1. Introduction

Languages of the world have a variety of ways to express spatial notions. For example, in Chalcantongo Mixtec, an Otomanguean language of Mexico, spatial configurations are classified via an extended and systematic body-part metaphor (Brugman 1983). Thus, in this language, the sentence “He sat down on the hill” is expressed as ‘He sat down the hill’s face’, as illustrated in (1).

(1)  ni-ndukoo-ø  nuù-yuku  
    perfv-sit-3sg     face-hill  
    'He sat down on the hill.'

In a language like English, spatial relationships are expressed primarily with prepositions and prepositional particles, which of course have additional, non-spatial uses as well. Even when we restrict our attention to these prepositions (or slightly more generally, adpositions), however, as we will in this chapter, we still encounter substantial cross-linguistic variation at a number of different levels.

Table 1 provides a brief overview of variation in adpositions and in particles. First, with regard to adpositions, there are languages in which the existence of P (prepositions and postpositions) as a syntactic category is in doubt. For example, Li & Thompson (1981:360-369) argue that the morphemes serving as functional equivalents of P in present-day Mandarin are better analyzed as ‘co-verbs’. These elements can often function as independent verbs in their own right, or occur with aspectual markers that are otherwise restricted to verbs. Huang, Li & Li (2009) argue for a broadly similar view, according to which only a handful of the adposition-like elements in Mandarin are plausibly members of the syntactic category P.

In other languages (those that do employ clearcut adpositions), there is considerable variation in the inventory of adpositions provided. For example, where French has a preposition...
*sous*, meaning 'under', Japanese instead requires the use of a spatial noun *sita* 'area underneath', to express the same meaning (2-3):

<table>
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<tr>
<th>General</th>
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<tr>
<td>Existence</td>
<td>Existence</td>
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<th>Lexicon</th>
<th>Inventory; Cases assigned</th>
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<th>Morphology</th>
<th>Use as case-marking; Suppletive forms</th>
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<th>Word-order options; A / A-bar extraction of object; Possibility of &quot;swiping&quot;; Possibility of &quot;stacking&quot;; Use as a Complementizer;</th>
<th>Word-order options Possibility of &quot;stacking&quot;</th>
</tr>
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<tr>
<th>Semantics</th>
<th>Event-type conversion</th>
<th>Event-type conversion</th>
</tr>
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</table>

**Table 1: Some Points of Cross-linguistic Variation in Adpositions and Particles.**

(2) *Le crayon est sous la table.*
    the pencil is under the table

(3) *Enpitsu-wa teeburu-no sita-ni aru.*
    pencil-TOP table-GEN "under-area"-LOC is
    'The pencil is under the table.'

Furthermore, languages may differ as to which spatial relations are expressed by the same spatial adposition. In English, relationships involving contact with and support by a vertical surface, as in “the handle on a cupboard door,” are grouped together with relationships involving contact with and support by a horizontal space, as in “a cup on the table,” while a different preposition is needed for containment relations: “the apple in the bowl.” This classification pattern is shared with neither Dutch nor Spanish. As indicated in Table 2, Dutch distinguishes all three spatial situations, and employs a different preposition in each of them. Spanish, in sharp contrast, collapses all three together and uses a single preposition.
Table 2: Classification of Three Static Spatial Situations (Bowerman 1996)

In languages with a rich system of morphological case-marking, the case assigned by a particular adposition may (or may not) vary as a function of semantics, as seen in the alternation between dative (used for location, as in 4) and accusative (for path, 5) in German:

(4) Wir haben in dem Saal getanzt.
    we have in the-DAT hall danced
    'We danced in the hall.'
(5) Wir sind in den Saal getanzt.
    we are in the-ACC hall danced
    'We danced into the hall.'

Certain languages use adpositions themselves as a form of case-marking. For example, English uses the adposition *to* both as a spatial preposition and as a marker of dative case (6):

(6) a. The teacher was walking to / towards the post office.  [spatial to]
b. The book belongs to / * towards that woman.  [dative to]
c. Something happened to / * towards the teacher.  [dative to]

The acquisition of spatial versus dative *to* in English is discussed in detail in Snyder & Stromswold (1997).

Another point of morphological variation concerns the existence, in some languages, of suppletive forms for certain combinations of P+D. In French, for example, *de of* + *le the* (masc.sg.) becomes the combined form *du*. As will be discussed below, the existence of P+D suppletion could be an indication that D in the given language consistently undergoes syntactic head-movement to P.

When it comes to adpositional syntax, languages vary considerably. First, there is the issue of whether adpositions surface as prepositions or postpositions. A second issue is whether one may...
extract a P’s complement. Extraction by A-movement, as in (7), is known as the “pseudopassive”, and is possible in English but extremely rare cross-linguistically.¹

(7) That idea is often spoken of.

