10

Second language constructions

Usage-based acquisition and transfer

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10.1 Constructing a second language

Cognitive linguistic theories of construction grammar posit that language comprises many thousands of constructions – form–meaning mappings, conventionalized in the speech community, and entrenched as language knowledge in the learner's mind (Goldberg, 1995; Robinson & Ellis, 2008a; Trousdale & Hoffmann, 2013). Usage-based approaches to language acquisition hold that schematic constructions emerge as prototypes from the conspiracy of memories of particular exemplars that language users have experienced. This chapter investigates second language (L2) processing of abstract verb–argument constructions (VACs) and its sensitivity to the statistics of usage in terms of verb exemplar type-token frequency distribution, VAC–verb contingency, and VAC–verb semantic prototypicality.

Second language and first language (L1) learners alike share the goal of understanding language and how it works. Since they achieve this based upon their experience of language usage, there are many commonalities between L1 and L2 acquisition (L2A) that can be understood from corpus analyses of input and from cognitive–linguistic and psycholinguistic analyses of construction acquisition following associative and cognitive principles of learning and categorization. Usage-based approaches, cognitive linguistics, and corpus linguistics are thus increasingly influential in L2A research too (Collins & Ellis, 2009; Ellis, 1998, 2003; Ellis & Cadierno, 2009; Robinson & Ellis, 2008a). However, because they have previously devoted considerable resources to the estimation of the characteristics of another language – the native tongue in which they have considerable fluency – L2 learners' computations and inductions are often affected by transfer, with L1-tuned expectations and selective attention (Ellis, 2006b; Ellis & Sagarra, 2011) blinding the acquisition system to aspects of the L2 sample. Learned attention biases their estimation from naturalistic usage and produces a distinctive attainment that is characteristic of L2A from speakers of different L1s (Ellis, 2007; Ellis & Sagarra, 2011). L2A is thus different from L1A in that it involves processes of construction and *re*construction. These are the issues explored here.

The organization of the chapter is as follows. Section 10.2 presents a psychological analysis of the effects of form, function, frequency, and contingency that are common to both L1 and L2 construction learning following statistical learning processes which relate input and learner cognition. Section 10.3 analyzes these factors in the statistics of a representative sample of VAC usage – the British National Corpus, a 100-million-word corpus of English (BNC, 2007). Section 10.4 tests the psycholinguistic reality of VACs in terms of the effects of VAC form, function, and contingency on the processing of VACs by native speakers of English. Respondents generated the first verb that came to mind that would fill the V slot in sparse VAC frames such as 'he __ across the ...,' 'it __ of the ...,' etc. For each VAC, we compared the results from such experiments with the corpus analyses of verb selection preferences described in section 10.3 to show independent contributions of (1) verb frequency in the VAC, (2) VAC–verb contingency, and (3) verb prototypicality in terms of centrality within the VAC semantic network. The fact that native-speaker VACs implicitly represent the statistics of language usage implies that they are learned from usage. Section 10.5 investigates the nature of these constructions in German, Spanish, and Czech advanced learners of English as a second language. When participants from these first-language backgrounds performed the same tasks, their responses were again sensitive to type-token frequency distribution, VAC–verb contingency, and semantic structure, confirming that they too acquired these constructions from English usage. Section 10.6 shows, however, that there are differences in the representation of these VACs in L2 speakers that result from L1 → L2 transfer or "learned attention." These were particularly apparent in L1 speakers of typologically distinct verb-framed Spanish as opposed to German and Czech which, like English, are satellite framed. It considers how learned attention affects learners' sensitivity to different aspects of the linguistic form of constructions.

10.2 Form, function, and frequency in L1 and L2 learning of constructions

Our experience of language allows us to converge upon similar interpretations of novel utterances like "the ball mandools across the ground" and "the teacher spugged the boy the book." You know that *mandool* is a verb of motion and have some idea of how mandooling works – its action semantics. You know that *spugging* involves some sort of gifting, that the teacher is the donor, the boy the recipient, and that the book is the transferred object. How is this possible, given that you have never heard these verbs before? There is a close relationship between the types of verb that typically appear within constructions, hence their meaning as a whole is inducible from the lexical items experienced within them. So your reading of "the ball mandools across the ground" is driven by an abstract 'V *across* noun' VAC which has inherited its schematic meaning from all of the relevant examples you have heard, and your interpretation of *mandool* emerges from the echoes of the verbs that occupy this VAC – words like *come, walk, move, . . ., scud, skitter*, and *flit*.

The specific claim under test in this chapter is that a VAC inherits its schematic meaning from the constituency of all of the verb exemplars experienced within it, weighted according to the frequency of their experience and the reliability of their association to that construction (their contingency), and their degree of prototypicality in the semantics of the VAC.

10.2.1 Frequency

Psycholinguistic research demonstrates language processing to be sensitive to usage frequency across many language representations: phonology and phonotactics, reading, spelling, lexis, morphosyntax, formulaic language, language comprehension, grammaticality, sentence production, and syntax (Ellis, 2002). That language users are sensitive to the input frequencies of constructions entails that they must have registered their occurrence in processing, and these frequency effects are thus compelling evidence for usage-based models of language acquisition. Is there evidence that language users have knowledge of the verb type-token distributions within VACs? Goldberg et al. (2004) showed that the verb types which children used in a VAC broadly follow the same relative frequencies as the verb types they experienced in their input. Ellis and Ferreira-Junior (2009b) investigated effects upon naturalistic second language acquisition of type-token distributions in the islands comprising the linguistic form of three schematic English VACs (VL verb locative, VOL verb object locative, VOO ditransitive) sampled from approximately 25,000 sentences of interaction between native English and adult non-native speakers in the European Science Foundation (ESF) corpus (Dietrich, Klein, & Noyau, 1995; Perdue, 1993). They showed that (1) the frequency profile of the verbs in each family follows a Zipfian profile (Zipf, 1935) whereby the highest frequency types account for the most linguistic tokens. Zipf's law states that in human language, the frequency of words decreases as a power function of their rank. They also showed that (2) learners first acquire the most frequent, prototypical and generic exemplar (e.g., *put* in VOL, *give* in VOO, etc.), and that (3) the rank order of verb types in the learner constructions was very similar to that in native-speaker usage: for the VL construction, frequency of lemma use by learner was correlated with the frequency of lemma use in comparable native language input ($r = 0.97$); for VOL the correlation was 0.89, for VOO 0.93.

