

Chapter 16. Construction grammar and first language acquisition

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1. Introduction

There are two major theoretical approaches to the study of grammatical development in first language acquisition. The nativist approach, which rests on central assumptions of generative grammar (cf. Chomsky 1972), and the usage-based approach, which is closely associated with construction grammar (cf. Tomasello 2003). The two grammatical theories make radically different assumptions about the nature of grammatical elements and the overall organization of the grammatical system.

Generative grammar is a formal syntactic theory that has crucially influenced research on first language acquisition for several decades (see O'Grady 1997 for an overview). In this approach, the core of grammar consists of invariable concepts and constraints that are predetermined by an innate 'language faculty' (see Pinker and Jackendoff 2005 for a recent discussion). There are two central assumptions that underlie the analysis of syntactic structure in this approach.

First, generative grammar is based on the assumption that the language faculty consists of modules. According to Chomsky (1965), (mental) grammar can be divided into three basic components: syntax, semantics, and phonology. Each component (or module) has its own categories and rules that are in principle independent of each other. On this account, syntactic representations are autonomous in the sense that they can be analyzed without reference to meaning.

Second, generative grammar is based on the assumption that syntactic representations are derived from a universal set of syntactic categories. Although there is no general consensus among generative grammarians as to which categories are universal (and innate), researchers agree that grammatical categories have to be defined prior to and independently of particular syntactic configurations. On this account, syntactic representations are formed from syntactic primitives that provide the building blocks for the analysis of syntactic structure in all languages.

Both assumptions, i.e. the assumption that syntax is autonomous and that syntactic structures are derived from primitive categories, are based on the innateness hypothesis of generative grammar. According to this hypothesis, children are born with a universal set of formal syntactic categories, to which generative grammarians refer as 'universal grammar (UG)' or the 'language faculty' (cf. Pinker and Jackendoff 2005). What children have to learn in this approach is how words and structures of the ambient language are related to elements of UG (cf. Pinker 1984). According to Chomsky (1999), grammatical development is a particular cognitive phenomenon that must be distinguished from learning—a term that

Chomsky considers inappropriate for the analysis of language acquisition (cf. Chomsky 1999: 43). Learning is a gradual process in which categories are acquired in a piecemeal fashion from experience, whereas grammatical development is an instantaneous process whereby elements of the ambient language are ‘hooked up’ to categories of UG. If the core inventory of grammar is innate, a single linguistic ‘trigger’ in the input is in principle sufficient to acquire a particular linguistic category (e.g. Meisel 1994:20).

Challenging the nativist account, usage-based researchers have developed a very different framework for the analysis of grammatical development that is crucially influenced by assumptions of construction grammar. In this approach, grammar is seen as a dynamic system of conventionalized form-function units, i.e. constructions, that children acquire based on domain-general learning mechanisms such as analogy, entrenchment, and automatization. On this account, syntactic categories are fluid entities that emerge from processing large amounts of linguistic data (cf. Bybee 2010; Dąbrowska 2004; Diessel 2004; Goldberg 2006; Tomasello 2003).

Although usage-based linguists emphasize the importance of experience for language acquisition, they do not generally deny the role of innate constraints for grammatical development. According to Elman et al. (1996), we have to distinguish between different types of innate knowledge. Specifically, Elman et al. suggested that assumptions about innate representations must be distinguished from assumptions about the innate architecture of grammar (or human cognition). Generative linguists emphasize the importance of innate linguistic representations, i.e. the importance of innate categories such NP or CP for grammar learning; whereas usage-based linguists emphasize the importance of the grammatical architecture for syntactic development (and diachronic change). The architectural constraints are commonly characterized by assumptions of construction grammar, which has crucially influenced the development of the usage-based approach. In fact, usage-based linguists have drawn so frequently on concepts of construction grammar that construction grammar is commonly seen as an integral part of the usage-based approach (cf. Bybee 2010; Diessel 2004; Goldberg 2006; Langacker 2008; Tomasello 2003).

In what follows, I provide an overview of usage-based research in first language acquisition that is based on assumptions of construction grammar. The chapter is divided into four sections. Section 2 considers some basic assumptions of construction grammar that underlie the usage-based approach to first language acquisition, Section 3 provides an overview of research on children’s early item-based constructions, Section 4 is concerned with the emergence of constructional schemas, and Section 5 considers the development of complex sentence constructions.

2. Theoretical foundations

In contrast to generative grammar, construction grammar does not presuppose a predefined set of grammatical categories. However, like all grammatical theories construction grammar makes particular assumptions about the nature of grammatical entities and the overall organization of the grammatical system. Two assumptions of construction grammar are essential to understand the usage-based analysis of grammar learning.

- First, construction grammar assumes that syntactic structures are symbolic units, i.e. constructions, that combine a particular form with a particular meaning (cf. Goldberg 1995: 4).
- Second, construction grammar assumes that constructions are associated with each other by various types of links that constitute a complex network of symbolic expressions (cf. Langacker 1987).

If grammar consists of constructions there is no principled difference between words and grammatical assemblies (cf. Goldberg 1995; Langacker 1987). Like words, constructions are symbolic entities in which a particular meaning or function is mapped onto a particular form, i.e. a particular configuration of structural and/or lexical elements. For instance, an imperative sentence such as *Open the door!* can be seen as a construction, i.e. a complex linguistic sign, in which a particular structural pattern is associated with a particular illocutionary force: An imperative sentence consists of an uninflected verb form, it lacks an overt subject, and it functions as a directive speech act. Figure 1 shows the parallel structures of words and constructions that underlie the usage-based approach.

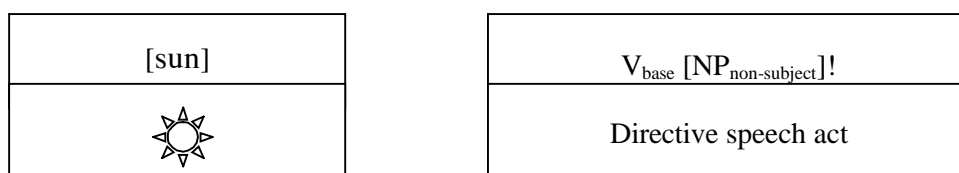


Figure 1. Examples of lexical and constructional symbols

The parallelism between lexical and grammatical symbols has led some researchers to apply the notion of construction to all linguistic expressions including words and bound morphemes (cf. Goldberg 1995: 4), or to characterize constructions as ‘big words’ (cf. Dąbrowska 2000). However, in this article words and construction are kept separate. Although both can be seen as symbols, the notion of construction is reserved for clause-level units such as imperative sentences or subordinate clauses, which have played a key role in the usage-based analysis of grammar and grammatical development (cf. Croft 2001; Goldberg 1995, 2006; Tomasello 2003).

