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19. Second language acquisition

1. Introduction

This chapter introduces a cognitive-linguistic perspective on second language acquisition (L2A).[1] Over the last 15 or so years, various aspects of L2 acquisition have been exam-

[1] Throughout this chapter, we use the terms *acquisition*, *learning*, and *development* interchangeably.

ined through a cognitive-linguistic lens, including phonology, morpho-syntax, lexis, syntax, and pragmatics. Likewise, various cognitive-linguistic frameworks including cognitive grammar, metaphor theory, and conceptual blending have been employed in L2 acquisition and teaching research. This chapter deliberately focuses on a construction grammar perspective on L2 acquisition. Robinson and Ellis (2008b), Littlemore (2009), and Tyler (2012) give broader overviews of cognitive-linguistic L2 learning and teaching research.

In traditional generative approaches, language is understood as a modular system: phonology, morphology, syntax, and semantics (and, in some versions of generative grammar, also pragmatics) are distinct subsystems. These modules are largely independent in structure and functioning from other human cognitive processes, and largely uninfluenced by the ways in which humans interact with the world. This view of language as a largely autonomous system comprised of largely autonomous subsystems has stipulated the assumption of a *narrow language faculty* (or *Universal Grammar*) and a *broad language faculty* (Hauser et al. 2002). The broad language faculty comprises cognitive abilities that are required for and assist in, but are not exclusive to, language acquisition and processing, such as the human auditory, motor, and vocal systems, short- and long-term memory, and (joint) attention, among others (Jackendoff 2011).

Cognitive linguistics, in contrast, adopts a non-modular approach to language: language is seen as part of human cognition, with language and cognition being systematically intertwined. Consequently, the focus in cognitive linguistics is on how general human cognitive abilities are manifest in language, and how general cognitive abilities impact language form, change, processing, and acquisition. Similarly, cognitive linguistics is non-modular in the sense that the idea of distinct linguistic subsystems is discarded, including the long-standing distinction between words (the lexicon) and the rules that combine them (grammar). Instead, mastery of a language entails knowing constructions at different levels of complexity and schematization, as well as knowledge of the probabilistic (as opposed to rigid) tendencies underlying their combination. In the following, we outline the implications of these working assumptions of cognitive linguistics for L2A.

In section 2, we provide a summary of how research on multi-word units in language learning and processing calls for a revised understanding of linguistic competence, and how a construction grammar perspective answers that call by shifting the focus to constructions and how they are learnable by both L1 and L2 speakers. In section 3, we outline the components of a constructionist model of language learning. Section 4 briefly discusses the observable differences between first and second language learning, and how a constructionist perspective accounts for them. Section 5 closes with suggestions for future research.

2. Constructions in first and second language acquisition

There is copious evidence from psycholinguistics, corpus linguistics, and cognitive linguistics that language users have rich knowledge of the frequencies of forms and of their sequential dependencies in their native language. Ellis (2002) reviewed evidence that language processing is sensitive to the sequential probabilities of linguistic elements at

all levels from phonemes to phrases, and in comprehension as well as in fluency and idiomaticity of speech production. He argued that this sensitivity to sequence information in language processing is evidence of learners' implicit knowledge of memorized sequences of language, and that this knowledge in itself serves as the basis for linguistic systematicity and creativity. The last ten years has seen substantial research confirming native language users' implicit knowledge of the constructions of their language and their probabilities of usage. This is not the place to review this research, instead see Rebuschat and Williams (2012), Ellis (2012a), Trousdale and Hoffman (2013), and chapters by Tremblay and by Divjak and Caldwell-Harris (this volume).

2.1. Do L2 learners have constructions too?

Such demonstrations of the psychological reality of constructions in native speakers' language raise the question if, and to what extent, constructions also underpin L2 learners' linguistic competence, and whether L2 learners implicitly "tally" and tune their constructional knowledge to construction-specific preferences in terms of the words that preferably occur in those constructions. There is mounting evidence that this is the case, as the following brief review of recent studies illustrates.

Jiang and Nekrasova (2007) examined the representation and processing of formulaic sequences using online grammaticality judgment tasks. L2 English and native English speakers were tested with formulaic and non-formulaic phrases matched for word length and frequency (e.g., *to tell the truth* vs. *to tell the price*). Both native and nonnative speakers responded to the formulaic sequences significantly faster and with fewer errors than they did to nonformulaic sequences. Similarly, Conklin and Schmitt (2007) measured reading times for formulaic sequences versus matched nonformulaic phrases in native and nonnative speakers. The formulaic sequences were read more quickly than the non-formulaic phrases by both groups of participants.