10.2.2 Contingency

Psychological research into associative learning has long recognized that while input frequency is important, more so is contingency of mapping. Consider how, in the learning of the category of birds, while eyes and wings are equally frequently experienced features in the exemplars, it is wings which are distinctive in differentiating birds from other animals. Wings are important features to learning the category of birds because they are reliably associated with class membership, eyes are neither. Some verbs are closely tied to a particular VAC (for example, *give* is highly indicative of the ditransitive construction, whereas *leave*, although it can form a ditransitive, is more often associated with other constructions such as the simple transitive or intransitive). The higher the contingency between a cue and an outcome, the more readily an association between them can be learned (Shanks, 1995), so constructions with more faithful verb members are more transparent and thus should be more readily acquired (Ellis, 2006a). In their study of L2 acquisition, Ellis and Ferreira-Junior (2009b) used a variety of metrics to show that VAC acquisition is determined by the contingency of form–function mapping: the one-way dependency statistic ΔP (Allan, 1980) that is commonly used in the associative learning literature (Shanks, 1995), as well as collostructional analysis measures current in corpus linguistics (Gries & Stefanowitsch, 2004; Stefanowitsch & Gries, 2003), both predicted effects of form–function contingency upon L2 VAC acquisition.

10.2.3 Prototypicality of meaning

Categories have graded structure, with some members being better exemplars than others. In the prototype theory of concepts (Rosch et al., 1976; Rosch & Mervis, 1975b), the prototype as an idealized central description is the best example of the category, appropriately summarizing the most representative attributes of a category. As the typical instance of a category, it serves as the benchmark against which surrounding, less representative instances are classified – people more quickly classify as *birds* sparrows (or other average sized, average colored, average beaked, average featured specimens) than they do birds with less common features or feature combinations like geese or albatrosses. Prototypes are judged faster and more accurately, even if they themselves have never been seen before – someone who has never seen a sparrow, yet who has experienced the rest of the run of the avian mill, will still be fast and accurate in judging it to be a bird

(Posner & Keele, 1970). The greater the token frequency of an exemplar, the more it contributes to defining the category, and the greater the likelihood it will be considered the prototype. The best way to teach a concept is to show an example of it. So the best way to introduce a category is to show a prototypical example. Ellis and Ferreira-Junior (2009a) show that the verbs that second language learners first used in particular VACs are prototypical and generic in function (*go* for VL, *put* for VOL, and *give* for VOO). The same has been shown for child language acquisition, where a small group of semantically general verbs, often referred to as *light verbs* (e.g., *go, do, make, come*) are learned early (Clark, 1978; Ninio, 1999; Pinker, 1989). Ninio argues that, because most of their semantics consist of some schematic notion of transitivity with the addition of a minimum specific element, they are semantically suitable, salient, and frequent; hence, learners start transitive word combinations with these generic verbs. Thereafter, as Clark describes, "many uses of these verbs are replaced, as children get older, by more specific terms. General purpose verbs, of course, continue to be used but become proportionately less frequent as children acquire more words for specific categories of actions" (p. 53).

If these are the factors in learners' experience of language usage that drive the emergence of schematic VACs, then the first step is to assess these factors in VAC usage. The second is to demonstrate their effects on VAC processing. We do this, like Rosch and Mervis (1975b), by simply asking respondents to generate exemplars of categories, in this case the verbs that come to mind when they see schematic VAC frames such as 'he __ across the . . .,' 'it __ of the . . .,' etc.

10.3 Analyzing the statistics of VAC usage

Ellis and O'Donnell (2011, 2012) investigated the type-token distributions of twenty VACs such as 'V(erb) *across* n(oun phrase)' in a 100-million-word corpus of English usage. The other prepositions sampled were *about, after, against, among, around, as, at, between, for, in, into, like, of, off, over, through, towards, under*, and *with*.

They searched a dependency-parsed version of the British National Corpus (BNC, 2007) for specific VACs previously identified in the Grammar Patterns volume resulting from the Collins Birmingham University International Language (COBUILD) corpus-based dictionary project (Francis, Hunston, & Manning, 1996). The details of the linguistic analyses, as well as subsequently modified search specifications in order to improve precision and recall, are described in Römer, O'Donnell, and Ellis (2013). The steps were, for each VAC, such as the pattern 'V *across* n':

1. Generate a list of verb types that occupy each construction (e.g., *come, walk, run, . . ., scud*).
2. Produce a frequency ranked type-token profile for these verbs (e.g., *come* 628, walk . . . 243, . . . *spread* 96, . . . *scurry* 13, . . . *float* 9, . . .), and determine whether this is Zipfian. Zipfian distributions exhibit a characteristic long tail in a plot of rank against frequency. Zipf's law, like other power–law distributions, is most easily observed when plotted on doubly logarithmic axes, where the relationship between log (rank order) and log (frequency) is linear. The advised method to do this is via the (complementary) cumulative distribution (Adamic, 2002; Adamic & Huberman, 2002). We generated logarithmic plots and linear regressions to examine the extent of this trend using logarithmic binning of frequency against log cumulative frequency. The binning allows us to select and illustrate an example verb type from each frequency band. Illustrative plots for 'V *across* n' and for 'V *of* n' can be seen in Figure 10.1.
3. Because some verbs are faithful to one construction while others are more promiscuous, calculate measures of contingency which reflect the statistical association between verb and VAC. We adopted various measures of contingency in usage, including ΔP (Ellis & Ferreira-Junior, 2009b): the association of *give* to the ditransitive (ΔP Word → Construction) is 0.025, that for *leave* is 0.001, the association of the ditransitive to *give* (ΔP Construction → Word) is *give* 0.314, that for *leave* is 0.003.

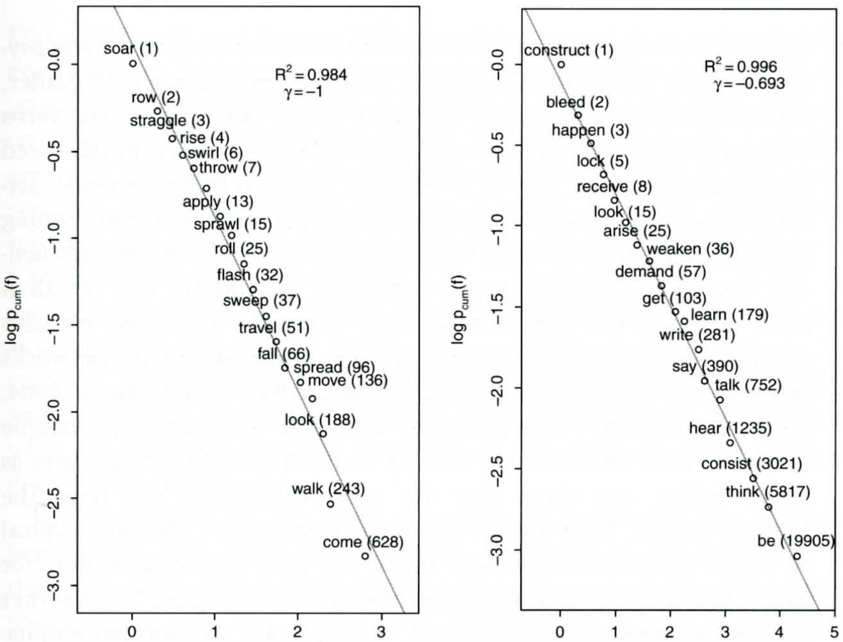

Figure 10.1 BNC verb type distribution for 'V *across* n' (left) and 'V *of* n' (right)