The assumption that grammar consists of symbols is consistent with the usage-based hypothesis that linguistic knowledge is domain-general. Cognitive psychologists have emphasized the importance of symbols for reasoning and abstract thought. According to Deacon (1997), symbols enable people to talk about entities that are not immediately present in the speech situation, providing a cognitive foundation for higher-level cognitive processes. Moreover, symbols encode particular perspectives on entities and situations, which Tomasello (1999) relates to the uniquely human ability to understand that other people view the world from a different perspective. No other species is able to consider the mental representations and viewpoints of other beings, which is reflected in the fact that no other species is able to deal with symbols—only humans are (cf. Tomasello 1999). Thus, if we assume that grammar consists of symbols, i.e. constructions, we are not making far-reaching assumptions about innate linguistic representations as in generative grammar; the only thing we claim is that grammar is symbolic, which can be seen as a domain-general aspect of human thought.

The second general assumption of construction grammar (i.e. that grammar constitutes a network) is equally broad (i.e. domain-general). If grammar consists of constructions, i.e. of complex linguistic signs, it is just consequent to assume that the grammatical system is organized in a similar way as the mental lexicon (cf. Langacker 1987) or as non-linguistic concepts in memory (cf. Harley 2001). There is abundant evidence from psycholinguistic research that people associate words and morphemes with each other based on overlapping and contrasting features, which has led psychologists to characterize the mental lexicon as a network of symbols (cf. Collins and Loftus 1975). In analogy to the mental lexicon, grammar can be seen as a network of complex linguistic signs that are associated with each other by various types of links (cf. Bybee 2010; Goldberg 1995, 2006; Langacker 1987, 2008). Figure 2 shows an example of the network architecture of constructions which Goldberg (1995: 109) used to characterize the semantic and structural relationships between verb-argument constructions in English.

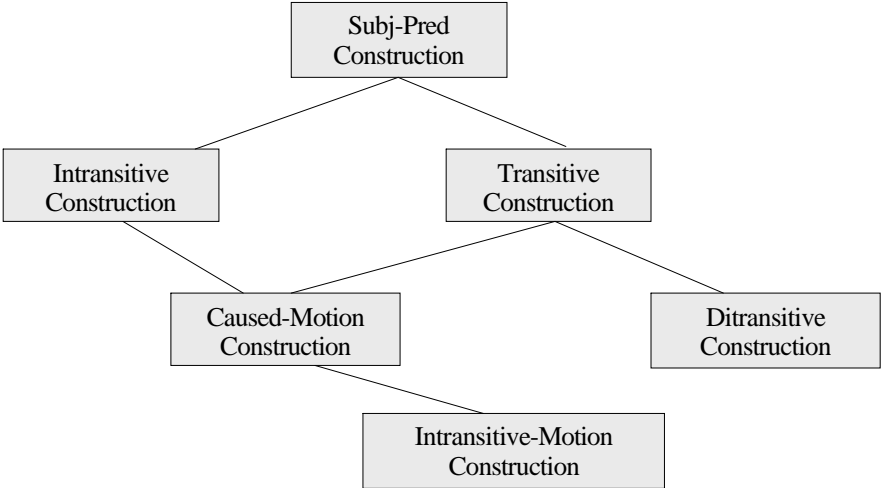


Figure 2. Network of argument-structure constructions (Goldberg 1995: 109)

The network model of construction grammar provides a highly flexible framework for the syntactic analysis of linguistic structure that is consistent with the usage-based hypothesis that grammar consists of fluid categories and variable constraints. Both individual constructions and the particular organization of the network are emergent phenomena that children acquire in a piecemeal bottom-up fashion based on general learning mechanisms that are also relevant for the acquisition of knowledge in other cognitive domains (cf. Bybee 2010; Elman et al. 1996; Goldberg 2006; Tomasello 2003).

In what follows, I provide an overview of empirical research on the development of constructions in early child language (for earlier reviews of construction-based research on first language acquisition see Tomasello 2000, 2003; see also Dąbrowska 2004 and Goldberg 2006).

3. Early item-based constructions

The earliest utterances that children produce consist of isolated words and holophrases, i.e. unanalyzed chunks of multi-word expressions that are learned as frozen units (cf. 1-3).

- (1) Get-it
- (2) All-gone
- (3) What-s-that?

These early words and holophrases are often tied to particular communicative situations. They can be seen as holistic symbols that children use as speech acts to accomplish particular communicative goals (cf. Tomasello 2003: 36-40). A few months after children produce their first one-word utterances and holophrases, they begin to use more complex utterances consisting of two or three words. The emergence of children's early multi-word constructions involves two complementary strategies. In some cases, children combine two or more words which they previously used in isolation under a single intonation contour (cf. Clark 2003: 162-165). This strategy is consistent with the classical scenario of grammar learning in which syntactic structures are compiled from smaller units (cf. Pinker 1984). In other cases, children's early multi-word constructions are not derived from two separate words but from frozen multi-word expressions that are segmented into their components (cf. Lieven et al 1997; Pine and Lieven 1993). For instance, many children begin to produce content questions in unanalyzed expressions such as *Whassis?* or *Whatchadoing?*, which are only later divided into separate words (see below).

One of the most striking properties of children's early multi-word constructions is that they are often organized around particular words (see Tomasello 2000a for a review). In a classical study, Martin Braine (1976) characterized these early item-based constructions as 'pivot schemas' (or 'pivot constructions'). Analyzing child language data from several unrelated languages (e.g. English, Finnish, Samoan), Braine observed that children's early multi-word utterances are commonly composed of a specific 'pivot word', i.e. a relational term (e.g. a verb), and an 'open slot' that can be filled by various expressions as long as these expressions are semantically appropriate in a particular position (cf. Bowerman 1973). For instance, as can be seen in Table 1, English-speaking children make common use of pivot schemas that combine a particular quantifier (or negative term) with a referential expression.

Table 1. Examples of pivot schemas (adopted from Braine 1976)

More __	All __	No __
More car	All broke	No bed
More crereal	All clean	No down
More cookie	All done	No fix
More fish	All dressed	No home
More hot	All dry	No mama
More juice	All shut	No pee
More sing	All wet	No plug

Although pivot schemas can occur with a large variety of lexical expressions in the variable position, Braine emphasized that each pivot schema is an isolated construction that children acquire independently of other pivot schemas, challenging the generative hypothesis that grammatical development involves the acquisition of general rules and categories that are independent of particular lexical expressions.