Ellis and Simpson-Vlach (2009) and Ellis et al. Maynard (2008) used four experimental procedures to determine how the corpus-linguistic metrics of frequency and mutual information (MI, a statistical measure of the coherence of strings) are represented implicitly in native and non-native speakers, thus to affect their accuracy and fluency of processing of the formulas of the Academic Formulas List (AFL; Simpson-Vlach and Ellis 2010). The language processing tasks in these experiments were selected to sample an ecologically valid range of language processing skills: spoken and written, production and comprehension, form-focused and meaning-focused. They were: (1) speed of reading and acceptance in a grammaticality judgment task, where half of the items were real phrases in English and half were not; (2) rate of reading and rate of spoken articulation; (3) binding and primed pronunciation − the degree to which reading the beginning of the formula primed recognition of its final word; and (4) speed of comprehension and acceptance of the formula as being appropriate in a meaningful context. Processing in all experiments was affected by various corpus-derived metrics: length, frequency, and mutual information (MI). Frequency was the major determinant for non-native speakers, whereas for native speakers it was predominantly the MI of the formula that determined processability.

Gries and Wulff (2005) showed that advanced German learners of English showed syntactic priming for ditransitive (e.g., *The racing driver showed the helpful mechanic*

...) and prepositional dative (e.g., *The racing driver showed the torn overall ...*) argument structure constructions in an English sentence completion task. Furthermore, they showed that learners' semantic knowledge of argument structure constructions affected their grouping of sentences in a sorting task. More specifically, learners' priming effects closely resembled those of native speakers of English in that they were highly correlated with native speakers' verbal subcategorization preferences whilst uncorrelated with the subcategorization preferences of the German translation equivalents of these verbs. Gries and Wulff (2009) found similar results for gerundial and infinitival complement constructions, and several other studies have demonstrated similar L2 syntactic priming effects (McDonough 2006; McDonough and Mackey 2006; McDonough and Trofimovich 2008). Liang (2002) replicated the semantic sorting experiment with three groups of Chinese learners of English at beginning, intermediate, and advanced proficiency levels, and found a significant positive correlation between the tendency to sort by construction and general proficiency.

Ellis and Ferreira-Junior (2009a, 2009b) analyzed longitudinal data for naturalistic L2 English learners in the *European Science Foundation* corpus (Klein and Perdue 1992; Perdue 1993) to show that naturalistic adult L2 learners used the same verbs in frequent verb argument constructions as are found in their input experience. Indeed, the relative ordering of the types in the input predicted uptake with correlations in excess of $r = 0.90$.

Taken together, these findings argue that grammatical and lexical knowledge are not stored or processed in different mental modules, but rather form a continuum from heavily entrenched and conventionalized formulaic units (unique patterns of high token frequency) to loosely connected but collaborative elements (patterns of high type frequency) (Bybee 2010; Ellis 2008c; Ellis and Larsen-Freeman 2009a, 2009b; Robinson and Ellis 2008a, 2008b). Accordingly, Wulff and Gries propose a constructionist definition of L2 accuracy as "the selection of a construction (in the Goldbergian sense of the term) in its preferred context within a particular target variety and genre" (2011: 70).

Thus, in both L1 and L2, learners are sensitive to the frequencies of occurrence of constructions and their transitional probabilities, and this suggests that they learn these statistics from usage, tallying them implicitly during each processing episode. Linguistic structure *emerges* from the conspiracy of these experiences (Ellis 1998, 2011). "The linguist's task is in fact to study the whole range of repetition in discourse, and in doing so to seek out those regularities which promise interest as incipient sub-systems. Structure, then, in this view is not an overarching set of abstract principles, but more a question of a spreading of systematicity from individual words, phrases, and small sets." (Hopper 1987: 143).

2.2. The role of formulaic language in L1 acquisition (L1A)

Demonstrating skilled language users' knowledge of formulaic language and other constructions is a separate but related matter from demonstrating that formulaic language plays a role in acquisition. It remains contentious in child language research whether children's early language (i) makes use of abstract categories and principles for composing sentences by combining those categories in ordered sequences, or whether it (ii)

consists of a repertoire of more concrete constructions or formulas, many based on particular lexical items (e.g., *jump*, *put*, and *give*) rather than abstract syntactic categories like *Verb*. The corresponding theoretical positions are that (i) children don't need to learn grammar because the principles and categories of grammar are innate, requiring only minimal exposure to the language to be 'triggered', or that (ii) the process of syntactic development consists of acquiring a large repertoire of constructions and formulas by statistically inducing increasingly abstract categories on the basis of experience of the types of items that occupy their component parts. The last 20 years has seen considerable research that points to the second alternative. We have neither space nor remit here to dispute the case, and gladly defer to the chapters by Matthews and Krajewski (this volume) as well as other recent reviews (Ambridge and Lieven 2011; Behrens 2009; Dąbrowska 2004; Diessel 2013; Lieven et al. 2003; Tomasello 1992, 2003).

One important evidential source has been dense longitudinal corpora of naturalistic language development that capture perhaps 10 % of children's speech and the input they are exposed to, collected from 2–4 years of age when children are undergoing maximal language development (Behrens 2008; Maslen et al. 2004). Without such dense sampling, it is difficult if not impossible to clearly identify sequences of development of linguistic items of relatively low frequency as they unfold over time (Tomasello and Stahl 2004).