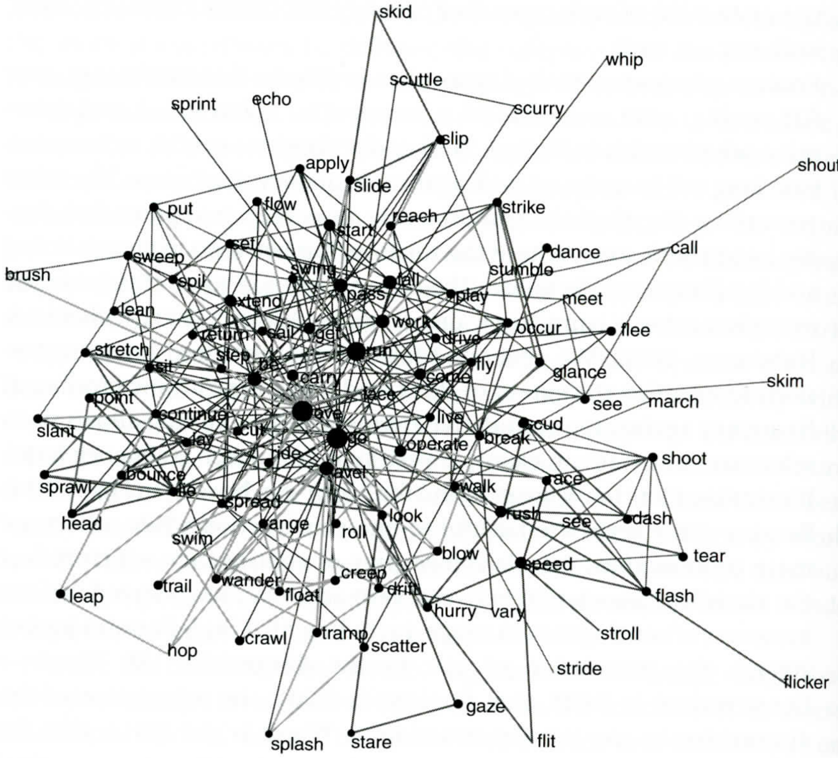

Figure 10.2 A semantic network for 'V *across* n' from the BNC using WordNet as a base. Node size is proportional to degree

4. Using WordNet, a distribution-free semantic database based upon psycholinguistic theory which has been in development since 1985 (Miller, 2009), measure the semantic similarity of the meanings of the verbs occupying each construction and apply networks science, graph-based algorithms (de Nooy, Mrvar, & Batagelj, 2010) to build semantic networks in which the nodes represent verb types and the edges of strong semantic similarity for each VAC. Standard measures of network density, average clustering, degree centrality, transitivity, etc. are then used to assess the cohesion of these semantic networks. We also apply algorithms for the detection of communities within the networks representing different semantic sets (Clauset, Newman, & Moore, 2004; Danon et al., 2005). The network for 'V *across* n' is shown as an example in Figure 10.2. The network is fairly dense. The hubs, shown here as larger nodes, are those that are most connected, i.e., have the highest degree. They are *go, move, run*, and *travel* – the prototypical 'V *across* n' senses. However, there are also subcommunities, for example one relating to vision including *look, stare, gaze, face*, another speeded movement: *run, shoot, scud, race, rush*, etc., and another emphasizing flat contact: *lay, lie, sprawl*, etc. Note that both degree and

centrality in the network are unrelated to token frequency in the corpus; they simply reflect verb type connectivity within the network. Betweenness centrality is a measure of a node's centrality in a network equal to the number of shortest paths from all vertices to all others that pass through that node (McDonough & De Vleeschauwer, 2012). In semantic networks, central nodes are those which are prototypical of the network as a whole.

This research demonstrated: (1) The frequency distribution for the types occupying the verb island of each VAC is Zipfian, with the most frequent verb taking the lion's share of the distribution. (2) The most frequent verb in each VAC is prototypical of that construction's functional interpretation, albeit generic in its action semantics. (3) VACs are selective in their verb form family occupancy: individual verbs select particular constructions; particular constructions select particular verbs; there is high contingency between verb types and constructions. (4) VACs are coherent in their semantics. Psychology theory relating to the statistical learning of categories suggests that these are the factors which make concepts robustly learnable. Ellis and O'Donnell (2011, 2012) conclude, therefore, that these are the mechanisms which make linguistic constructions robustly learnable too, and that they are learned by similar means.

10.4 L1 sensitivity to VAC structure

Ellis, O'Donnell, and Römer (2014a) used free association and verbal fluency tasks to investigate verb–argument constructions (VACs) and the ways in which their processing is sensitive to statistical patterns of usage (verb type-token frequency distribution, VAC–verb contingency, VAC–verb semantic prototypicality). In one experiment (Experiment 1), 285 native speakers of English (mostly students enrolled at a large mid-western research university) generated the first word that came to mind to fill the V slot in 40 sparse VAC frames such as 'he __ across the . . .,' 'it __ of the . . .,' etc. In a second experiment (Experiment 2), 40 English speakers generated as many verbs that fit each frame as they could think of in a minute. For each VAC, we compared the results from the experiments with the corpus analyses of verb selection preferences in 100 million words of usage and with the semantic network structure of the verbs in these VACs as described in section 10.3.