In accordance with this analysis, Tomasello (1992) observed that children’s early verb-argument constructions are commonly organized around specific verbs. Analyzing diary data from his two-year-old daughter Travis, he found that a substantial number of Travis’ early two- and three-word utterances are based on particular verbs which she associated with specific structural patterns. Although verbs are commonly used across a wide range of verb-argument constructions (see below), Tomasello’s daughter used most of her early verbs in particular frames. Each verb was tied to a particular structural pattern, which Tomasello characterized as a ‘constructional island’ (cf. Table 2).

Table 2. Examples of verb-island constructions (adopted from Tomasello 1992)

Find it __	__ get it	__ gone
Find-it funny	Block get-it	Peter Pan gone
Find-it bird	Bottle get-it	Raisins gone
Find-it chess	Phone get-it	Doo-doo gone
Find-it bricks	Towel get-it	Cherry gone
Find-it Weezer	Bedus get-it	Fox gone
Find-it ball	Coffee get-it	Hammer gone
Find it stick	Mama get-it	French fries gone

Like verb-argument constructions, questions are initially organized around particular words; they exhibit the same ‘pivot look’ as other lexically-specific constructions. In the generative literature, the acquisition of questions involves the acquisition of highly general syntactic operations such as WH-movement and subject-auxiliary inversion (cf. Radford 1990). However, there is compelling evidence that children’s early questions are lexically-specific formulas consisting of a particular question word and/or a particular auxiliary that are tied to specific structural positions (the classical analysis of children’s early questions is Klima and Bellugi 1966; for a construction-based analysis of children’s questions see Dąbrowska 2000; Dąbrowska and Lieven 2005; Dąbrowska et al 2009; Rowland and Pine 2000; and Rowland 2007). For instance, children’s early yes-no questions are usually formed from a particular auxiliary and a particular subject pronoun which together constitute a frame (e.g. *Can I __ ?* or *Will you __?*). Similarly, WH-questions are commonly derived from lexically-specific formulas (cf. Dąbrowska 2000). The earliest WH-questions that English-speaking children produce are frozen expressions such as *What-s-that?* or *How-do-you-know?* As children grow older, these early holistic expressions are segmented into their components and the use of WH-questions becomes gradually more flexible. Consider for instance the examples in (4) to (12), which Dąbrowska (2000) provided to illustrate the development of a particular type of question in the speech of a two-year-old child named Naomi.

- (4) What doing? (many times) 1;11.11
 (5) Whats Mommy doing? (many times) 1;11.21

(6)	Whats donkey doing? (4 times)	2;0.18
(7)	Whats Nomi doing? (2 times)	2;0.18
(8)	Whats toy doing?	2;0.18
(9)	Whats Mommy holding?	2;0.26
(10)	Whats Georgie saying?	2;1.19
(11)	What is the boy making?	2;11.17
(12)	What is Andy doing?	2;11.18

As can be seen in these examples, the development originates from a very simple pattern consisting of the question word *what* and the verb *doing*, which Naomi used many times before *what* appeared in any other context. Later, the child inserted the noun *Mommy* into this pattern, which again was used many times before Naomi began to produce questions with different types of nouns and a bit later also with different types of verbs. At the end of the analyzed period, Naomi recognized that the question word *what* and the auxiliary *is* are separate words and abandoned the contracted form *whats*, which only recurred in Naomi's use of WH-questions after a few months.

Obviously, this pathway of development is difficult to reconcile with the hypothesis that the acquisition of questions involves the acquisition of general syntactic operations. There is no evidence that children's early questions involve WH-movement or subject-auxiliary inversion. However, when children get older they often produce WH-questions with uninverted word-order (cf. 13) and other syntactic errors (cf. 14-17), which some researchers interpreted as evidence for the emergence of subject-auxiliary inversion in early child language (cf. Santelmann et al. 2002).

(13)	Why he can go?	Non-inversion error
(14)	What can he can do?	Double marking error
(15)	What does he likes?	Agreement error
(16)	Where does her go?	Case error
(17)	Does he going to the shops?	Auxiliary-verb mismatch

However, if we look at these errors more closely we find that they are consistent with a frame-based analysis of children's early questions. Examining several thousand interrogative sentences from ten English-speaking children aged 2;1 to 5;1, Rowland (2007) found that children's errors with both yes-no questions and WH-questions correlate with the frequency of particular word combinations at the beginning of the sentence (see also Rowland and Pine 2000). Specifically, she showed that children are prone to produce inversion errors and other types of mistakes in lexically innovative questions, i.e. in questions with innovative combinations of auxiliaries, subjects, and interrogative pronouns. As can be seen in Figure 3, questions that are based on a prior lexical frame, i.e. a specific lexical pattern such as *What's ___* or *Can I ___*, which the children of Rowland's study had used in earlier transcripts, are much less likely to include an error than questions that are not based on a prior frame (e.g. *Does NP ___*, *Who can ___*, *What must ___*), suggesting that children's lack of experience with specific patterns, rather than an abstract syntactic operation, accounts for their problems with producing questions. If children had difficulties with the acquisition of subject-auxiliary inversion, one would expect an equal number of errors across all question types; however, the

lexically-specific nature of their errors provides strong evidence for the hypothesis that children acquire questions like other sentence-level constructions based on early formulas or lexically-specific frames.

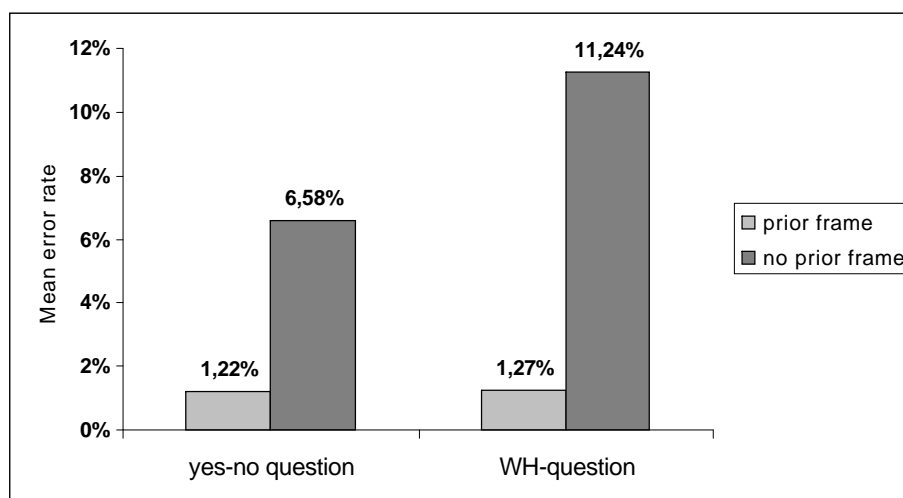


Figure 3. Error rate in children's questions with and without a prior frame (based on data from Rowland 2007: 123, Table 6)

