from Spanish-speaking and English-speaking families in Memphis at the beginning and at the end of their kindergarten

year. Of the 30 Hispanic children, 13 had been exposed to English for one year prior to the baseline test, and the others were considered to be essentially monolingual. There were two comprehension tasks, one in English and one in Spanish, both involving 4-choice picture identification. There were also two production tasks, one in English and one in Spanish, both involving picture naming. At both times of testing, monolingual English-speaking children scored close to 100 percent, while the children from Spanish-speaking families revealed a stunning discrepancy between the comprehension and production tasks in Spanish (more than one-and-a-half standard deviations). It appears that very soon after entering the L2-dominant school system, a suppression mechanism impeded access to L1 vocabulary. Although this fits with anecdotal reports, a caveat must be sounded in interpreting the results. As argued in Bardovi-Harlig and Stringer (2010), the establishment of a peak of attainment is fundamental in the documentation of attrition. In this case, the baseline was late-established, at an unspecified time near "the beginning" (p. 476) of kindergarten. As the same comprehension–production discrepancy was found in pre- and post-test, and as the Hispanic children had spent an average of 4.4 (SD = 1.8) years in the USA *before* entering kindergarten, it is possible that the discrepancy was already in place before the period of investigation, and may even have been present from the outset of their heritage language learning.

The converse effect, where a language "comes flooding back" in situations of re-immersion, is also regularly confirmed in anecdotal reports but has yet to be comprehensively studied. To our knowledge, the only published attempt to document this in recent years was by Meara (2005), who coined it the Boulogne Ferry Effect, due to his own experience of the phenomenon. He noted that when visiting France from the UK, "the mere act of walking down the main street in Boulogne shortly after getting off the ferry can sometimes trigger the reactivation of a whole stream of dormant French vocabulary" (p. 271). Inspired equally by the many anecdotal reports of learners who report spontaneous reactivation of L2 vocabulary after short periods of re-immersion, and by similar processes of reactivation in his computational models (Meara, 2004), he set out to investigate the idea that the activation of small numbers of words can initiate "a ripple effect which works its way right through the entire lexicon" (p. 272).

Given the logistical and financial obstacles involved in sending groups of attriters on vacation to revisit old haunts, and the patience required of participants to test large numbers of words, Meara argues convincingly that there is merit in exploring single-case studies with

cooperative volunteers, and presents the findings from one such investigation. The participant was an L1 English speaker who agreed to participate in a study while revisiting the Netherlands after 18 months without speaking Dutch. A list of 244 Dutch words was drawn up, taken from the participant's personal vocabulary notebooks created several years before. He was tested on his knowledge of these words once a day, for 12 consecutive days, six in the UK before taking his trip, three after his arrival in the Netherlands, and three after his return to the UK. When presented with an English translation equivalent, he was asked to consider if he could provide the target Dutch word, and then press one of four buttons corresponding to the responses: "I do not know this word"; "I think I don't know this word"; "I think I do know this word"; and "I'm certain I know this word." Some results were intriguing. He reported a significant increase in vocabulary awareness on the morning of the day he traveled, before any actual contact with Dutch speakers. In addition, his performance continued to improve after his return to the UK. The key finding, however, was the dramatic increase on days 7, 8, and 9 while he was in the L2 environment, during which time his active vocabulary more than tripled in size.

However, as Meara (2005) recognizes, findings from this initial exploration need to be treated with caution. The post-experiment interview made clear that the methodology was problematic in a number of ways. Some English words were ambiguous, allowing for unintended translations; the participant later said he could sometimes translate a word by adopting a paraphrasing strategy; he sometimes recorded a negative response only to have the word come to mind two or three seconds later; and, crucially, there was almost certainly an inescapable task effect – the participant reported that repeated testing of the same words facilitated his noticing of them in context in the Netherlands. If one steps outside of the theoretical framework of the study, other issues arise, such as how much we can rely on self-reports at all, how much recognition of simple sound–meaning correspondences tell us about knowledge of the lexicon, and what might happen in cases of recall of phrases, idioms, and conventional expressions. Nevertheless, this pioneering study provides a valuable platform for further research. It provides justification for more case studies in this area, and meets one of the most important criteria for the assessment of attrition and recovery laid out in Bardovi-Harlig and Stringer (2010) – the comparison of participants to themselves in longitudinal designs.