Only slightly more common crosslinguistically is “adposition-stranding” (typically called “preposition-stranding”), the extraction of a P’s complement by A-bar movement, as in (8a). Outside of English, adposition-stranding (henceforth “stranding”) has been documented in the North Germanic languages (Icelandic, Norwegian, Danish, Swedish) and some of the Niger-Congo languages (Vata and Gbadi; Koopman 1984), and also seems to be available, at least to some speakers, in other West Germanic languages (especially Frisian; cf. Merchant 2002). Outside of these languages, stranding appears to be extremely rare.

(8) English:
   a. Who was Peter talking with t ?
   b. ?? With whom was Peter talking t ? [Odd, in spoken English]

(9) Spanish:
   a. * Quién hablaba Pedro con t ?
      who was-talking Peter with
   b. Con quién hablaba Pedro t ?
      with who(m) was-talking Peter

Instead of stranding, most languages that form adpositional questions by means of wh-movement require “pied-piping” (henceforth “piping”) of the adposition, as shown for Spanish in (9b). Cross-linguistic variation in the availability of stranding, and children’s acquisition of prepositional questions (P-questions) in English and other languages, will be discussed at some length below.

Table 1 includes several additional points of syntactic variation. The term "swiping" in the table refers to the possibility in some languages of inverting the order of a P and a wh-object, as in (10).

(10) John was obviously upset, but I don’t know what about.

¹ Even within the Germanic family, the pseudopassive seems to be quite restricted. For example, according to Mailing & Zaenen (1990) and Lodrup (1991), Norwegian has a productive pseudopassive, but other Scandinavian languages do not.
German has similar-looking expressions (known as R-pronouns) that involve the wh-word wo 'where', as in (11).

(11) Hans war unmutig, aber ich weiss nicht worüber.
    Hans was displeased, but I know not where+about
    'Hans was displeased, but I don't know what about.'

The form worüber is a combination of wo 'where' and the preposition über 'about, over', with a "linking" segment -r- in the middle. Note that although wo is literally 'where', its domain in an expression like worüber is far more general than location, and R-pronouns can therefore take on most of the meanings expressed by swiping in English. Yet, despite the similarities between swiping and German R-pronouns, Merchant (2002) gives evidence for a number of important differences in their syntactic properties. Hence, this is an area of considerable richness for studies of both syntactic variation and language acquisition.

The term "stacking" in Table 1 refers to the possibility, found at least in English, of inserting one or more particles on top of a preposition, as in (12).

(12) He stormed back on up over the hill.

Stacking seems to have received surprisingly little attention in the syntax literature, although it is discussed briefly (under the name ‘particle recursion’) in work of den Dikken (1995:80), whose examples suggest that it might be considerably more restricted in Dutch than in English.

Another, quite exotic property of English is that it allows the use of a preposition (for, with) as a Case-assigning complementizer:

(13) a. John wants very much [CP for [TP Mary to leave now]].
    b. John wants [CP (??for) [TP Mary to leave now]].
    c. John would prefer [CP *(for) [TP Mary to leave now]].
    d. With [SC John in the kitchen], dinner might be late.

Note that for becomes phonetically null when adjacent to want, as in (13b), although it must remain overt when adjacent to prefer, as in (13c). Cross-linguistic variation in the availability of prepositional complementizers, and their acquisition in English, will be discussed below.

One final point of cross-linguistic variation in adpositions relates to compositional semantics, namely the possibility of “event-type conversion.” In some languages, including
English, a simple-Activity verb like run can combine with a spatial PP and yield a VP denoting an Accomplishment, as in (15).

(15) John ran *(through the tunnel) in five minutes.

In other languages, like Spanish, there is no such change in Aktionsart:

(16) * Juan corrió por el túnel en cinco minutos.
     John run-3sPRET through the tunnel in five minutes
     'John ran through the tunnel in five minutes.'
     *[on accomplishment reading]

In Spanish a VP headed by the activity verb corrió 'ran' denotes a simple Activity, even when there is a PP like 'through the tunnel' that offers a natural endpoint (i.e. reaching the far end of the tunnel) for an Accomplishment event. This point of variation will be discussed below.

Another prominent area of cross-linguistic variation, often connected with prepositions, is the availability of verb-particle constructions. As illustrated by the English examples in (17), a particle (e.g. down) is a spatial morpheme that works in concert with the verb to characterize an event, but is morphologically and syntactically a free word.

(17) a. Mary set the box down.
     b. Mary set down the box.

In the literature on German or Dutch one may find particles referred to as separable prefixes, because in these languages particles are sometimes free, and other times bound to the verb as a prefix, as illustrated for German in (18).