4. The emergence of constructional schemas

Like children's early pivot schemas, the constructions of adult language are often lexically particular. Many adult constructions include specific words or affixes that cannot be replaced by other lexical expressions. For instance, the comparative conditional construction, e.g. *The faster the better*, consists of two particular grammatical markers, i.e. two instances of the determiner *the*, and two comparative phrases, which together constitute a unique frame (cf. Fillmore et al. 1988). Similarly, the hortative construction (e.g. *Let's go to the movies*) includes a particular lexical frame consisting of the auxiliary *let* and a contracted pronoun that mark a particular sentence type (cf. Hopper and Traugott 2003: 10-13). Thus, like child language, adult language includes lexically-particular constructions that revolve around specific words. In fact, it is a central assumption of the usage-based approach that grammatical patterns are commonly associated with particular lexical expressions (cf. Langacker 1987), either categorically as in the above examples, in which particular constructions are marked by specific words (e.g. *The __ the __*; *Lets __*), or probabilistically as in the case of verb-argument constructions that often strongly prefer particular nouns and verbs (cf. Stefanowitsch and Gries 2003).

Nevertheless, the relationship between words and constructions is much more variable in adult language than in children's early pivot schemas. With age, children's constructions become increasingly more abstract and independent of particular lexical expressions. There are two important aspects of grammatical development that reflect the increasing variability and abstractness of children's verb-argument constructions.

First, the 'slots' of children's early pivot schemas are commonly extended from a few words to a whole class of lexical expressions. For instance, in the previous section we saw that children's early questions are initially often tied to specific subject pronouns that are later

replaced by other referential expressions (e.g. *Can I* → *Can Mommy*). Similar extensions of lexical expressions in a particular ‘slot’ have been observed in the development of many other item-based constructions. Consider for instance, the child utterances in (18) to (22), which illustrate the development of the ‘object slot’ after the verb *want* in spontaneous child language (data and analysis from Diessel 2004: 68-72).

- | | | |
|------|---------------------------------------|------------|
| (18) | I wanna bag. | Sarah 2;3 |
| (19) | I wanna ride (my horsie). | Sarah 2;3 |
| (20) | I want ice cream in the refrigerator. | Sarah 2;10 |
| (21) | Want me open it? | Adam 2;9 |
| (22) | Do want he walk? | Adam 2;10 |

At first, children use the verb *want* and its phonetic variants *wan* and *wanna* in combination with a first person pronoun as subject and a nominal complement, as in example (18). However, soon they begin to use the same verb forms, i.e. *want*, *wan*, and *wanna*, also with infinitival complements (cf. 19), but then it takes several months until they produce more complex constructions in which a nominal complement is elaborated to a non-verbal clause (cf. 20) or to a complex infinitive in which the nominal object of *want* serves as the semantic subject of a non-finite complement clause (cf. 21). Interestingly, as can be seen in example (cf. 22), in some cases children realize the syntactic object of *want* by a subject pronoun (cf. 22), suggesting that they overextend the use of infinitival complements to finite complement clauses. What this example demonstrates is that the slots of children’s early pivot schemas become increasingly more flexible and schematic, thus making the use of children’s early item-based constructions gradually more productive.

The second aspect of syntactic development that increases the variability and productivity of children’s early constructions concerns the role of verbs, which commonly emerge as the pivot words of item-specific constructions. As noted above, children’s early verbs are usually tied to specific syntactic patterns, i.e. particular constructions, whereas the verbs of adult language are often used across several constructions. For instance, as can be seen in examples (23) to (26), the verb *break* can occur in the transitive and intransitive constructions (cf. 23-24), in the caused motion construction (cf. 25), and in the passive construction (cf. 26) with minimal difference in meaning.

- | | | |
|------|--|----------------------------|
| (23) | He <i>broke</i> his arm. | Transitive construction |
| (24) | The window <i>broke</i> . | Intransitive construction |
| (25) | She <i>broke</i> the vase into pieces. | Caused motion construction |
| (26) | The mirror is <i>broken</i> . | Passive construction |

In child language, the use of *break* is very different. For instance, Tomasello observed that his two-year-old daughter Travis used *break* only in transitive clauses (or in one-word utterances); there is not a single example of *break* in the intransitive construction or the caused-motion construction in Travis’ data and the few utterances that she produced with *broken* (e.g. *Broken glass* – after Travis broke it) do not seem to be passive sentences and may have been produced independently of the use of *break* in the transitive construction (cf.

Tomasello 1992: 108-9). Thus, since children's early verbs are tied to particular constructions, we have to ask when and how do they learn to extend the use of verbs across constructions?

This is one of the most fundamental questions in the construction-based approach to first language acquisition that has been addressed in a wide range of studies (see Tomasello 2000 for a review). The question is important because the extension of verbs across constructions marks a milestone in the development of more schematic verb-argument constructions, which crucially increase the child's ability to use syntactic patterns productively. As long as each verb (or each pivot word) is used as the constant part of a constructional island, children's productivity with grammar is very limited. A pivot schema allows the child to vary the elements in a particular slot; but at the same time it forces the child to present an event from a particular perspective. As long as children's grammatical knowledge is based on pivot schemas (or constructional islands) they have only one way of presenting a particular event. However, when children begin to extend the use of individual verbs across constructions they gain the possibility to choose between alternative constructions for the expression of the same event (or the same scene), making the use of grammar much more productive. What children eventually learn is a network of related constructions in which the same event is construed from different perspectives so that speakers can choose the construction that is most appropriate to realize their communicative intention in a particular situation.

There are two methodologies that child language researchers have used to investigate the emergence of linguistic productivity in the domain of verb-argument constructions. Either they have analyzed the occurrence of overextension errors in spontaneous child language (cf. Bowerman 1982, 1988; Clark 1987; Pinker et al. 1987), or they have designed experiments to test if children are willing to extend a novel verb to another construction (cf. Brooks et al. 1999; Brooks and Tomasello 1999; Pinker et al. 1987; Tomasello and Brooks 1998).