Using dense corpora, Lieven and colleagues have used the 'traceback' method (Dąbrowska and Lieven 2005) of analyzing adult-child conversation to show that very often when a child produces what seems to be a novel utterance, the ingredients for that utterance are to be found earlier in the transcript. That is, the novel utterance has not been generated from scratch but rather a previous sentence has been manipulated, replacing one content word. Even when children are more productive than that, the data-dependent nature of children's underlying knowledge is evidenced in the relations between the frequency of structures in the input and the frequency of children's production of those structures. Children are initially conservative in their language in that their production is more formulaic than openly combinatorial. These are the essential observations for the developmental sequence from formula to limited-scope pattern to creative construction in L1A (Lieven et al. 2003; Tomasello 2000, 2003).

2.3. The role of formulaic language in L2 acquisition

2.3.1. A review of the research

What about when learners *re*construct an L2? The field of SLA showed early interest in multi-word sequences and their potential role in language development. Corder (1973) coined the term *holophrase*, and, in similar spirit, Brown (1973) defined prefabricated routines as unanalyzed multi-word sequences associated with a particular pragmatic function. One of the main research questions for SLA researchers at the time was: do prefabricated routines pose a challenge to the traditional view of language learning as a process by which children start out with small units (morphemes and words) and then gradually combine them into more complex structures? Do children alternatively and/or additionally start out from large(r) chunks of language which they then gradually break

down into their component parts? Early studies did not yield conclusive results (a good discussion can be found in Krashen and Scarcella 1978). For example, Hatch (1972) found evidence for both learning strategies in the English production data of a 4-year old Chinese boy. Hakuta (1974, 1976), based on data from a 5-year-old Japanese learner of English, argued in favor of a more fine-grained distinction between prefabricated routines and prefabricated patterns, that is, low-scope patterns that have at least one variable slot. Wong-Fillmore's (1976) dissertation project was one of the first to track more than one child over a longer period of time; her analysis suggested that children do in fact start out with prefabricated patterns which they gradually break down into their component parts in search for the rules governing their L2, which, in turn, ultimately enables them to use language creatively.

There were only a few early studies on adult L2 learners (Wray 2002: 172−198 provides a detailed overview). The general consensus, however, was that while adult L2 learners may occasionally employ prefabricated language, there was less evidence than in children's data that knowledge of prefabricated language would foster grammatical development in adult L2A. Hanania and Gradman (1977), for instance, studied Fatmah, a native speaker of Arabic. Fatmah was 19 years old at the time of the study, and she had received only little formal education in her native language. When speaking English, Fatmah used several routines that were tied to specific pragmatic situations; however, the researchers found her largely unable to analyze these routines into their component parts. Similarly, Schumann (1978), who investigated data from several adult L2 learners with different native language backgrounds, found only little evidence in favor of prefabricated language use in the first place, or any positive effect of prefabricated language knowledge on language development for that matter. A slightly different picture emerged in Schmidt's (1983) well-known research on Wes, a native speaker of Japanese who immigrated to Hawaii in his early thirties. Wes seemed to make extensive use of prefabricated routines. However, while this significantly boosted Wes' fluency, his grammatical competence remained low. Ellis (1984), looking at the use of prefabricated language in an instructional setting, suggested that there is considerable individual variation in learners' ability to make the leap from prefabricated routines to the underlying grammatical rules they exemplify. Krashen and Scarcella (1978) were outright pessimistic regarding adult learners' ability to even retain prefabricated routines, and cautioned against focusing adult learners' attention on prefabricated language because "[t]he outside world for adults is nowhere near as predictable as the linguistic environment around Fillmore's children was" (Krashen and Scarcella 1978: 298).

In the light of developments in child language acquisition, Ellis (1996, 2002) revisited the issue, asking whether a common pattern of developmental sequence in both L1A and L2A might be from formulaic phrases to limited scope slot-and-frame patterns to fully productive schematic patterns. Ellis (2003) phrased the argument in terms of constructions rather than formulas. There are subsequent longitudinal studies in support of this sequence in L2A, though the available corpora are far from dense.

In an extensive study of secondary school pupils learning French as a foreign language in England, Myles (2004; Myles et al. 1999) analyzed longitudinal corpora of oral language in 16 beginning learners [(11−14 years old), tracked over the first 2 years, using 13 oral tasks] and 60 intermediate learners [20 classroom learners in each of years 9, 10 and 11 studied cross-sectionally using four oral tasks]. These data showed that multimorphemic sequences, which go well beyond learners' grammatical competence,

are very common in early L2 production. Notwithstanding that these sequences contain such forms as finite verbs, wh-questions and clitics, Myles denied this as evidence for functional projections from the start of L2A because these properties are not initially present outside of chunks. Analyses of inflected verb forms suggested that early productions containing them were formulaic chunks. These structures, sometimes syntactically highly complex (e.g., in the case of interrogatives), cohabited for extended periods of time with very simple sentences, usually verbless, or when a verb was present, this was normally untensed. Likewise, clitics first appeared in chunks containing tensed verbs, suggesting that it is through these chunks that learners acquire them. Myles characterizes these early grammars as consisting of lexical projections and formulaic sequences, showing no evidence of functional categories. "Chunks do not become discarded; they remain grammatically advanced until the grammar catches up, and it is this process of resolving the tension between these grammatically advanced chunks and the current grammar which drives the learning process forward" (Myles 2004: 152). The study also investigated the development of chunks within individual learners over time, showing a clear correlation between chunk use and linguistic development:

> In the beginners' corpus, at one extreme, we had learners who failed to memorize chunks after the first round of elicitation; these were also the learners whose interlanguage remained primarily verbless, and who needed extensive help in carrying out the tasks. At the other extreme, we had learners whose linguistic development was most advanced by the end of the study. These were also the learners who, far from discarding chunks, were seen to be actively working on them throughout the data-collection period. These chunks seem to provide these learners with a databank of complex structures beyond their current grammar, which they keep working on until they can make their current generative grammar compatible with them. (Myles 2004: 153)

Eskildsen and Cadierno (2007) investigated the development of *do*-negation by a Mexican learner of English. *Do*-negation learning was found to be initially reliant on one specific instantiation of the pattern *I don't know*, which thereafter gradually expanded to be used with other verbs and pronouns as the underlying knowledge seemed to become increasingly abstract, as reflected in token and type frequencies.

Mellow (2008) describes a longitudinal case study of a 12-year-old Spanish learner of English, Ana, who wrote stories describing 15 different wordless picture books during a 201-day period. The findings indicate that Ana began by producing only a few types of complex constructions that were lexically-selected by a small set of verbs which gradually seeded a growing range of constructions.

Sugaya and Shirai (2009) describe the acquisition of Japanese tense-aspect morphology in L1 Russian learner Alla. In her ten-month longitudinal data, some verbs (e.g., *siru* 'come to know,' *tuku* 'be attached') were produced exclusively with the imperfective aspect marker *-te i-*(*ru*), while other verbs (e.g., *iku* 'go,' *tigau* 'differ') were rarely used with *-te i-*(*ru*). Even though these verbs can be used in any of the four basic forms, Alla demonstrated a very strong verb-specific preference. Sugaya and Shirai followed this up with a larger cross-sectional study of 61 intermediate and advanced learners (based on the ACTFL scale), who were divided into 34 lower and 27 higher proficiency groups using grammaticality judgment tasks. The lower proficiency learners used the individual verbs in verb-specific ways, and this tendency was stronger for the verbs denoting resultative state meaning with *-te i-*(*ru*) (e.g., achievement verbs) than the verbs denoting

progressive meaning with *-te i-*(*ru*) (e.g., activity, accomplishment, and semelfactive verbs). Sugaya and Shirai concluded that the intermediate learners begin with item-based learning and low scope patterns and that these formulas allow them to gradually gain control over tense-aspect. Nevertheless, they also considered how memory-based and rule-based processes might co-exist for particular linguistic forms, and that linguistic knowledge should be considered a "formulaic-creative continuum".

On the other hand, there are studies of L2 that have set out to look for this sequence and found less compelling evidence.

Bardovi-Harlig (2002) studied the emergence of future expression involving *will* and *going to* in a longitudinal study of 16 adult L2 English learners (mean length of observation 11.5 months; 1,576 written texts, mainly journal entries, and 175 oral texts, either guided conversational interviews or elicited narratives based on silent films). The data showed that future *will* emerges first and greatly outnumbers the use of tokens of *going to*. Bardovi-Harlig described how the rapid spread of *will* to a variety of verbs suggests that, "for most learners, there is either little initial formulaic use of *will* or that it is so brief that it cannot be detected in this corpus" (Bardovi-Harlig 2002: 192). There was some evidence of formulaicity in early use of *going to*: "For 5 of the 16 learners, the use of *I am going to write* stands out. Their production over the months of observation show that the formula breaks down into smaller parts, from the full *I am going to write about* to the core *going to* where not only the verb but also person and number vary. This seems to be an example of learner production moving along the formulaic-creative continuum" (Bardovi-Harlig 2002: 197). But other learners showed greater variety of use of *going to*, with different verbs and different person-number forms, from its earliest appearance in the diary. Bardovi-Harlig concludes that "although the use of formulaic language seems to play a limited role in the expression of future, its influence is noteworthy" (Bardovi-Harlig 2002: 198).

Eskildsen (2009) analyzed longitudinal oral L2 classroom interaction for the use of *can* by one student, Carlo. *Can* first appeared in the data in the formula *I can write*. But Eskildsen noted how formulas are interactionally and locally contextualized, which means that they may possibly be transitory in nature, their deployment over time being occasioned by specific recurring usage events.