(18) a. Sie setzt es ab.
        she sets it down
     ‘She sets it down.’

     b. Sie hat es ab+ge+setzt.
        she has it down+PERF+set
     ‘She (has) set it down.’
In a language like English, where this type of prefixation does not occur, the notion of separability is nonetheless key. This is because one of the distinctive properties of English particles is that they can be separated from their associated verb by phrasal material, such as the direct object in (17a).

In English and other Germanic languages, most particles are homophonous with prepositions, and for this reason some syntactic analyses (e.g. Emonds 1985) regard them as intransitive prepositions. Yet even in Mandarin, where the existence of P as a syntactic category is doubtful, there are nonetheless verb-particle constructions comparable to those in (17) and (18). In Mandarin, the counterparts to English particles tend to be homophonous with verbs, namely verbs of directed motion.

While verb-particle constructions are certainly found outside the Germanic family, they are by no means universal. Indeed, true verb-particle constructions, with a particle that is fully separable from the verb, seem to be unavailable in the major Romance languages. This is illustrated in (19) for Spanish, where there is no direct counterpart to a particle like English off.

(19) a. María arrancó el tapón (* de/afuera/...)
Mary ripped the lid off

b. María arrancó (* de/afuera/...) el tapón
Mary ripped off the lid

In the languages that do have particles, their morphological and syntactic properties vary. For example, the possible placement of a particle in relation to a direct object varies considerably, even between closely related languages. Thus, in English one finds both *I picked the book up* and *I picked up the book* (though if the direct object is a pronoun, only the first order is possible). Norwegian allows the same two orders as English, while Swedish requires the particle to come before the direct object, and Danish strongly prefers for it to come after. Variation in the availability of particles, and in their syntactic distribution, will be addressed below.

Further points of cross-linguistic variation in particles include two with direct parallels to what we have already seen for adpositions. First, the possibility of "stacking" one or more particles above an English preposition has a counterpart in which the bottom of the stack is not a preposition but simply another particle:

(20) He stormed right on out.

Second the possibility of event-type conversion, where an Activity is converted into an Accomplishment by adding a PP, may likewise exist with a particle, as in (21).
Mary walked *(over) in an hour.

(21) Mary walked *(over) in an hour.

Again, variation in availability of aspectual conversion of this kind will be taken up below.

In sum, cross-linguistic variation in the syntax and semantics of adpositions and particles leads to a very important but difficult question of how children converge on the target grammar. As a first step towards an answer, the remainder of this chapter will focus primarily on syntactic variation, and on acquisition studies that consider the role of innate constraints on syntactic variation. Since languages permitting verb-particle constructions are somewhat uncommon, and languages permitting stranding are downright rare (seldom seen outside the Germanic family), evidence from child language acquisition is an extremely important source of insight into the variation permitted in these areas of syntax.

Therefore, in the remainder of this chapter the scope of the discussion will be restricted in at least the following two ways. First, the chapter will not address acquisition of the lexical semantics of prepositions, nor the development of (nonlinguistic) spatial concepts. Readers who are interested in these topics are referred to Bowerman (1996) and references therein. Second, the chapter will gloss over many details concerning the internal structure of PPs and verb-particle constructions. Readers who would like to know more about current approaches to the syntax of PPs are referred to the papers collected in Cinque & Rizzi (2010). Those who would like to know more about the syntax of particle constructions may wish to consult den Dikken (1995) and the papers collected in Dehé, Jackendoff, McIntyre & Urban (2002), among many others.

2. Stranding: Cross-linguistic Variation and Acquisition

2.1. The Acquisition of Stranding and Piping

As we have seen above, languages differ in the movement possibilities for adpositional complements. In English, wh-movement of a prepositional complement can strand the preposition, while in Romance languages like Spanish, the preposition must be piped with the wh-word. Crosslinguistically, stranding seems to be a highly marked option: Most languages with overt wh-movement require piping (Abels 2003; van Riemsdijk 1978; Hornstein & Weinberg 1981; Kayne 1981; Stowell 1981, 1982; among many others). In light of its marked status, early studies on the acquisition of stranding investigated whether the “unmarked” option (piping) precedes the marked option (stranding) during children’s acquisition of English.

French (1984) was one of the earliest studies to address this question. Two experiments were conducted with 33 English-speaking children, ranging in age from 2;11 to 5;06. In one experiment children were tested for comprehension of sentences like (22). If they understood the preposition, they were expected to point at the box that the boy was hiding in, but if they simply ignored the
preposition, they were expected to point at the box that the boy had hidden. French further reasoned that if stranding is late to emerge, there should be a tendency to ignore the preposition more often in the stranded version (22a) of a test sentence.

(22)  
(a) Show me the box which the boy hides in.  
(b) Show me the box in which the boy hides.

Contrary to this prediction, however, the children performed identically on stranding and piping, with a mean success rate of 68% on either structure.