For illustration of the kind of responses generated, we plot the lemmatized verb types for each VAC generated in Experiment 1 in the space defined by log token generation frequency against log token frequency in that VAC in the BNC. The plot for 'V *of* n' is shown in Figure 10.3 for detailed study. Items appear on the graph if the lemma

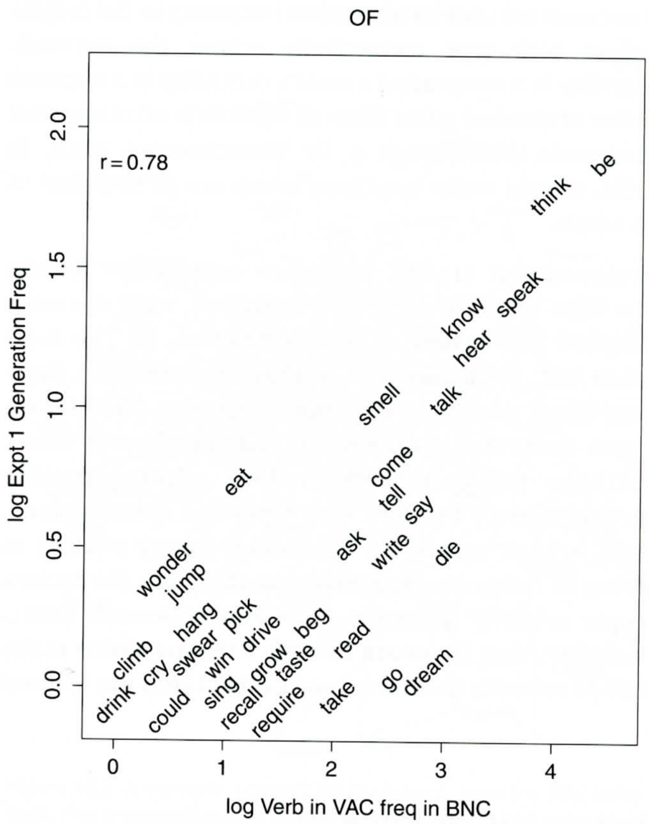

Figure 10.3 Experiment 1 log10 verb generation frequency against log10 verb frequency in that VAC in the BNC for 'V *of* n'.

both appears as a response in the generation task for that VAC and it also appears in the BNC. It can be seen that generation frequency follows verb frequency in that VAC in the BNC with a correlation of $r = 0.78$. After the copula *be*, cognition verbs (*think* and *know*) are the most frequent types, followed by communication verbs (*speak, say, talk, ask*), and also perception verbs (*smell, hear*). Thus the semantic sets of the VAC frame in usage (of the sort shown in Figure 10.2) are all sampled in the free association task, and the sampling follows the frequencies of usage.

For both experiments, the frequencies of verb types generated for each VAC were affected by three factors:

1. Entrenchment – verb token frequencies in those VACs in usage experience.
2. Contingency – how faithful verbs are to particular VACs in usage experience.

3. Semantic prototypicality – the centrality of the verb meaning in the semantic network of the VAC in usage experience.

Multiple regression analyses showed that these factors make significant independent contributions. For example, the analysis of the Experiment 1 ('first word that came to mind') responses, including cases where the verb appeared in the generations for that VAC and in the BNC in that VAC, explained 30 percent of the variance of the responses, with relative importance determination showing that the major predictor was ΔPconstruction →word (0.45) followed by BNC verb frequency in that VAC (0.29), followed by verb betweenness centrality in the semantic network for VAC usage in the BNC (0.26). How might these factors affect processing in the generation fluency task?

1. Effects of frequency of usage upon language learning, entrenchment, and subsequent fluency of linguistic processing are well documented and understood in terms of Hebbian learning (Bybee, 2010; Bybee & Hopper, 2001; Ellis, 2002; MacWhinney, 2001).
2. Effects of contingency of association are also standard fare in the psychology of learning (Rescorla & Wagner, 1972; Shanks, 1995), in the psychology of language learning (Ellis, 2006a, 2006b; MacWhinney, 1987a; MacWhinney, Bates, & Kliegl, 1984), and in the particular case of English VAC acquisition (Ellis & Ferreira-Junior, 2009a, 2009b; Ellis & Larsen-Freeman, 2009) and of German L2 English learners' verb-specific knowledge of VACs as demonstrated in priming experiments (Gries & Wulff, 2005, 2009).
3. We interpret the effects of semantic prototypicality in terms of the spreading activation theory of semantic memory (Anderson, 1983). The prototype has two advantages: The first is a frequency factor. We have already described how in usage, the greater the token frequency of an exemplar, the more it contributes to defining the category, and the greater the likelihood it will be considered the prototype (Rosch et al., 1976; Rosch & Mervis, 1975b). Thus it is the response that is most associated with the VAC in its own right. But beyond that, it gets the network centrality advantage. When any response is made, it spreads activation and reminds other members in the set. The prototype is most connected at the center of the network and, like Rome, all roads lead to it. Thus it receives the most spreading activation. Likewise in social networks, individuals with high betweenness centrality are key agents in navigating the network – they mediate communication between most other individuals.

These findings promote a usage-based view of L1A, with L1 VAC processing involving rich associations, tuned by verb type and token frequencies and their contingencies of usage, which interface syntax, lexis, and semantics.

10.5 Similarities: L2 speakers' sensitivity to the statistics of usage

What about L2A? Ellis, O'Donnell, and Römer (2014b) investigated how similar or different the mental representations of common VACs are between native speakers and learners of English and whether there are observable effects of the learners' first language. They had 131 advanced English language learners of three different first language backgrounds (German, Czech, and Spanish) complete the same type of free association task as in Experiment 1 described in section 10.4. The L1 German, L1 Czech, and L1 Spanish learners were students enrolled at research universities in Germany, the Czech Republic, and Spain. The mean number of years of English instruction was 10.04 years for German, 11.37 for Czech, and 12.68 for Spanish. The responses made by these groups of L2 learners were compared with each other and with those of a random subset of 131 L1 English speakers from Experiment 1. Illustrative plots of the responses for the VACs 'V *about* n,' 'V *between* n,' and 'V *against* n' against frequencies of the verbs in that VAC in the BNC are shown in Figures 10.4, 10.5, and 10.6 where it can be seen that the advanced L2 English speakers generated a similar set of verb types for these VACs with similar token frequencies.

As with the native speaker data, in order to assess the degree to which these patterns hold across the VACs and the degree to which each causal variable makes an independent contribution, for each L1 we stacked the generation data for the different VACs into a combined dataset, including cases where the verb appeared in the generations for that VAC and in the BNC in that VAC. We then used this dataset to perform a multiple regression of generation frequency against BNC verb frequency in that VAC, ΔPcw, and verb betweenness centrality in that VAC usage in the BNC. All three independent variables were entered into the regression. The resultant coefficients are summarized in Table 10.1, showing the results for each L2 against those for English L1 participants.