2.3.2. Methodological considerations

The outcome of such studies searching for developmental sequences seeded by use of formulaic patterns rests on a range of factors:

Firstly, regarding methodology, data has to be dense enough to identify repeated uses at the time of emergence (Tomasello and Stahl 2004). The use of formulas and constructions are determined by context, function, genre and register. If the elicitation tasks vary, the chance of sampling the same formula and its potential variants diminishes accordingly.

Secondly, they may vary as a function of L1A vs. L2A. L1A may indeed be more formulaic than L2 acquisition. When child learners are learning about language from formulaic frames (Ambridge and Lieven 2011; Mintz 2003; Tomasello 2003) and the analysis of sequences of words (Elman 1990; Kiss 1973; Redington and Chater 1998),

they are learning from scratch about more abstract categories such as verb, pronoun, preposition, noun, transitive frame, etc. It is debatable whether the units of early L1A are words at all (Peters 1983). Adult L2 learners already know about the existence of these units, categories, and linguistic structures. They expect that there will be words and constructions in the L2 which correspond to such word classes and frames. Once they have identified them, or even, once they have searched them out and actively learned such key vocabulary, they are more likely therefore to attempt creative construction, swopping these elements into corresponding slots in frames.

Thirdly, as in all other areas of language processing, recognition of formulas is easier than production. As described in section 2.1, Ellis and Ferreira-Junior (2009a, 2009b) showed that naturalistic adult L2 learners used the same verbs in frequent verb argument constructions as are found in their input experience, with the relative ordering of the types in the input predicting uptake with correlations in excess of $r = 0.90$. Nevertheless, while they would accurately produce short simple formulaic sequences such as *come in* or *I went to the shop*, structurally more complex constructions were often produced in the simplified form of the Basic Variety (Klein and Perdue 1992; Perdue 1993) which involves a pragmatic topic-comment word ordering, where old information goes first and new information follows.

Fourthly, transfer from the L1 is also likely to affect the process (Granger 2001). The more learners attempt word-by-word translation from their L1, the more they deviate from L2 idiomaticity.

Finally, amount and type of exposure is bound to play a role. Children are naturalistic language learners from thousands of hours of interaction and input. While some adults learn naturalistically, others take grammar-rich courses. Dictionaries and grammar books do not provide naturalistic input, nor do they encourage fluent idiomatic expression of formulaic speech. Nevertheless, Myles (2004) demonstrates the viability of this sequence of acquisition even for classroom foreign language acquisition.

2.3.3. Caveat and conclusion

A common misunderstanding about the role of formulaic sequences in language acquisition warrants a caveat here. The fact that formulaic sequences play roles in the development of more creative competence does not imply that all apparently formulaic strings so serve. Far from it: Some formulaic sequences are readily learnable by dint of being highly frequent and prototypical in their functionality − *how are you?*, *it's lunch time*, *I don't know*, *I am going to write about*, and the like. These are likely candidates as construction seeds.

Other formulaic sequences are not readily learnable − these are of low frequency, often indeed rare, and many are non-transparent and idiomatic in their interpretation (e.g., *once in a blue moon*). As idioms they must be learned as such. However, learners require considerable language experience before they encounter these once, never mind sufficient times to commit them to memory (Ellis 2008b). This is why learners typically do not achieve nativelike idiomaticity (Granger 2001; Pawley and Syder 1983). These low frequency, low transparency formulas are targets for learning rather than seeds of learning. Hence the observations that learner language is often light in frequency of

formulaic language compared to native norms (Granger 2001) and that acquisition of nativelike targets can be challenging (Pawley and Syder 1983).

Is the notion of language acquisition being seeded by formulaic phrases and yet learner language being formula-light 'having your cake and eating it too'? Pawley and Syder (1983) thought not. While much of their classic article concentrated on the difficulty L2 learners had in achieving nativelike formulaic selection and nativelike fluency, they nevertheless state "Indeed, we believe that memorized sentences are the normal building blocks of fluent spoken discourse, and at the same time, that they provide models for the creation of many (partly) new sequences which are memorable and in their turn enter into the stock of familiar uses" (1983: 208). Ellis (2012b) further examines this apparent paradox whereby large-scale analyses of learner corpora show that L2 learners typically do not achieve nativelike formulaicity and idiomaticity (Granger 2001; Pawley and Syder 1983) while, at the same time, formulas can provide learners with a databank of complex structures beyond their current grammar which can drive the learning process forward.

The most balanced conclusion is that linguistic knowledge is a formulaic-creative continuum. In this light, how are constructions acquired?