A somewhat stronger finding emerged in the second experiment, which employed an elicited imitation task. There the children were significantly more successful at the production of stranding, as compared with piping: The 18 children who completed the imitation task scored only 29% correct on piping, but 55% correct on stranding. French took these results as evidence that children do not acquire piping before stranding: The results, according to French, argue against the hypothesis that the “unmarked” option of piping is adopted in advance of linguistic experience.

Hildebrand (1987) also addressed the question of whether the “marked” option of stranding appears late in the acquisition of English, albeit in a different way: Her study investigated whether sentences like (23b), with stranding, are more difficult for children to produce than sentences like (23a), in which there is no stranding.

(23)  
(a) What is the boy pulling?  
(b) What is the boy drawing with?

Two experiments were conducted with 48 children (4-, 6-, 8-, and 10-year-olds, with 12 children in each group). One was an elicited-imitation task, in which the child was asked to repeat a model sentence when cued by the experimenter. The other was an elicited-production task, in which the experimenter showed a picture and uttered a statement about it. The child’s task was to convert the experimenter’s sentence into a cleft. Examples are given in (24) and (25).

(24)  
Type I:  
Stimulus: [picture of a car]  
The boy on the road is pulling a car.  
Expected Response: This is the car that the boy on the road is pulling.

(25)  
Type II:  
Stimulus: [picture of a crayon]  
The boy at the table is drawing with a crayon.  
Expected Response: This is the crayon that the boy at the table is drawing with.
The results of the elicited-imitation task suggested that children in the youngest group had not yet acquired the more marked option, Type II. Similarly, the results of the elicited-production task indicated that Type II is acquired later than Type I. The predominant error observed in these experiments was to omit the stranded preposition. In light of these findings, Hildebrand argued against French (1984), and claimed that unmarked options are indeed acquired before marked ones. A word of caution is in order, however: The two structures Hildebrand investigated are different from those in French’s study: While French compared the acquisition of stranding versus piping, Hildebrand compared the acquisition of sentences with stranding versus sentences with neither stranding nor piping (that is, direct-object \textit{wh}-questions). This difference could perhaps be the source of the discrepancy in their results.

Stranding and piping can be observed not only in \textit{wh}-questions but also in relative clauses, as shown in (26). McDaniel et al. (1998) ran two experiments on children’s knowledge of stranding and piping in English relative clauses. Their subjects were 115 children, aged 3;05 to 11;11. One experiment employed an elicited-production task, and the other used a grammaticality-judgment task. The results of the elicited-production task showed that even the youngest children tested (age range, 3;05 – 5;11) had stranding as an option in their grammars. In sharp contrast, piping was never produced by any child (nor, in fact, by the adult controls).

In the judgment task, children were asked whether sentences like (26) sounded ‘right’ or ‘wrong’:

(26)  
\begin{itemize}
  \item a. Stranding: This is the woman who Grover talked to.
  \item b. Piping: This is the woman to whom Grover talked.
\end{itemize}

The results of the judgment task were consistent with those of the production task: Even the youngest children accepted sentences involving stranding more than 90% of the time. Piping, on the other hand, was generally rejected by the younger children (6% acceptance; age range, 3;05 – 5;11), and was accepted by only about half of the children in the older age group (54% acceptance; age range, 9;01 – 11;11). In contrast, adults generally accepted piping.

According to McDaniel and colleagues, the results of these two experiments indicate that stranding is already an option in young children’s grammars, despite its marked status crosslinguistically. They argue that the lack of a piping option in child English is consistent with certain aspects of the Minimalist Program (Chomsky 1995): The stranding and piping alternatives involve the same numeration, but the stranding alternative involves movement of less material and hence is the more economical derivation. On their account, adults’ acceptance of the piping alternative is due to a prescriptive rule taught in school.
The studies reviewed above focused on stranding and piping in the acquisition of English, but others have examined children’s acquisition of non-stranding languages. Elicited-production studies with French- and Spanish-speaking children between the age of 3 and 6 have suggested that children avoid the use of piping in their own speech, even though stranding is not an option in these languages (Labelle 1990, Pérez-Leroux 1993): The children did not strand prepositions, but instead employed alternatives like resumptive pronouns. In a study on Serbo-Croatian, which is also an obligatory-piping language, Goodluck & Stojanovic (1997) found that children around the age of 4 to 6 understood sentences with piping, but only a few, older children ever produced them. As in the studies of French and Spanish, no child ever produced a sentence with stranding.

In contrast to the studies summarized above, which employed experimental tasks, Sugisaki & Snyder (2003) examined the acquisition of prepositional questions (P-questions), in both English and Spanish, using longitudinal corpora of children’s spontaneous speech. The details of their study will be spelled out in some detail, because they are relevant for the interpretation of a number of other spontaneous-speech studies to be discussed below.