Moreover, although empirical evidence is lacking, anecdotal evidence abounds that when an L2 comes flooding back, speakers are not left with a mere list of Saussurean correspondences. Within a few days,

phrases, sentences, and stretches of discourse also reveal a grammatical reawakening. It is a plausible hypothesis that the recall of common constructions, conversational idioms and conventional expressions in daily use all help to stimulate this recovery, as multi-word expressions are laden with syntactic information.

Conclusion

There appears to be a thread running through the maze of L2 attrition research. Empirical studies offering support for sequences of L2 attrition, whether in terms of the Regression Hypothesis or the various versions of the Threshold Hypothesis, may all be understood as centrally involving the retrieval of items from the mental lexicon. Generally speaking, reported findings are commensurate with the Activation Threshold Hypothesis of Paradis (2004, 2007), in which both recency and frequency of access determine the efficiency of lexical retrieval, comprehension is more resilient than production, and simple sound–meaning correspondences stored in declarative memory are prone to interference from lexical analogues in the dominant language. It is plausible to claim that vocabulary is more vulnerable than grammar in situations of disuse; however, such a claim requires clarification when sound–meaning correspondences are embedded in a more sophisticated account of the lexicon. Different types of lexical entries show different patterns of attrition. Moreover, the lexicon *contains* syntax, not only in the form of inherent and selectional features, but also due to its status as a reservoir of constructional idioms and fixed expressions. As revealed in the L2 acquisition of conventional expressions, complex lexical entries may differ between learners and may change over time, as varied syntactic structures are mapped onto a target conceptual structure. Moreover, computational modeling and psycholinguistic research reveal that lexical entries are interconnected in a system in which no lexical item is activated or inhibited in isolation. Successive attrition events may thus eventually result in global lack of access, and reactivation events may eventually result in global reactivation.

This fresh perspective on patterns of L2 attrition has yet to be comprehensively explored. One characteristic of previous work on multi-word units is that data were not targeted for elicitation but drawn from unplanned use in production. Using techniques from acquisition studies, such as the oral discourse completion task which simulates the time pressure of turn taking and explores specific mappings between conceptual and linguistic representations, future work may study attrition of the lexicon beyond the word more systematically. The proposal

that continuous inhibition leads to eventual attrition remains a plausible if not proven account of language loss more generally. Without words, there is no syntactic expression, whether or not principles of syntax continue to abide in the bilingual mind. However, even if implicit syntactic knowledge is prone to attrition, our reconsideration of the lexicon as a vast repository of phrases, idioms, and conventional expressions provides a bridge between the recall of PS–CS correspondences sustained by declarative memory and SS–CS correspondences sustained by procedural memory. When the lexicon awakes, syntax is necessarily aroused from slumber.

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12 Memory and first language forgetting

Ludmila Isurin

Abstract

Non-pathological first language forgetting is studied by socio- and psycholinguists. Psycholinguistic research relies on the same methodological approaches used in studies of bilingual memory. The present chapter gives a brief overview of theories, tasks, and findings pertaining to this domain of research. The reported empirical study contributes to the existing knowledge of first language (L1) attrition as well as shows a way in which the quantitative and qualitative methods of analysis can be used to provide deeper insight into bilingual memory. Three groups of Russian bilinguals with different second language backgrounds (English, Hebrew, and German) participated in a picture-naming study. Word frequency was found to be a decisive factor in L1 forgetting whereas the length of immigration proved only marginally reliable. Qualitative analysis of the data revealed retrieval failures at the semantic and word-form levels and showed how each of the second languages interfered with successful access of the L1 lexicon.

The role of memory in first language (L1) forgetting experienced by healthy individuals has been studied by psycholinguists over the last two to three decades. However, the obvious difficulty of conducting psycholinguistic research in a real – not experimentally simulated – setting, the diversity of the population groups studied, the lack of consistency in the use of methodologically robust approaches, and a relatively small group of researchers in the field leaves the topic largely unexplored. This chapter gives a brief overview of the psycholinguistic research on first language forgetting – commonly known as L1 attrition – and reports on the findings of an empirical study involving three groups of Russian bilinguals.

Theories of first language forgetting

The forgetting of the native language is a phenomenon that may sound puzzling to those individuals who take first language retention