Recall that for the 285 English L1 responses, the multiple regression explained 30 percent of the variance, with the relative importance of the predictors being ΔPcw (0.45), BNC verb frequency in that VAC (0.29), verb betweenness centrality in the semantic network for VAC usage in the BNC (0.26). The data here for the random 131 English subset showed a very similar pattern: R^2=31 percent, relative importances ΔPcw (0.40), BNC verb in VAC frequency (0.29), verb betweenness centrality (0.31) with each of these factors making significant independent contributions. Table 10.1 shows that the L2 data pattern in a very similar fashion. For each language, each of the three independent variables make significant independent contributions.

Table 10.1 *Multiple regression summary statistics for the analyses of 131 L1 English respondents and 131 German, Spanish, and Czech L2 English respondents*

Group	R sq	b			Relative importance		
		Frequency	Contingency	Prototypicality	Frequency	Contingency	Prototypicality
English	0.31	.07**	0.39***	0.30***	0.29	0.40	0.31
German	0.34	.06**	0.48***	0.29***	0.28	0.47	0.25
Spanish	0.44	.06**	0.60***	0.23***	0.29	0.53	0.17
Czech	0.33	.08**	0.54***	0.17***	0.31	0.56	0.14

Significance levels: *** < .0001
** < 0.001
* < 0.05

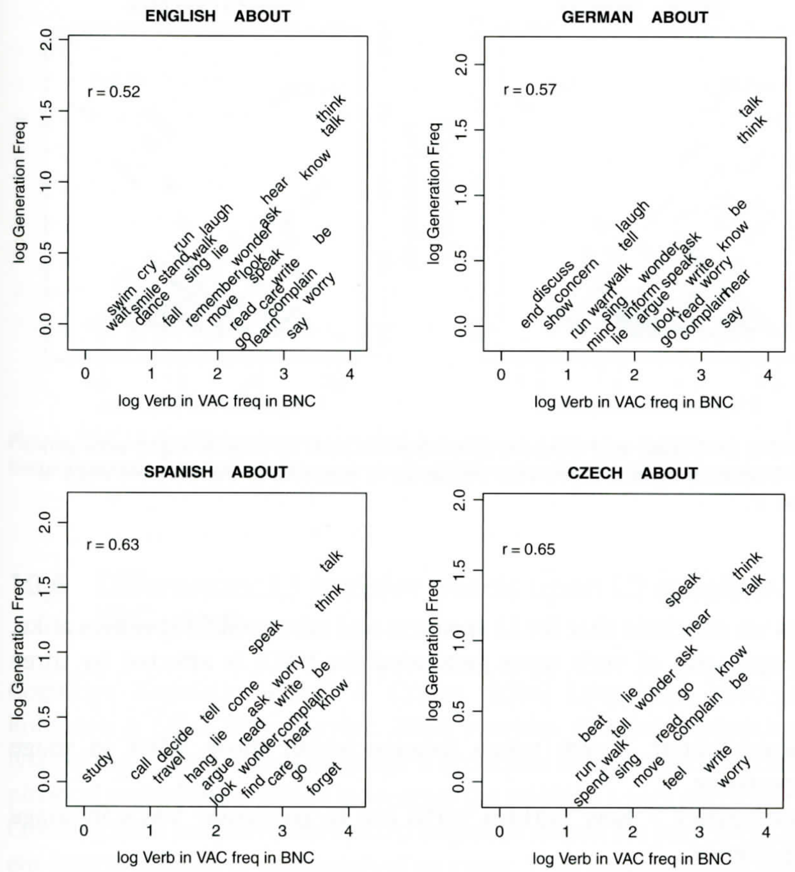

Figure 10.4 L1 English and German, Spanish and Czech L2 English log10 verb generation frequency against log10 verb frequency in that VAC in the BNC for VACs 'V *about* n'.

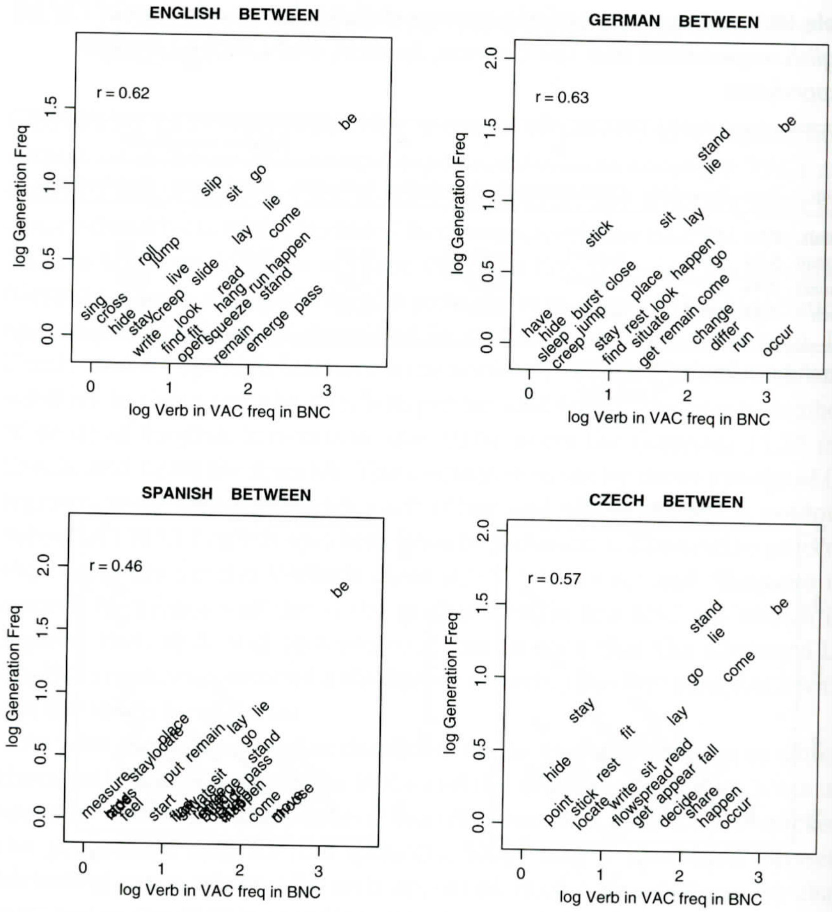

Figure 10.5 L1 English and German, Spanish and Czech L2 English log10 verb generation frequency against log10 verb frequency in that VAC in the BNC for VACs 'V *between* n'.