First, Sugisaki and Snyder’s findings for English strongly supported the conclusions of French (1984) and McDaniel et al. (1998): There was no evidence that any child acquiring English had piping as an initial, “default” strategy. Of ten children acquiring English, none had P-questions at the beginning of his or her corpus, but nine had begun using P-questions by the end of the corpus. (The exception was a child whose corpus ended at age 2;10.) In these nine children, the age of onset for P-questions with stranding ranged from 2;02 to 3;03 (mean 2;07). Crucially, none of the ten children examined ever produced even a single question with piping.

Sugisaki and Snyder’s findings for Spanish indicated that children acquiring an obligatory-piping language sometimes master the syntax of piping quite early. Of four children acquiring Spanish, two were making regular use of P-questions by the end of their corpora. (The two who did not were a child whose corpus ended at 2;05, and a child whose corpus extended to 4;11 but contained very sparse data, especially after the age of 2;10.) The ages of onset for P-questions with piping were 2;01 and 2;04. None of the four children ever produced a P-question with stranding. While these data for Spanish are somewhat limited, they indicate that production of piping by children acquiring a piping language can begin much earlier than one would have thought, given the experimental findings for French, Spanish, and Serbo-Croatian reported above. One possibility is that children’s difficulties in the studies of elicited production indicate difficulty in sentence processing (or perhaps simply difficulty with the experimental tasks), rather than a lack of grammatical knowledge.

Sugisaki and Snyder’s combined data from English and Spanish corpora provide support for another point that is worth mentioning here, because of its bearing on spontaneous-speech studies more broadly. Namely, the children appear to have been “grammatically conservative,” in
the sense discussed at length by Snyder (2008, 2011): From the perspective of their spontaneous speech, the children were making steady progress towards the adult grammar, with few grammatical errors. The children acquiring English did not experiment with (i.e. produce) various possible types of P-questions, nor did they begin with an ‘unmarked’ type and correct this error later. Instead, they waited until they knew the correct option for English, and only then began producing P-questions. The children acquiring Spanish likewise showed no sign of experimentation with the stranding option before they began producing P-questions with piping, the correct option for Spanish.

Here and in other studies, the majority of errors in children’s spontaneous speech (though not in their elicited production) are errors of omission, where required words or morphemes are simply absent. It is far less common to find an actual error of “co-mission,” where the child puts words or morphemes together in a way that is disallowed in the target language. This observation suggests that when a child abruptly goes from never using a construction to using it frequently and correctly in her spontaneous speech, with a variety of lexical items, we are entitled to conclude that the child’s construction has the same grammatical basis (in terms of parameter settings and lexical information) as it has for the adult speaker. An important consequence of this “grammatical conservatism” is that the longitudinal records of children's spontaneous speech provide an extremely valuable testing ground for predictions stemming from theories of cross-linguistic variation. This testing ground is directly exploited in a number of studies discussed below.

To summarize this subsection, English-learning children appear to have no difficulty acquiring stranding, despite its “marked” status crosslinguistically. On the other hand, the “unmarked” option of piping seems to give children some difficulty, although this may be at the level of processing rather than grammar. The expected developmental change from the unmarked option (piping) to the marked option (stranding) was not observed in the acquisition of English. On the other hand, the phenomenon of grammatical conservatism makes it possible to test parametric proposals about stranding fairly directly, using longitudinal corpora of spontaneous speech. In the subsections that follow, we review a number of acquisition studies that pursued this general research strategy.

2.2. Stranding and the V-Particle-DP Construction

As mentioned above, stranding and separable-particle constructions are both among the more exotic properties of English, and are absent from the major Romance and Slavic languages, for example. Building on this observation, Stowell (1981, 1982) proposed to relate the two. On his account, stranding requires the availability of a “reanalysis” rule like (27), which creates a single, complex word from a string-adjacent V and P:
Stowell further proposed that a reanalysis rule like (27) is permitted to exist in English only because the result is weakly equivalent to the ‘[V+P] DP’ form that is allowed independently by the English ‘[V+Particle] NP’ construction.

Stowell’s proposals were framed in a theory of grammar that is no longer current, but his intuition that stranding in English relies (at least in part) on whatever makes V-Particle-DP possible, is an idea that could still be translated into a current framework. Whether such a translation is warranted will depend on whether Stowell’s intuition is supported by the available evidence from comparative syntax and child language acquisition.