3. Components of a constructionist model of language learning

Constructionist accounts of language acquisition involve the distributional analysis of the language stream and the parallel analysis of contingent perceptual activity, with abstract constructions being learned from the conspiracy of concrete exemplars of usage following statistical learning mechanisms (Rebuschat and Williams 2012) relating input and learner cognition. Psychological analyses of this learning of constructions as form-meaning pairs is informed by the literature on the associative learning of cue-outcome contingencies where the usual determinants include: factors relating to the form such as frequency and salience; factors relating to the interpretation such as significance in the comprehension of the overall utterance, prototypicality, generality, redundancy, and surprise value; factors relating to the contingency of form and function; and factors relating to learner attention, such as automaticity, transfer, overshadowing, and blocking (Ellis, 2002, 2003, 2006, 2008a, 2008b). These various psycholinguistic factors conspire in the acquisition and use of any linguistic construction. This section briefly considers each in turn.

3.1. Frequency of construction in the input

According to usage-based approaches to language, frequency of exposure promotes learning and cognitive entrenchment. Type and token frequency play different roles. Token frequency is the frequency with which a particular construction (i.e., a particular phonotactic sequence, morpheme, or syntactic frame) occurs in the input. Type frequency, in contrast, refers to the number of distinct realizations of a given construction. For example, the English past tense morpheme − *ed* has a very high type frequency: in any sizeable data sample of English, it occurs with thousands of different verbs. Irregular past tense forms as in *blew*, *sang*, or *rode*, on the contrary, have low type frequency:

they occur only with a comparatively restricted number of verbs. Type frequency is one indicator of the productivity of a construction because high type frequency allows the hearer to parse the construction in question and results in a stronger schematic representation of the form, which in turn renders it more available not only for reuse, but also novel uses (Bybee and Hopper 2001). Bybee (2006: 15) provides the following example:

> If *happiness* is learned by someone who knows no related words, there is no way to infer that it has two morphemes. If *happy* is also learned, then the learner could hypothesize that − *ness* is a suffix, but only if it occurs on other adjectives would its status as a suffix become established. Thus a certain degree of type frequency is needed to uncover the structure of words and phrases.

High token frequency may in fact yield the opposite effect by promoting the conservation of specific realizations of a construction (see Bybee 2006 for a detailed discussion of the conserving, form-reducing, and autonomy-stipulating effects of high token frequency).

3.2. Distribution of construction in the input

In accordance with Goldberg et al. (2004), research suggests that acquisition benefits from initial exposure to massive, low-variance input that is centered around prototypical realizations (or exemplars) of the target construction (Elio and Anderson 1981, 1984). This focused and stereotypical input allows the learner to induce what accounts for the majority of the category members; continuing exposure to the full breadth of exemplar types later defines category boundaries (Nosofsky 1988). Both childrens' input and output in Goldberg et al. (2004) reflected a Zipfian distribution. According to Zipf's Law (Zipf 1935), in natural language, the frequency of a word is inversely proportional to its rank in a frequency table: the most frequent word occurs about twice as often as the second most frequent word, three times as often as the third most frequent word, and so on. Importantly, Goldberg et al. (2004) showed that Zipf's Law does not only hold when counting words in a given sample of naturalistic speech − it also seems to hold for verbs *within* a given construction. According to Goldberg et al., this Zipfian distribution of the childrens' input plays a significant role in acquisition: one specific typical verb is made salient by being extremely frequent in the input and serves as the "pathbreaking verb" in the process of category formation (see also Ninio 1999, 2006). Ellis and Ferreira-Junior (2009a, 2009b) examined a corpus of naturalistic L2A and likewise confirmed that the type/token ratio of the verbs in argument structure constructions is Zipfian. Furthermore, they were able to show that, as Tomasello (2003) has argued for L1A, the most frequent and prototypical verbs seem to act as "verb islands" around which the verb argument construction is gradually built up. Ellis and O'Donnell (2012) and Römer, O'Donnell, and Ellis (2013) confirm the Zipfian distribution of verb argument constructions in large-scale analyses of English language usage.

3.3. Recency of construction in the input

Research in cognitive psychology has taught us that three key factors influence the activation of memory schemata: frequency, recency, and context (Anderson 1989; Ander-

son and Schooler 2000). Recency, also referred to as priming or persistence, is an implicit memory effect: exposure to a stimulus affects a response to a later stimulus. Recency has been shown to impact processing at the level of phonology, conceptual representation, lexical choice, and syntax (McDonough 2006; McDonough and Mackey 2006; McDonough and Trofimovich 2008).

3.4. Salience, redundancy, and perception of form of the construction

The general perceived strength of a stimulus is referred to as its salience. As the Rescorla-Wagner (1972) model of associative learning encapsulates, the amount of learning induced from an experience of a cue-outcome association depends crucially upon the salience of the cue and the importance of the outcome: low salience cues are less readily learned. Many grammatical functors in English have low salience in the input, for example, inflections like the third person singular − *s* morpheme. It is not surprising, then, that it is these grammatical symbols in particular that L2 learners tend to have most difficulty with.