Thus we conclude that for L1 speakers and advanced L2 speakers alike, the frequencies of verb types generated for VACs is affected by three factors:

1. Entrenchment – verb token frequencies in those VACs in usage experience.
2. Contingency – how faithful verbs are to particular VACs in usage experience.
3. Semantic prototypicality – the centrality of the verb meaning in the semantic network of the VAC in usage experience.

We take this as evidence for common processes of construction learning from usage in L1A and L2A.

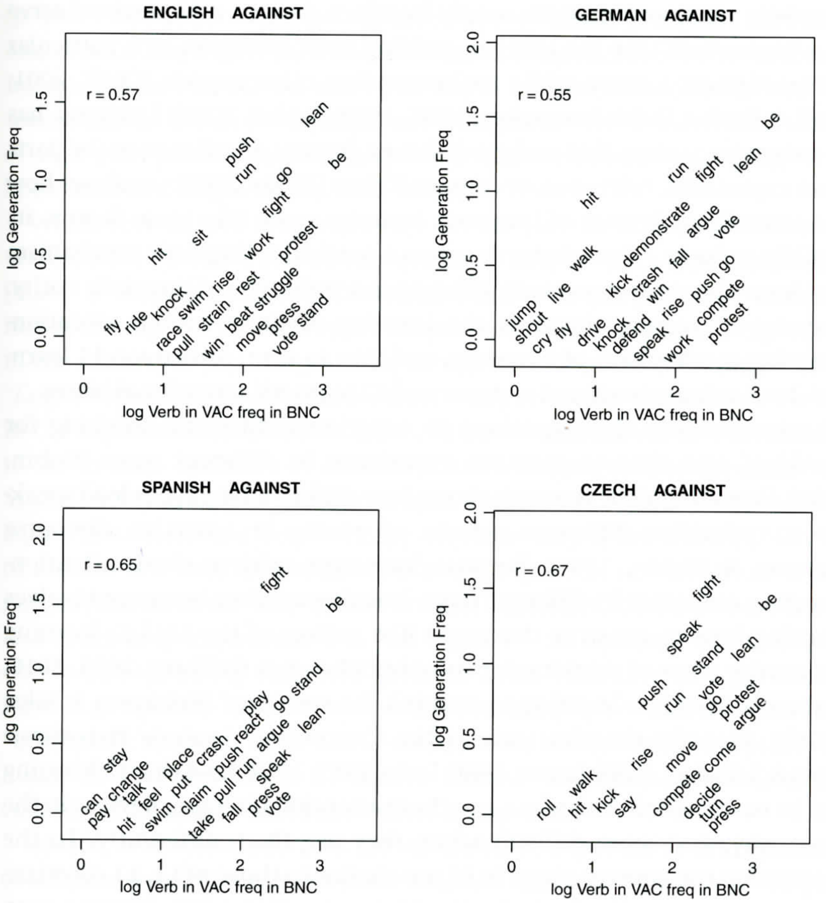

Figure 10.6 L1 English and German, Spanish and Czech L2 English log10 verb generation frequency against log10 verb frequency in that VAC in the BNC for VACs 'V *against* n'.

10.6 Differences: L1 transfer effects upon L2 speakers' VAC usage

Cognitive linguistics (Croft & Cruise, 2004; Langacker, 1987, 2000; Robinson & Ellis, 2008a; Taylor, 2002) provides detailed qualitative analyses of the ways in which language is grounded in our experience and our physical embodiment which represents the world in a very particular way. Constructions are conventionalized linguistic means for presenting different interpretations or construals of an event. They structure concepts and direct attention to aspects of experience through the options specific languages make available to speakers (Talmy, 2000a, 2000b). The different degrees of salience or prominence of elements involved in situations that we wish to describe affect the selection of subject, object, adverbials, and other clause arrangements. In language comprehension, abstract linguistic constructions (like simple locatives, datives, and passives) serve as a "zoom lens" for the listener, guiding their attention to a particular perspective on a scene while backgrounding other aspects (Croft, 2001; Croft & Cruise, 2004; Langacker, 1987, 1999; Taylor, 2002). Language has an extensive system that assigns different degrees of salience to the parts of an expression, reference, or context. Talmy (2000a, 2000b) analyses how the Attentional System of Language includes some fifty basic factors, its "building blocks." Each factor involves a particular linguistic mechanism that increases or decreases attention on a certain type of linguistic entity. Learning a language involves the learning of these various attention-directing mechanisms of language, and this, in turn, rests upon L1 learners' developing attentional systems and L2 learners' attentional biases.

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 & 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 (Brown & Gullberg, 2008, 2010; Cadierno, 2008) or learning to 'rethink for speaking' (Robinson & Ellis, 2008b). Transfer theories such as the Contrastive Analysis Hypothesis (Gass & Selinker, 1983; James, 1980; Lado, 1957, 1964) hold that L2 learning 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 acquisition of the L2 pattern in all its detail is hindered by the L1 pattern (Cadierno, 2008; Odlin, 1989, 2008; Robinson & Ellis, 2008a).

There is good reason to expect that there will be L1 effects upon VAC acquisition. Languages differ in the ways in which verb phrases express motion events. According to Talmy (2000),

> The world's languages generally seem to divide into a two-category typology on the basis of the characteristic pattern in which the conceptual structure of the macro-event is mapped onto syntactic structure. To characterize it initially in broad strokes, the typology consists of whether the core schema is expressed by the main verb or by the satellite. (p. 221)

The "core schema" here refers to the "framing event," i.e., the expression of the path of motion. Talmy (2000) goes on to say that "[l]anguages that characteristically map the core schema into the verb will be said to have a **framing verb** and to be **verb-framed** languages" and that "languages that characteristically map the core schema onto the satellite will be said to have a **framing satellite** and to be **satellite-framed** languages"

(p. 222; emphasis in original). Included in the former group are Romance and Semitic languages, Japanese, and Tamil. Languages in the latter group include Germanic, Slavic, and Finno-Ugric languages, and Chinese. This means that a Germanic language such as English often uses a combination of verb plus particle (*go into, jump over*) where a Romance language like Spanish uses a single form (*entrar, saltar*).

While verb-framed languages express the path of motion in the main verb and are "path-incorporating" (Talmy, 1985) or "path-type" languages (Mani & Pustejovski, 2012), satellite-framed languages are "manner-incorporating" or "manner-type" languages in which manner is expressed in the main verb (e.g., English *run, stroll*). According to Slobin (2003: 162), "English speakers get manner for free." They commonly use manner verbs in the expression of motion events and have more lexical items available to do so than speakers of satellite-framed languages like Spanish. The Spanish motion verb *saltar*, for example, has a range of English translation equivalents including *jump* (*over, up*), *leap, climb, skip, spurt*, and *hop*. Manner of motion is a "highly saturated" semantic space in satellite-framed languages (Slobin, 2003: 163). In verb-framed languages, manner of motion is less commonly expressed. It is "an adjunct – an optional addition to a clause that is already complete" (Slobin, 2003: 162), such as a participial form (e.g., Spanish *entró corriendo*, "enter running"). We therefore assume "manner of motion" to be a less entrenched, less salient concept in the minds of speakers whose L1 is verb framed. The concept is less easily codable and requires additional effort to express.