Sugisaki & Snyder (2002) sought to answer this question. They began with a basic comparative survey. As shown in Table 3, the results were largely consistent with Stowell’s intuition: Languages allowing stranding also permitted a prepositional particle to stand adjacent to a transitive V.²

<table>
<thead>
<tr>
<th>Language</th>
<th>Stranding?</th>
<th>V-Particle-DP?</th>
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<tbody>
<tr>
<td><strong>North Germanic:</strong></td>
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<tr>
<td>Icelandic</td>
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<td>Yes</td>
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<tr>
<td>Norwegian</td>
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<td>Yes</td>
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<tr>
<td>Swedish</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>West Germanic:</strong></td>
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<tr>
<td>English</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Greek:</strong></td>
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<tr>
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<tr>
<td>Italian</td>
<td>No</td>
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<tr>
<td>Spanish</td>
<td>No</td>
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</table>

2. Danish was the one potential counterexample they found to Stowell’s generalization. Danish allows stranding, but Herslund (1984: 40) and others have asserted that Danish systematically disallows the V-Particle-DP order. Yet, Thráinsson (2000: 166) reports that the following example with V-Particle-DP order is accepted. Thus, the grammatical status of this order in Danish calls for further investigation.

(i) Jeg skrev op nummeret / *det.
   I wrote up number-the it
   “I wrote the number / it down.”
Yet, given the cross-linguistic rarity of stranding, their survey was based on an extremely limited sample of languages. It was also based on extremely superficial diagnostics for the actual grammatical properties of each language examined. As a consequence, the apparent connection between stranding and the V-Particle-DP construction could easily be an accident. To bring in some evidence from a different source, they conducted an acquisitional investigation. Such an investigation has the advantage that it can focus on one or two well-studied target language, like English, without the need for in-depth analysis of diverse languages that comes with a comparative approach.

The prediction tested by Sugisaki and Snyder was that every child acquiring English will have the V-Particle-DP construction in place, in their spontaneous speech, by the time they begin to use stranding. Note that this prediction is independent of exactly how the two structures are thought to be related, and independent of how one would decide whether a structure in some language other than English is comparable to the one in English. As long as the properties of English grammar that make V-Particle-DP possible in English are a proper subset of the specific properties of English that make stranding possible, the prediction stands.3

To evaluate this prediction, Sugisaki and Snyder analyzed a sample of ten English-learning children for whom longitudinal corpora were available in the CHILDES database (MacWhinney 2000), and asked whether any child in the sample acquired stranding significantly earlier than the V-Particle-DP construction. To address this question, they needed a way to judge when a temporal gap between the first uses of two constructions went beyond what could be attributed to simple differences in frequency of use. Their approach was to apply a Binomial Test to each child’s data, using frequency data from the same child’s speech slightly later in the corpus.

<table>
<thead>
<tr>
<th>Slavic:</th>
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<tbody>
<tr>
<td></td>
<td>Bulgarian</td>
<td>No</td>
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<td></td>
<td>Russian</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Serbo-Croatian</td>
<td>No</td>
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</tbody>
</table>

Table 3: Cross-linguistic Survey on P-stranding and the V-Particle-NP Construction

3. Strictly speaking, it is rather unlikely, and in practice unnecessary, for the full set of grammatical pre-requisites of the English-type V-Particle-DP construction to be needed for stranding. Rather, what is crucial is that the late-acquired pre-requisites of the former be a proper subset of the pre-requisites for the latter. To the extent that this is the situation, one may safely abstract away from ‘non-shared but early-acquired’ pre-requisites of the first construction.
Specifically, their approach to each child’s corpus was as follows: (i) Locate the child’s “first clear use” of either stranding or a V-Particle-DP construction.4 (ii) Identify each use of this first construction, up to the point when he or she begins using both constructions. (iii) Determine the relative frequency of the two constructions in the next four transcripts, or until the end of the child’s corpus, whichever comes first. (iv) Use the Binomial Test to calculate the probability of the child’s producing at least the observed number of examples of the first construction, before starting to use the second construction, simply by chance. The null hypothesis for this test was that the second construction was grammatically available at least as early as the first construction, and that the two constructions had the same relative frequency of use that was observed in the child’s own speech slightly later in the corpus (Stromswold 1996).

The results were as follows: Seven of the ten children acquired the V-Particle-DP construction significantly earlier than stranding, and three acquired them at approximately the same age (no significant difference by Binomial Test). Crucially, no child acquired stranding significantly earlier than the V-Particle-DP construction. Thus, evidence from child English provided a completely new type of support for Stowell’s proposal to link the availability of stranding to that of V-Particle-DP constructions.

2.3. Stranding, Prepositional Complementizers, and Double Accusatives

Kayne (1981) proposed that the availability of stranding is a necessary condition for two further syntactic properties: the possibility of prepositional-complementizer (PC) constructions, in which an infinitival clause takes a lexical subject that is accompanied by an overt or null prepositional complementizer; and the possibility of double-accusative constructions, in which a single verb takes two accusative-marked objects.5,6 English, which allows stranding, clearly exhibits both of these other properties, while French, which requires piping, exhibits neither.