The Rescorla-Wagner (1972) model also accounts for the fact that redundant cues tend not to be acquired. Many grammatical constructions are not only low in salience, but also are redundant in the listener's understanding of an utterance in that they compete with more salient psychophysical forms. For example, third person singular − *s* marks present tense, but *today* is more salient in the input and effectively overshadows and blocks acquisition of the morpheme (Ellis 2006, 2008b; Ellis and Sagarra 2010b, Goldschneider and DeKeyser 2001). Generally, inflectional case markings such as tense are often accompanied by (more salient) adverbs that indicate temporal reference. Accordingly, L2 learners typically prefer adverbial over inflectional cues to tense, a phenomenon that has been well-documented in longitudinal studies of naturalistic L2A (Dietrich et al. 1995; Bardovi-Harlig 2000), training experiments (Ellis and Sagarra 2010b, 2011), and studies of L2 language processing (VanPatten 2006; Ellis and Sagarra 2010a).

3.5. Prototypicality of function

Categories have graded structure: some members are better exemplars of the category than others. In Prototype Theory (Rosch and Mervis 1975; Rosch et al. 1976), the prototype of a category is defined as an idealized mental representation of the best example of that category in the sense of encapsulating the most representative features of that category. The prototype serves as the gold standard against which exemplars are classified as more or less central members of the category. For example, people readily classify sparrows as birds: sparrows are good examples of the category BIRD because they incorporate various representative attributes (they are average in size, beak size, color, etc.). In contrast, people take considerably longer to confirm that albatrosses are birds too. Prototypical exemplars are judged faster and more accurately even upon first encounter (Posner and Keele 1970) − a sparrow will be instantly recognized as a bird even by a person who has never seen a sparrow before. Prototypicality and token frequency

interact: the higher the token frequency of an exemplar, the higher the likelihood of this exemplar becoming the prototype. Accordingly, Goldberg et al. (2004) showed that in L1A, children's first uses of verbs, in particular verb-argument constructions, are often semantically typical generic verb types that are at the center of the construction meaning (*go* for verb-locative, *put* for verb-object-locative, and *give* for the ditransitive). Likewise for L2A, Ellis and Ferreira-Junior (2009a) showed that the verbs first used by L2 learners are prototypical and generic in function: *go* dominates in the verb-locative construction (*She went home*), *put* in the verb-object-locative construction (*She put the groceries in the bag*), and *give* in the verb-object-object construction (*He gave her a flower*).

3.6. Contingency of form-function mapping

Psychological research on associative learning has long recognized that next to the form and the function of a given exemplar to be categorized and learned, the contingency of the form-function mapping plays a role as well (Shanks 1995). Let us return to the example of the category BIRD. All birds have eyes and wings, and so we encounter these features equally frequently. However, while many other animals have eyes, only birds have wings. That renders wings a much more reliable (or *distinctive*) cue to membership in the category BIRD than eyes. In other words, whether or not a given exemplar qualifies as a bird is much more contingent on its having the features "wings" than the feature "eyes". Such form-function mapping contingency is the driving force of all associative learning, which is often correspondingly referred to as *contingency learning*. One early powerful demonstration of contingency learning was Rescorla's (1968) classic conditioning study with rats. Rescorla found that if one removed the contingency between the conditioned stimulus and the unconditioned stimulus by preserving the temporal pairing between the two, yet adding trials where the unconditioned stimulus appeared on its own, the animals did not develop a conditioned response to the conditioned stimulus. Contingency, and its associated aspects of predictive value, information gain, and statistical association, have been at the core of learning theory ever since, including theories of L2A such as MacWhinney's *Competition Model* (MacWhinney 1987a, 1987b, 1997, 2001). Current research in cognitive and corpus linguistics focuses on the question which specific association measures are most predictive of linguistic representation, acquisition, and processing (Divjak and Gries 2012; Gries and Divjak 2012). Several studies have applied a Fisher Yates exact test as a measure of contingency of verb-complement construction pairings (Gries and Wulff 2009) and verb-tense/aspect morphology associations in learner data (Wulff et al. 2009); Ellis and Ferreira-Junior (2009b) used a directional association measure, DeltaP, to demonstrate effects of form-function contingency on the L2 acquisition of verb argument constructions (see Ellis 2006 for the use of this measure in research in human associative learning, Schmid 2010 supporting its use as a proxy for cognitive entrenchment, and Gries 2013 for its applications in collocation research); Boyd and Goldberg (2009) used conditional probabilities to analyze contingency effects in their L1A data of verb argument constructions. For a comprehensive contrastive analysis of corpus-based association measures and their correlation with behavioral data, see Wiechmann (2008).