Römer, O'Donnell, and Ellis (2014) therefore expected to find speakers of satellite-framed languages (here English, German, and Czech)[1] to produce more verbs that express specific manners of motion in the verb generation tasks. Conversely, we expected speakers of a verb-framed language (here Spanish) to produce specific manner of motion verbs less frequently and instead respond with more general motion verbs such as *go, come*, or *move*. All groups of speakers were asked to produce verbs in response to VAC frames that encode a path of motion, with the path expressed by a satellite (a particle or preposition). We therefore also expected that learners whose L1 is satellite-framed (and hence typologically similar to English) might find it easier to respond to the survey prompts and produce more target-like verbs (verbs that correlate more closely with those produced by L1 English speakers) than speakers whose L1 is verb framed.

[1] Whereas Slavic languages are generally considered satellite framed (Slobin, 2003, 2006), Gehrke (2008) cautions that Czech is "neither straightforwardly verb-framed nor straightforwardly satellite-framed" (p. 203) and that, while motion and manner are included in the verb (as is typically the case for a satellite-framed language), paths of motion may be mapped onto the verb and/or a directional preposition. To give one example, Czech offers three ways of expressing jump over: *skočit přes* ('jump over'), *přeskočit přes* ('overjump over'), and *přeskočit* ('overjump'). Czech hence appears to be a less prototypical satellite-framed language than English or German.

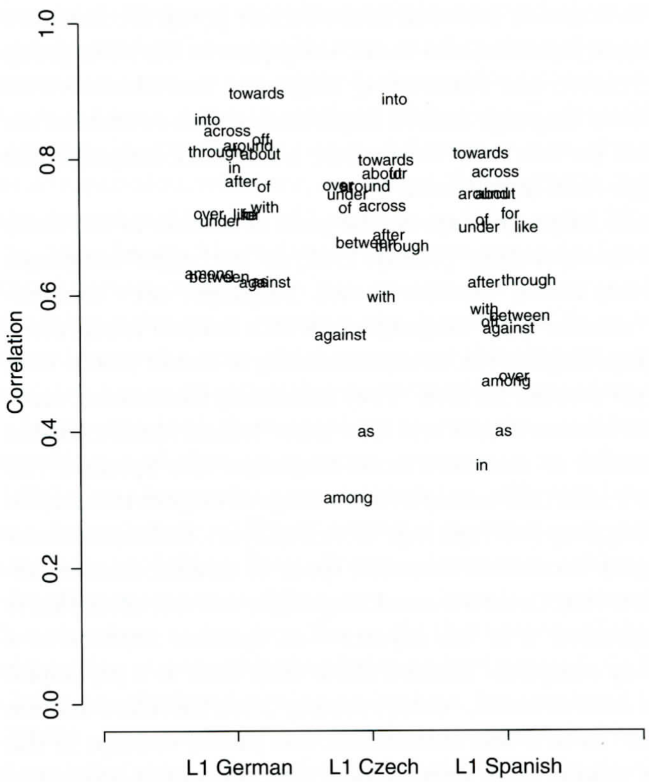

Figure 10.7 Correlations between learner and native speaker response

In order to investigate these hypotheses, we compared lists based on the learner responses with lists based on English native speaker responses: L1 German vs. English, L1 Czech vs. English, and L1 Spanish vs. English. We plotted L2 responses against L1 responses (rather than BNC usage as in sections 10.4 and 10.5), and the effects of transfer became apparent in the residuals. Figure 10.7 provides a visual representation of these bilingual correlations for each VAC, with data points represented by prepositions. The possible range of values is 0 to 1. The closer the value is to 1, the stronger the correlation between the responses. Based on the language typology issues, our hypothesis is that Spanish learners will find it harder to produce verbs that correlate closely with those produced by native English speakers than German and Czech learners.

Across the 57 datasets (19 VACs times three learner groups), correlations range from 0.3 ('V *among* n,' L1 Czech) to 0.9 ('V *towards* n,' L1 German). As Figure 10.7 indicates, L1 German vs. English correlations are much more homogeneous across VACs (0.62 to 0.9) than L1 Spanish vs. English and (even more so) L1 Czech vs. English correlations (0.35 to 0.81 and 0.3 to 0.89 respectively). For L1 German, we also observe a higher average correlation of 0.75 than for L1 Czech (0.68) and L1 Spanish (0.62). Overall then, the

Table 10.2 *'V in n,' top-20 verbs in native speaker and learner responses*

Rank	Native speakers		German learners		Czech learners		Spanish learners	
1	BE	19	*BE*	27	*BE*	33	*BE*	53
2	SIT	15	*SIT*	11	*LIVE*	10	*LIVE*	9
3	JUMP	10	*LIVE*	8	*STAND*	7	STAY	8
4	WALK	8	*GO*	8	*SIT*	7	PLAY	4
5	GO	7	*WALK*	8	WAIT	6	*SLEEP*	3
6	LOOK	6	*HIDE*	5	WORK	5	*HIDE*	3
7	FALL	6	*STAND*	5	*COME*	5	*COME*	3
8	COME	4	*LOOK*	4	*SLEEP*	4	*STAND*	3
9	LIVE	4	*SLEEP*	3	STAY	4	PUT	3
10	SING	3	*COME*	3	PARTICIPATE	3	WORK	2
11	RUN	3	*FALL*	3	*FALL*	3	TRAVEL	2
12	STAND	3	STAY	3	*LIE*	3	ENTER	2
13	SWIM	3	WORK	2	*LOOK*	3	ARRIVE	2
14	HIDE	3	PARTICIPATE	2	*GO*	3	GET	2
15	SLEEP	3	STUDY	2	*WALK*	3	FILL	2
16	SLIDE	2	WAIT	2	*HIDE*	2	REMAIN	2
17	DRAW	2	BITE	2	*SWIM*	2	*GO*	2
18	LIE	2	SEARCH	2	PUT	2	EAT	2
19	READ	2	*RUN*	2	*JUMP*	2	INVOLVE	1
20	BLOW	2	*JUMP*	2	RELAX	1	STUDY	1

German learner responses most closely and the Spanish learner responses least closely match the native speaker responses, with the Czech learner responses falling somewhere between these two groups (see our note above on Czech's status as a less clear-cut exemplar of a satellite-framed language). It appears that, at least with respect to a large number of VACs, Spanish learners' form–meaning mappings are less in line with native-speaker peers than those of German or Czech learners. This is particularly true for the VACs 'V *against* n,' 'V *among* n,' 'V *as* n,' 'V *between* n,' 'V *in* n,' 'V *off* n,' 'V *over* n,' and 'V *with* n'. These quantitative analyses confirm our hypothesis that Spanish learners find it harder than German and Czech learners to produce verbs that correlate closely with those produced by native English speakers.