5. See Lasnik & Saito (1991: 337) for arguments that in sentences like (28b), when for is not overtly present, the infinitival subject is assigned Case not by the matrix verb, but by a null prepositional complementizer.
6. The term double-accusative construction is based on the fact that both of the two NPs that follow the verb in the English example (28c) bear morphological accusative case. We can observe this in the following example, in which both of the objects are pronouns:

(i) I showed him her.

Yet, it might be the case that one of the two objects bears a dative Case, and that the loss of the morphological distinction between accusative and dative in English masks this fact. In the analysis by Kayne (1981), it is crucially assumed that both of the DPs in fact bear accusative Case.
Icelandic appears to have an intermediate status between English and French: It allows stranding in *wh*-questions as shown in (30), but does not have PC constructions or double-accusative constructions.

(30) Hann spurði hvern ég hefði talað við.  
He asked whomACC I had talked to  
(Maling & Zaenen 1990: 155)

<table>
<thead>
<tr>
<th>Language</th>
<th>Stranding?</th>
<th>PC Construction?</th>
<th>Double Accusatives?</th>
</tr>
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</tr>
<tr>
<td>French</td>
<td>No</td>
<td>No</td>
<td>No</td>
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</table>

Table 4: Kayne’s (1981) Cross-linguistic Survey

Since the properties listed in Table 4 can be found in very few languages, it is extremely difficult to evaluate Kayne’s parametric proposal through comparison of typologically diverse languages. Sugisaki & Snyder (2005/2006) therefore conducted an acquisitional evaluation, in which they analyzed the longitudinal corpora of spontaneous speech samples from ten children acquiring American English.

The fundamental idea in Kayne’s (1981) proposal is that the parameter-settings required for stranding are a proper subset of the parameter-settings required for the PC construction and the double-accusative construction. The prediction from this proposal is that any English-learning child who uses the PC construction or the double-accusative construction should also allow stranding. This amounts to (31).
Predictions from Kayne’s Parametric Proposal:

a. Children learning English should never acquire the PC construction significantly earlier than stranding.

b. Children learning English should never acquire the double-accusative construction significantly earlier than stranding.

The approach taken by Sugisaki & Snyder (2005/2006) was basically the same as in Sugisaki & Snyder (2002). The results were as follows: Seven of the ten children produced both stranding and the PC construction by the end of their corpora. Among these seven children, three acquired stranding significantly earlier than the PC construction. The remaining four children acquired stranding and the PC construction at approximately the same age (no significant difference by Binomial Test). Crucially, none of the ten children acquired the PC construction significantly earlier than stranding. Thus, the results are consistent with the prediction in (31a), and lend support to theories positing a direct implicational relationship from the existence of prepositional complementizers in a language, to the possibility of stranding.

On the other hand, the results for stranding and double accusatives falsified the prediction. Nine of the ten children produced both stranding and the double-accusative construction by the end of their corpora, and five of these nine children actually acquired the double-accusative construction significantly earlier than stranding, by Binomial Test. For the remaining four children, the age-discrepancy did not reach significance ($p > .05$, by Binomial Test). These acquisitional findings directly contradict the prediction in (31b), and therefore constitute strong evidence against Kayne’s (1981) view that natural-language grammars permitting the type of double-accusative construction found in English are a proper subset of those permitting stranding.

2.4. Piping and P+D Suppletion

In previous subsections we saw acquisitional evidence supporting Stowell’s (1981, 1982) proposal of a link between stranding and the V-Particle-DP construction of English, and we saw evidence from child English thus bolsters Zhang’s (1990) point that Chinese is a problem for Kayne’s proposal, because it permits a double-accusative construction but disallows stranding:

(i) Wo song le Lisi yi ben shu.
   I give Asp Lisi one copy book
   ‘I gave Lisi a book.’

Note that this type of converging evidence from comparative syntax and acquisition is far stronger than either type of evidence alone, because the two have complementary strengths and weaknesses. For example, a weakness of (i) by itself is that the Chinese construction may or may not turn out to be equivalent, in relevant respects, to the one in English. See Snyder (2012) for detailed discussion.
additional evidence supporting Kayne’s (1981) proposal of a direct parametric link connecting PCs to stranding. These proposals share the fundamental idea that stranding is a marked option, and that the relevant parameter determines whether stranding is permitted or not in a given language. In sharp contrast, Law (1998, 2006) and Salles (1997) regard stranding as an unmarked option, and attempt to account for why piping of prepositions is obligatory in a number of languages.