There is abundant evidence that children overextend the use of verbs in spontaneous language. At first, children's use of verbs is very conservative. Each verb is associated with a particular syntactic pattern that reflects the frequency of individual verb-argument constructions in the ambient language. However, when children get older they realize the structural overlap between different item-based constructions and begin to generalize across them, creating schematic representations that are no longer tied to particular lexical expressions. The emergence of such schematic constructions is reflected in the occurrence of overextension errors, which have been investigated by Bowerman (1982, 1988), Clark (1987), and others. For instance, Bowerman (1982) observed that her two daughters extended the use of various intransitive verbs to the transitive construction in ways that are not licensed by adult grammar.

- | | | |
|------|---|-----|
| (27) | Kendall <i>fall</i> that toy. | 2;3 |
| (28) | Who <i>deaded</i> my kitty cat? | 2;6 |
| (29) | They just <i>cough</i> me. | 2;8 |
| (29) | Don't <i>giggle</i> me. | 3;0 |
| (30) | I am gonna put the washrag in and <i>disappear</i> something under the washrag. | 3;7 |

Children also overextend the use of transitive verbs to the intransitive construction, but these errors are much less frequent (cf. Bowerman 1988). If children extend a transitive verb to the

intransitive construction, the resulting structure usually has a passive (i.e. unaccusative), meaning (cf. examples 32-34 from Clark 2003: 235).

- | | | |
|------|---|-----|
| (32) | The flower cuts. [= The flower can be cut] | 2;8 |
| (33) | Bert knocked down. [= Bert got knocked down] | 3;0 |
| (34) | They don't seem to see. [= They cannot be seen] | 3;8 |

Other overextension errors involve the use of intransitive verbs in the passive construction (cf. 35-37), the use of simple transitive verbs in the resultative construction (cf. 38-40), and the use of transitive verbs in the double object constructions (cf. 41-42) (examples from Pinker et al. 1987 and Bowerman 1988):

- | | | |
|------|------------------------------------|-------------|
| (35) | He get died. | 3;8 |
| (36) | I don't like being falled down on. | age unclear |
| (37) | I don't want to get waded (on). | age unclear |
| (38) | I pulled it unstapled. | 3;8 |
| (39) | I am patting her wet. | 4;0 |
| (40) | Are you washing me blind? | 5;6 |
| (41) | I'll brush him his hair. | 2;3 |
| (42) | I said her no. | 3;1 |
| (43) | Button me the rest. | 3;4 |

Note that most of the errors in examples (27) to (43) occur after the third birthday; there are a few errors from an earlier age, but they are rare, suggesting that the productivity of verb-argument constructions emerges only gradually during the preschool years. This hypothesis is supported by findings from experimental research with preschool children.

Pinker, Lebeaux, and Frost (1987) conducted an experiment in which four-year-old English-speaking children were taught novel verbs in active transitive constructions and passive constructions. The novel verbs referred to a transitive scene with two animate nouns that could function both as agent or patient. For instance, one of the verbs that the children had to learn referred to a situation in which a toy dog rubbed the neck of a toy elephant. Participants were divided into two groups. One group of children learned the novel verbs in an active transitive construction (e.g. *The dog is pelling the elephant*), and the other group learned them in a passive construction (e.g. *The elephant is being pelled by the dog*). At test, children had to answer two types of questions that were designed to pull either for a passive sentence (e.g. What is happening to the patient?) or for an active sentence (e.g. What is the agent doing?).

Figure 3 shows the proportions of active and passive sentences the children produced in response to the two questions. As can be seen, four-year-old children use both constructions productively; that is, they produced passive sentences with verbs they had only heard in active voice, and they produced active sentences with verbs they had only heard in passive voice. Note that the children were more likely to generalize verbs from passive sentences to active sentences than vice versa: 86 percent of the children who had heard a verb only in the passive

used this verb also in active sentences, but only 64 percent of the children who had heard a verb only in active voice used this verb also in passive sentences, suggesting that the transitive SVO construction is a stronger attractor than the passive construction (cf. Brooks et al. 1999). Note also that children’s experience with the novel verbs influenced their performance. Although the children were able to extend a novel verb to constructions in which they had never heard the verb before, they used the novel verbs more frequently in constructions they had learned in the course of the experiment.

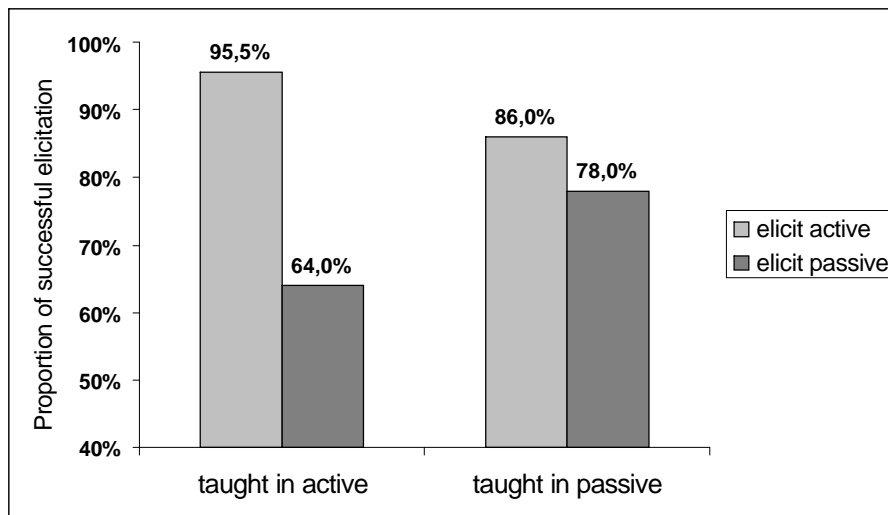


Figure 4. Proportion of successfully elicited active and passive constructions (based on data from Pinker, Lebeaux, and Frost: 125, Table 4)

In a similar study, Brooks and Tomasello (1999a) showed that even younger children are able to extend a novel verb they had only heard in passive voice to constructions in active voice and vice versa. However, the ability to extend a novel verb from one construction to another increases with age. Comparing children from two different age groups, Brooks and Tomasello showed that younger children (mean age 34.6 months) are somewhat less likely to extend a novel verb from active to passive sentences (and vice versa) than older children (mean age 40.9). However, the difference between the two age groups was relatively small. In another study, Tomasello and Brooks (1998) exposed children of two younger age groups (mean age: 24 months vs. 30 months) to novel verbs in transitive and intransitive constructions. In this case, there was a clear difference in performance between the two age groups. About one-third of the older children showed at least some productivity with novel verbs, whereas the vast majority of the younger children used the novel verbs only in constructions they had experienced during training, suggesting that very young children are reluctant to extend verbs across constructions. Similar age-related differences in the productive use of verb-argument constructions were observed in other experimental studies using other methodologies and focusing on other constructions (cf. Akthar and Tomasello 1997; Akthar 1999; Brooks et al. 1999).