A qualitative analysis of 'V *in* n' provides a detailed example. Correlations are high for German (0.79), slightly above average for Czech (0.69), and low for Spanish (0.35). We hence expect strong overlap in terms of verb preferences between native speaker and German and Czech learner responses. We expect the verb choices of Spanish learners to be rather different from those of native speakers and from those of their German and Czech peers. Table 10.2 shows lemmatized lists of the 20 most frequent verbs produced by the four groups of survey participants in response to the prompts 'he ___ in the ... ' and 'it ___ in the ... '. The native speaker responses in the left-hand column serve as a reference point for comparisons with the German, Czech, and Spanish learner responses. Verbs are italicized in a learner list if they also appear in the native speaker list.

It is generally the case that learners have stronger associations with verbs that are common in general language use. Hasselgren (1994) describes how in an L2 we "regularly clutch for the words we feel safe with: our 'lexical teddy bears'" (p. 237) and shows how even advanced L2 learners often overuse high frequency basic words rather than risking making a word selection error going for a less frequent but more appropriate term.

In addition to this general effect, we observe more overlap between native speaker and German (13 verbs) and native speaker and Czech (14 verbs) top-20 lists than between native speaker and Spanish lists (7 verbs). These shared verbs do, however, occupy different ranks across lists and/or have quite different token frequencies. Although shared among the top 20, verbs that express static meanings (including BE, LIVE, STAY, and STAND) are more often produced by German and Czech learners than by native speakers. Several of the motion verbs produced by native speakers (GO, WALK, COME) have the same or similar frequencies in the German and (though to a lesser extent) Czech lists. Other motion verbs produced by native speakers (SLIDE, BLOW, DRAW, JUMP, SWIM) are absent from or less common in the German and Czech learner responses.

The Spanish learner responses are different from both the native speaker and the German/Czech learner responses. Over 40 percent of Spanish survey participants (53 of 131) respond to the 'V *in* n' prompt with forms of the most frequent, semantically bleached verb BE. They share their preference for LIVE and STAY with the German and Czech groups but largely avoid motion verbs. WALK, FALL, and JUMP are absent from the Spanish list while COME and GO are rare. Such differences between native speaker and Spanish learner responses are consistent with our hypotheses relating to language typology and thinking-for-speaking. 'V *in* n' is one of many VACs in our set in which a path of motion is expressed by a 'satellite' (here the preposition *in*). The verb-framed language Spanish tends to encode this path in the verb and the manner of motion in an adjunct, so *walk in* is realized as *entrar caminando* (enter walking). It is hence not surprising that our Spanish learners do not (or very rarely) produce verbs such as WALK, GO, FALL, or JUMP in response to the 'V *in* n' prompt.

10.7 Conclusions

This work is framed within cognitive linguistic theories of construction grammar which hold that language comprises many thousands of constructions as form–meaning mappings, conventionalized in the speech community, and entrenched as language knowledge in the learner's mind. Usage-based approaches to language acquisition believe that schematic constructions emerge as prototypes from the conspiracy of memories of particular exemplars that language users have experienced. Psychological analyses of the 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 type and token frequency; factors relating to the interpretation such as prototypicality and generality of meaning, and factors relating to the contingency of form and function. These various psycholinguistic factors conspire in the acquisition and use of any linguistic construction. Constructionist accounts of language acquisition thus 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 (Christiansen & Chater, 2001; Rebuschat & Williams, 2012) relating input and learner cognition.

We explored these assumptions for VACs, first by using corpus and NLP techniques to investigate the latent structures of their usage in language. This research demonstrated: (1) the frequency distribution for the types occupying the verb island of each VAC is Zipfian, with the most frequent verb taking the lion's share of the distribution. (2) The most frequent verb in each VAC is prototypical of that construction's functional interpretation, albeit generic in its action semantics. (3) VACs are selective in their verb form family occupancy: individual verbs select particular constructions; particular constructions select particular verbs; there is high contingency between verb types and constructions. (4) VACs are coherent in their semantics.

Next we investigated native speakers' processing of VACs and demonstrated that the frequencies of verb types generated for each VAC were affected by the three factors of frequency, contingency, and prototypicality. These findings promoted a usage-based view of L1A, with L1 VAC processing involving rich associations, tuned by verb type and token frequencies and their contingencies of usage, which interface syntax, lexis, and semantics.

We did the same for L2 constructions. When German, Czech, and Spanish L1 advanced learners of English as an L2 were given the same tasks, their processing too showed independent effects of frequency, contingency, and prototypicality. So L2A depends upon learners' experience of language usage and upon what they can make of it. Language learners, L1 and L2, both share the goal of understanding language and how it works. Since they achieve this based upon their experience of language usage, there are many commonalities between first and second language acquisition that can be understood from corpus analyses of input and cognitive–linguistic and psycholinguistic analyses of construction acquisition following associative and cognitive principles of learning and categorization (Collins & Ellis, 2009; Robinson & Ellis, 2008b).

Yet L2 learners are distinguished from infant L1 acquirers by the fact that they have previously devoted considerable resources to the estimation of the characteristics of another language – the native tongue in which they have considerable fluency. As Slobin (1993) notes, "[f]or 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" (p. 242). Since they are using the same apparatus to survey their L2 too, their inductions are often affected by transfer, with L1-tuned expectations and selective attention (Ellis, 2006b) blinding the computational system to aspects of L2 form and meaning, thus rendering biased estimates from naturalistic usage. As we explored these factors in L2 learners of different L1 typologies, we found that learners whose L1 is satellite framed (and hence typologically similar to English) find it easier to produce more target-like verbs (verbs that correlate more closely with those produced by L1 English speakers) than speakers whose L1 is verb framed. L2 learning from usage shows additional influences of L1 transfer. Second language constructions thus demonstrate effects of L2 and L1 usage.