4. First vs. second language learning: (re-)constructing a language

Countless studies in cognitive linguistics have demonstrated that language is grounded in our experience and our physical embodiment (Langacker 1987, 2000; Taylor 2002, Croft and Cruse 2004; Robinson and Ellis 2008b). The meaning of words in a given language, and how speakers combine them, depends on speakers' perception and categorization of, and interaction with, the real world around them. How speakers perceive, categorize, and interact with their environment is in turn a function of the human cognitive apparatus and bodily make-up. For example, the meaning of verbs like *push*, *poke*, *pull*, *hold* and so on, can only be fully distinguished if the sensori-motor features they encode, like hand posture, hand motions, force, aspect, and goals are taken into consideration (Bailey et al. 1997; Bergen and Chang 2005; Lakoff and Johnson 1999; Feldman 2006). Similarly, spatial language understanding is firmly grounded in our visual processing system as it relates to motor action (Regier and Carlson 2002; Conventry and Garrod 2004), multiple constraints relating to our knowledge about objects, dynamic-kinematic routines, and functional geometric analyses. What prepositions like *under*, *over*, *in*, or *on* mean is not fixed and steady, but dynamically construed on-line (Elman 2004; Spivey 2006; McRae et al. 2006). How exactly a given meaning is construed depends in large parts on where the language user's attention is being directed. Talmy (2000a, 2000b) describes the building blocks of the attentional system of language; each of around 50 building blocks, or factors, involves a particular linguistic mechanism that increases or decreases attention of a certain type of linguistic entity. Learning a language, then, means learning these various attention-directing mechanisms, which requires L1 learners to develop an attentional system in the first place, and L2 learners to reconfigure the attentional biases of having acquired their first language. In consequence, language cannot be taught through rules or rote-learning alone − ideally, it is learned in situated action.

Languages lead their speakers to experience different 'thinking for speaking' and thus to construe experience in different ways (Slobin 1996). Cross-linguistic research shows how different languages lead speakers to prioritize different aspects of events in narrative discourse (Berman and Slobin 1994). Because languages achieve these attention-directing outcomes in different ways, learning another language involves learning how to construe the world like natives of the L2, i.e., learning alternative ways of thinking for speaking (Cadierno 2008; Brown and Gullberg 2008, 2010) or 'rethinking for speaking' (Ellis and Cadierno 2009; Robinson and Ellis 2008a). Transfer theories such as the Contrastive Analysis Hypothesis (Lado 1957, 1964; James 1980, Gass and Selinker 1983) hold that L2A can be easier where languages use these attention-directing devices in the same way, and more difficult when they use them differently. To the extent that the constructions in L2 are similar to those of L1, L1 constructions can serve as the basis for the L2 constructions, but, because even similar constructions across languages differ in detail, the complete acquisition of the L2 pattern is hindered by the L1 pattern (Odlin 1989, 2008).

As Slobin (1993: 242) notes, "For the child, the construction of the grammar and the construction of semantic/pragmatic concepts go hand-in-hand. For the adult, construction of the grammar often requires a revision of semantic/pragmatic concepts, along with what may well be a more difficult task of perceptual identification of the relevant morphological elements". The human mind is built to integrate new information in a way

that is maximally compatible with established knowledge − consequently, L1-attuned expectations and selective attention bias L2 acquisition.

5. Future priorities

Robinson and Ellis (2008b) provide a detailed list of issues in cognitive linguistics and L2 acquisition; we highlight just a few here.

A constructionist perspective, in particular, calls for thorough empirical analysis of language usage. This is the evidence from which learners induce how language works. We need to understand its latent structures. O'Donnell and Ellis (2010) and Römer et al. (2013) outline a proposal to describe a usage-based verbal grammar of English, to analyze the ways verb argument constructions map form and meaning, and to provide an inventory of the verbs that exemplify constructions, their lexical constituency, and their frequencies.

A constructionist perspective also calls for thorough empirical analysis of the syntactic and semantic bootstrapping of constructions. Given the demonstrated value of longitudinal corpus research in child language acquisition, corresponding corpora of L2A are needed that allow researchers to empirically investigate the adult L2A comprehensively, longitudinally, and cross-linguistically (Ortega and Iberri-Shea 2005; Collins and Ellis 2009).

The cognitive commitment we emphasize throughout this chapter demands converging evidence from corpus data and behavioral data (Ellis 2012a; Gries 2012). Only in combination will we be able to fully understand the interplay of input and cognition in shaping L2A. This holds in particular for recent discussions of the nature and relevance of frequency and form-function contingency effects in language acquisition.

Cognitive linguistics emphasizes how multiple factors at different scales jointly affect L2 acquisition: cognition, consciousness, experience, embodiment, brain, self, human interaction, society, culture, and history are all inextricably intertwined in rich, complex, and dynamic ways. Researching how these diverse factors interact dynamically in the emergence of linguistic structure will remain a priority and a challenge for some time to come. Ellis and Larsen-Freeman (2009a) provide an illustration of how computer simulations can inform this question for argument structure constructions. More generally, emergentism, complex adaptive systems theory, dynamic systems theory, exemplar theory, and related approaches provide means for modeling language development and language as a complex adaptive system (Ellis and Larsen-Freeman 2006a, 2006b, 2009b; Ellis 2008a; Beckner et al. 2009). Cognitive-linguistic and broader usage-based approaches have done much to inform our understanding of L2A. Nevertheless, the research agenda is long. Much remains to be done, both locally and within the still broader family of the cognitive sciences.

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20. Poetics