While the extension of verbs across constructions can be seen as a milestone in the development of schematic constructions, it must be emphasized that the verbs of adult language cannot be freely extended across constructions. In some cases, particular verbs are

tied to specific constructions. For instance, in contrast to *break* which can appear in both intransitive and transitive constructions (see above), the verb *fall* can only occur in the intransitive construction because if a speaker wants to express that an agent made an object fall he or she can use the verb *drop*, which can be seen as the transitive (or causative) counterpart of the intransitive *fall* (i.e. ‘drop’ = ‘make fall’). In other words, the existence of *drop* pre-empts the occurrence of *fall* in the transitive construction. Brooks and Tomasello (1999b) showed that when children are aware of a pre-empting verb form such as *drop*, they are reluctant to extend a novel intransitive verb to the transitive construction and vice versa, suggesting that pre-emption is an important factor for the constraining of children’s verb-argument constructions (cf. Bowerman 1988; Braine and Brooks 1995; Clark 1987). A related factor that constrains children’s productive use of verbs is frequency or entrenchment. As Brooks et al. (1999) have demonstrated, a frequent verb that children only experience in one construction is less likely to be extended to another construction than an infrequent one. For instance, children are more likely to extend the infrequent intransitive verb *vanish* to the transitive construction (e.g. *He vanished it*) than the frequent intransitive verb *disappear* (e.g. *I disappeared it*). Brooks et al. suggest that frequency of occurrence provides an important constraint for children’s productive use of verbs across constructions because frequency determines the activation strength of the link between verbs and constructions, which children seem to interpret as ‘indirect negative evidence’ for the construction-specific use of a particular verb if the link is strongly activated, i.e. deeply entrenched in memory (cf. Brooks et al. 1999; Clark 1987; Stefanowitsch 2008).

5. The emergence of complex sentence constructions

Having outlined the development of simple sentences, I now turn to the acquisition of complex sentences (see Diessel 2004 for a review and new data). Complex sentences are particular constructions consisting of two or more clauses. They are commonly divided into three basic types: (i) sentences including complement clauses, (ii) sentences including relative clauses, and (iii) sentences including adverbial clauses.

The development of complex sentences originates from simple non-embedded sentences that are gradually transformed into bi-clausal constructions. Two general developmental pathways can be distinguished: Complex sentences including complement clauses and relative clauses evolve from semantically simple sentences through a process of ‘clause expansion’, whereas complex sentences including adverbial clauses (or coordinate clauses) are commonly derived from two independent sentences that are ‘integrated’ into a specific bi-clausal unit (cf. Diessel 2004).

The earliest structures that one could analyze as complex sentences emerge at around the second birthday; they often include a non-finite complement clause that occurs in place of a nominal complement. A case in point is the development of *want*-constructions, which was considered briefly in the previous section. *Want* is a complement-taking verb that can occur with nominal and infinitival complements. As pointed out above, the earliest uses of *want* occur with a nominal complement (e.g. *I wanna bag*), but shortly thereafter children begin to use *want* also with simple infinitives (e.g. *I wanna swim*), which are gradually expanded to complex infinitival constructions (e.g. *Want me open it?*), which some children overextend to fully developed complement clauses (e.g. *Do want he walk?*). The development of *want*-

constructions is characteristic of the development of non-finite complement clauses. It commonly originates from structures that are only little different from simple sentences, which are gradually expanded to bi-clausal constructions.

The development involves both semantic and structural changes. Semantically, it originates from structures denoting a single event that are replaced by structures denoting two related events, and structurally the development involves a series of morphosyntactic changes whereby unmarked infinitives are gradually replaced by more explicit types of non-finite complement clauses including their own semantic subject (e.g. *She made me cry*) and/or an infinitive marker or WH-pronoun (e.g. *I know how to drive*). Parallel to this development, the matrix clauses become increasingly more complex and schematic. The earliest non-finite complement clauses occur with formulaic main clauses such as *I wanna* or *I hafta*, which can be seen as pivot schemas; but as children grow older they produce matrix clauses with other types of subjects and other types of verbs that are semantically more independent of the event in the complement clause than children's early matrix clauses, in which the verb often functions as a semi-modal. The first non-finite complement clauses occur with verbs such as *want to*, *stop*, *like* and *try*, which elaborate an aspect of the infinitive or participle in the complement clause, whereas later complement-taking predicates are commonly used to denote independent activities (e.g. *The doctor said to stay in bed all day*). Table 3 summarizes the changes that are involved in the acquisition of non-finite complement clauses.

Table 3. The development of non-finite complement clauses (based on Diessel 2004: 49-76)

	Features of children's early non-finite COMP-clauses	Features of children's later non-finite COMP-clauses
Meaning of the sentence	S _{complex} denotes a single event	S _{complex} denotes two events
Main clause	formulaic	non-formulaic
Matrix verb	semi-modal	semantically independent verb
Argument structure	NP-V-VP	NP-V-NP-VP
Grammatical marking	bare infinitive	to-infinitive / WH-infinitive

Like non-finite complement clauses, finite complement clauses originate from structures that denote a single situation. The earliest non-finite complement clauses that English-speaking children produce include formulaic main clauses such as *I think* __, *(Do) you know* __, *I know* __, *How do you know* __, *I guess* __, *Remember* __, and *See if* __, which can be seen as pivot schemas (cf. Diessel 2004: 77-115; Diessel and Tomasello 2001). However, in contrast to the constant parts of other pivot schemas, the formulaic main clauses of children's early complement clauses are non-referential. A main clause such as *I think* or *See if* does not denote a mental activity or an act of perception, rather it functions as an epistemic marker or marker of the illocutionary force that is attached to a complement clause which is really an independent assertion. In accordance with this analysis, Diessel and Tomasello (1999) observed that children's early complement clauses are generally produced without a complementizer and that the matrix clauses are often placed at the end of the sentence (e.g. *It's a crazy bone ... I think*). Both the absence of a complementizer and the final occurrence of the matrix clause reflect the fact that children's early complement clauses are non-embedded assertions. However, as children grow older, the formulaic main clauses are gradually reanalyzed as referential expressions denoting a true mental state or a communicative activity.

The development is reflected in the gradual increase of inflected verb forms and a larger variety of subjects in the main clause (e.g. *Paul thought*), the occurrence of main clause negation (e.g. *Mommy don't know*), and the emergence of speech act verbs such as *say* and *tell* which from the very beginning are used to denote an independent state of affairs (e.g. *The kitty says he wants to come in*).

In general, the development of complex sentences with finite and non-finite complement clauses exhibits some striking parallels to the development of children's early verb-argument constructions. It originates from item-specific constructions that are organized around a pivot expression, i.e. a formulaic main clause, and an open slot that can be filled by an infinitive or a fully developed clause. As children grow older, these constructions become increasingly more complex and diverse, resulting in bi-clausal schemas in which both the main clause and the subordinate clause denote some state of affairs.

Like complement clauses, relative clauses develop from semantically simple sentences that are gradually expanded to bi-clausal constructions (cf. Diessel 2004: 116-148; see also Diessel and Tomasello 2000 and Diessel 2009). The earliest relative clauses that English-speaking children produce occur in two contexts. Either they are attached to an isolated head noun that is used to answer a previous question (cf. 44) or they modify the predicate nominal of a copular clause that functions to draw the hearer's attention to an object in the surrounding situation (cf. 45).

- (44) Adult: No what did you eat?
 Child: Some apples that were sweet. Abe 3;6
- (45) Child: Here's his box that he's gonna go in. Nina 3;0

Both types of constructions denote a single state of affairs that is expressed in the relative clause, whereas the main clause serves to establish a referent in topic or focus position without denoting an independent state of affairs. With age, children begin to produce more complex relative constructions in which the main clauses are gradually expanded to fully developed clauses denoting an event that is semantically independent of the event in the relative clause (e.g. *Once I saw a person that shot a fire arrow*).

If we disregard the topicalized NPs and copular clauses that precede children's early relative clauses, these sentences have the same structure as simple SV(O) clauses. The earliest relative clauses that English-speaking children produce are subject-relatives, which involve the same sequence of grammatical roles as (in)transitive clauses, i.e. agent-verb-(patient). Other structural types of relative clauses in which the agent (or subject) follows another referent (e.g. *The picture I made*) tend to occur later and cause comprehension difficulties in experiments, which is commonly explained by the fact that these structures deviate from the SV(O) word order of simple (in)transitive clauses (cf. Bever 1970; Bever and Slobin 1982), suggesting that what children eventually learn is a network of related structural patterns with overlapping semantic and syntactic features (cf. Diessel 2009; Diessel and Tomasello 2005).

Finally, the development of complex sentences including adverbial and coordinate clauses takes a different pathway. In contrast to complement and relative clauses, which are commonly derived from simple sentences through clause expansion, adverbial and coordinate clauses are derived from independent sentences that are linked to a preceding sentence by a

conjunction. The earliest adverbial clauses that English-speaking children produce are intonationally unbound sentences, they always follow the semantically associated clause, and function as independent speech acts that children learn in the context of particular communicative situations. For instance, causal *because*-clauses are at first commonly used in response to a causal question (cf. 46), and *but*-clauses are initially always used by the child to object to a prior adult utterance (cf. 47).

(46) Child: You can't have this.
Adult: Why?
Child: Cause I'm using it.

(47) Adult: It is called the skin of the peanut.
Child: But this isn't the skin.

As children grow older they combine adverbial and coordinate clauses with the semantically associated (main) clause under a single intonation contour and begin to place adverbial clauses before the main clause, which presupposes the ability to anticipate the link between two clauses before the first clause has been produced. While final adverbial clauses can be planned after the completion of the preceding main clause, an initial adverbial clause can only be produced if the speaker is able to plan the occurrence of two conjoined clauses (cf. Diessel 2005). The development can be characterized as a process of clause integration whereby two independent sentences are combined to (or integrated into) a particular bi-clausal unit.

6. Conclusion

In conclusion, this paper has surveyed construction-based research on first language acquisition. It has been argued that grammatical development starts with lexically-specific formulas that children gradually decompose and elaborate to more complex and schematic units. The development is driven by general learning mechanisms such as analogy and categorization that are not restricted to language acquisition. What children eventually learn is a network of constructions that is immediately grounded in their linguistic experience.

References

- Akthar, Nameera. 1999. Acquiring basic word order: evidence for data-driven learning of syntactic structure. *Journal of Child Language* 26: 339-356.
- Akthar, Nameera and Michael Tomasello. 1997. Young children's productivity with word order and verb morphology. *Developmental Psychology* 33: 952-965.
- Bever, Thomas G. 1970. The cognitive basis for linguistic structures. In J.R. Hayes (ed.), *Cognition and Development of Language*. New York: Wiley, 279-352.
- Bowerman, Melissa. 1973. *Early Syntactic Development*. Cambridge: Cambridge University Press.
- Bowerman, Melissa. 1982. Reorganizational processes in lexical and syntactic development. In E. Wanner and L. R. Gleitman. (eds.), *Language Acquisition: The state of the art*. Cambridge: University Press, 319-346.

- Bowerman, Melissa. 1988. The 'no negative evidence' problem: How do children avoid constructing an overly general grammar. In J.A. Hawkins (ed.), *Explaining Language Universals*, New York, 73-101.
- Braine, Martin D.S. 1976. *Children's First Word Combinations*. Monographs of the Society for Research in Child Development 41(1).
- Braine, Martin D.S. and Patricia Brooks. 1995. Verb-argument structure and the problem of avoiding an overgeneral grammar. In M. Tomasello and W. Merriman (eds.), *Beyond Names for Things: Young children's acquisition of verbs*. Hillsdale, NJ: Erlbaum, 353-376.
- Brown, Roger. 1973. *A First Language*. Cambridge, MA: Harvard University Press.
- Brooks, Patricia and Michael Tomasello. 1999. Young children learn to produce passives with nonce verbs. *Developmental Psychology* 35: 29-44.
- Brooks, Patricia and Michael Tomasello. 1999. How children constrain their argument structure constructions. *Language* 75: 720-738.
- Brooks, Patricia, Michael Tomasello, Kelly Dodson, and Lawrence B. Lewis. 1999. Young children's overgeneralizations with fixed transitivity verbs. *Child Development* 70: 1325-1337.
- Bybee, Joan. 2010. *Language, Usage, and Cognition*. Cambridge: Cambridge University Press.
- Clark, Eve V. 1987. The principle of contrast: A constraint on language acquisition. In B. MacWhinney (ed.), *Mechanisms of Language Acquisition*. Hillsdale, NJ: Erlbaum, 1-33.
- Clark, Eve V. 2003. *First Language Acquisition*. Cambridge: Cambridge University Press.
- Chomsky, Noam. 1965. *Aspects of the Theory of Syntax*, Cambridge: MIT Press.
- Chomsky, Noam. 1972. *Studies on Semantics in Generative Grammar*. The Hague: Princeton.
- Chomsky, Noam. 1999. On the nature, use, and acquisition of language. In W.C. Ritchie and T.K. Bhatia (eds.), *Handbook of Child Language Acquisition*. Cambridge: Cambridge University Press, 33-54.
- Collins, A.M. and E.F. Loftus 1975. The spreading activation theory of semantic processing. *Psychological Review* 82: 407-428.
- Croft, William 2001, *Radical Construction Grammar*, Oxford: Oxford University Press.
- Dąbrowska, Eva. 2000. From formula to schema: The acquisition of English questions. *Cognitive Linguistics* 11: 83-102.
- Dąbrowska, Eva. 2004. *Language, Mind, and Brain. Some psychological and neurological constraints on theories of grammar*. Edinburgh: Edinburgh University Press.
- Dąbrowska, Ewa and Elena Lieven 2005. Towards a lexically specific grammar of children's question constructions. *Cognitive Linguistics* 16: 437-474.
- Dąbrowska, Ewa, Caroline Rowland, and Anna Theakston. 2009. The acquisition of questions with long-distance dependencies. *Cognitive Linguistics* 20: 571-598.
- Deacon, Terrance. 1998. *The Symbolic Species. The co-evolution of language and the human brain*. London: Penguin.
- Diessel, Holger. 2004. *The Acquisition of Complex Sentences*. Cambridge: Cambridge University Press.
- Diessel, Holger. 2009. On the role of frequency and similarity in the acquisition of subject and non-subject relative clauses. In T. Givón and M. Shibatani (eds.), *Syntactic Complexity*. Amsterdam: John Benjamins, 251-276.

- Diessel, Holger and Michael Tomasello. 1999. Why complement clauses do not include a *that*-complementizer in early child language. *Berkeley Linguistics Society* 25: 86-97.
- Diessel, Holger and Michael Tomasello. 2000. The development of relative clauses in English. *Cognitive Linguistics* 11: 131-151.
- Diessel, Diessel and Michael Tomasello. 2001. The acquisition of finite complement clauses in English: A corpus-based analysis. *Cognitive Linguistics* 12: 1-45.
- Diessel, Holger. 2005. Competing motivations for the ordering of main and adverbial clauses. *Linguistics* 43: 449-470.
- Diessel, Holger and Michael Tomasello. 2005. A new look at the acquisition of relative clauses. *Language* 81: 1-25.
- Elman, Jeffrey L., Elizabeth A. Bates, Mark H. Johnson, Annette Karmiloff-Smith, Domencio Parisi, and Kim Plunkett. 1996. *Rethinking Innateness. A connectionist perspective on development*. Cambridge: Bradford Books/MIT Press.
- Fillmore, Charles J., Paul Kay and Catherine O'Connor. 1988. Regularity and idiomaticity in grammatical constructions: The case of *let alone*. *Language* 64: 501-538.
- Goldberg, Adele E. 1995. *A Construction Grammar Approach to Argument Structure*. Chicago: The University of Chicago Press.
- Goldberg, Adele E. 2006. *Constructions at Work. The nature of generalizations in language*. Oxford: Oxford University Press.
- Klima, Edward S. and Ursula Bellugi. 1966. Syntactic regularities in the speech of children. In J. Lyons and R.J. Wales (eds.), *Psycholinguistic Papers*. Edinburgh: University of Edinburgh Press.
- Langacker, Ronald W. 1987. *Foundations of Cognitive Grammar, Vol. I, Theoretical Prerequisites*. Stanford: Stanford University Press.
- Langacker, Roland W. 2008. *Cognitive Grammar. A basic introduction*. Oxford: Oxford University Press.
- Lieven, Elena V.M., Julian M. Pine, and Gillian Baldwin. 1997. Lexically-based learning and early grammatical development. *Journal of Child Language* 24: 187-219.
- Harley, Trevor. 2001. *The Psychology of Language. From data to theory*. Hove: Psychology Press. [second edition]
- Hopper, Paul and Elizabeth Closs Traugott 2003, *Grammaticalization*, Cambridge: Cambridge University Press. [second edition]
- Meisel, Jürgen M. 1994, Parameters in acquisition, in Paul Fletcher and Brian MacWhinney (eds.), *Handbook of Child Language*. Oxford: Blackwell, 9-35.
- O'Grady, William. 1997. *Syntactic Development*, Chicago: The University of Chicago Press.
- Pine, Julian M. and Elena V.M. Lieven. 1993. Reanalyzing rote-learned phrases: Individual differences in the transition to multi-word speech. *Journal of Child Language* 20: 551-571.
- Pinker, Steven. 1984. *Language Learnability and Language Development*. Cambridge, Mass: Harvard University Press.
- Pinker, Steven, David S. Lebeaux and Loren Ann Frost. 1987. Productivity and constraints in the acquisition of the passive. *Cognition* 26: 195-267.
- Pinker, Steven and Ray Jackendoff. 2005. The faculty of language: what's special about it? *Cognition* 95: 201-236.

- Radford, Andrew. 1990. *Syntactic Theory and the Acquisition of English Syntax*. Cambridge, MA: Blackwell.
- Rowland, Caroline F. 2007. Explaining errors in children's questions: Auxiliary DO and modal auxiliaries. *Cognition* 104: 106-134.
- Santelmann, Lynn, Stephanie Berk, Jennifer Austin, Shamitha Somashekar, and Barbara Lust. 2002. Continuity and development in the acquisition of inversion in yes/no questions: dissociating movement and inflection. *Journal of Child Language* 29: 813-840.
- Slobin, Dan I. and Thomas G. Bever. 1982. Children use canonical sentence schemas: A cross-linguistic study of word order and inflection. *Cognition* 12: 229-265.
- Tomasello, Michael. 1992. *First Verbs. A case study of early grammatical development*. Cambridge: Cambridge University Press.
- Tomasello, Michael. 1999. *The Cultural Origins of Human Cognition. An Essay*. Cambridge: Harvard University Press.
- Tomasello, Michael. 2000. Do young children have adult syntactic competence? *Cognition* 74: 209-253.
- Tomasello, Michael. 2003. *Constructing a Language. A usage-based approach*. Cambridge: Harvard University Press.
- Tomasello, Michael and Patricia Brooks. 1998. Young children's earliest transitive and intransitive constructions. *Cognitive Linguistics* 9: 379-395.
- Stefanowitsch, Anatol. 2008. Negative entrenchment: A usage-based approach to negative evidence. *Cognitive Linguistics* 19: 513-531.
- Stefanowitsch, Anatol and Stefan Gries. 2003. Collostructional analysis: Investigating the interaction of words and constructions. *International Journal of Corpus Linguistics* 8: 209-243.