Capitalizing on the observation that ‘piping’ languages like French and Italian have the property that a preposition sometimes coalesces with the following determiner into a suppletive form, Law (1998, 2006) and Salles (1997) argue that the existence of such suppletive forms of prepositions and determiners (henceforth, P+D suppletive forms) is the source of obligatory piping. According to their analysis, the existence of P+D suppletive forms in a given language is an indication that D always incorporates to P in that language, and this D-to-P incorporation forces the movement of a wh-phrase to carry along the preposition. The sentences in (32) and (33) illustrate the P+D suppletive forms in French and Italian respectively, and Table 5 summarizes the crosslinguistic surveys conducted by Law (1998, 2006) and Salles (1997) of P+D suppletive forms and obligatory piping.

(32) French:
Jean a parlé du sujet le plus difficile.
Jean have talked about-the subject the most difficult
‘Jean talked about the most difficult subject.’

(33) Italian:
Gianni ha parlato del sogetto più difficile.
Gianni have talked about-the subject most difficult
‘Gianni talked about the most difficult subject.’

<table>
<thead>
<tr>
<th>Language</th>
<th>P+D Suppletive Forms?</th>
<th>Obligatory Piping?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Romance:</td>
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<td></td>
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<tr>
<td>French</td>
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<tr>
<td>Italian</td>
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<td>Portuguese</td>
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<td>Germanic:</td>
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<tr>
<td>German</td>
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<td>Yes</td>
</tr>
<tr>
<td>English</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Scandinavian Languages</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
Table 5: Crosslinguistic Survey of P+D Suppletive Forms and Obligatory Piping

Under the system of Law (1998, 2006) and Salles (1997), the existence of P+D suppletion constitutes a sufficient condition for the obligatory piping of prepositions: In every language that has P+D suppletive forms, D-incorporation to P is obligatory and hence piping is required. Therefore, the following prediction can be made for the time course of acquisition.

Every child acquiring a language with P+D suppletion will exhibit piping in P-questions as soon as she acquires both overt wh-movement and at least one P+D suppletive form.

In order to evaluate this prediction, Isobe & Sugisaki (2002) analyzed two longitudinal corpora for French available in the CHILDES database. The results were as follows. One of the two children (Philippe) acquired overt wh-movement, P+D suppletive forms, and piping by the end of his corpus. Contrary to the prediction, however, P+D suppletive forms appeared earlier than piping, and the age-discrepancy between the two was statistically significant by Binomial Test. Thus, having both overt wh-movement and P+D suppletion was not sufficient to let Philippe know how to form P-questions. The findings are still compatible with an analysis in which the availability of P+D suppletion is only a necessary, not a sufficient, condition for piping. However, such an analysis is far from appealing, because it would seem to entail that adult grammars can have P+D suppletive forms and still permit stranding. Thus, evidence from child language runs counter to the view that P+D suppletion and piping are tied to the same parameter-setting.

2.5. Summary

In this section we reviewed studies that addressed variation in stranding from both a comparative and an acquisitional perspective. We saw acquisitional evidence for the view that stranding (at least in English) is dependent on the availability of V-Particle-DP constructions, and for the view that the availability of prepositional complementizers depends on the possibility of stranding. We also saw acquisitional evidence against the view that P+D suppletion directly entails piping, and against the view that the English double-accusative construction would be impossible without the availability of stranding. Naturally, the hard work of figuring out the grammatical details of stranding and related structures still remains, as does the question of how stranding should be captured within a Minimalist approach to syntax (though see Abels 2003 for one attempt). Nonetheless, these findings from the time course of acquisition impose considerable constraints on the syntactic analyses, and the accounts of syntactic variation, that are empirically tenable.
3. The Verb-Particle Construction: Acquisition and Cross-linguistic Variation

In the previous section we saw evidence linking the availability of stranding (at least in English) to the availability of a V-Particle-DP construction. In this section we turn to the latter point of variation, and address from an acquisitional perspective the question of what is necessary for the availability of separable-particle constructions.

3.1. Verb-Particle Construction and Productive Compounding

It has been observed at least since Talmy (1985) that the English-type of verb-particle construction, in which the prepositional particle can be separated from the verb by a phrasal constituent, is not available in Romance languages like Spanish, as illustrated in (19), repeated as (35). In Talmy’s (1985) terminology, English is a “satellite-framed” language, meaning that path is normally expressed by a “satellite” such as a particle or a PP, while Spanish is a “verb-framed” language, in which path is normally expressed not by a satellite but within the main verb.

(35) a. María arrancó el tapón (*de/afuera/...)
Mary ripped the lid off
b. María arrancó (*de/afuera/... el tapón
Mary ripped off the lid

Snyder (1995, 2001) examined cross-linguistic variation in particle constructions within a parametric framework, and found evidence suggesting that the crucial prerequisite for a language to have English-style separable particles is the availability of endocentric, bare-root compounding as a fully “creative” process. While novel endocentric compounds can be created freely in English, this is not possible in Spanish, as illustrated in (36).

(36) a. English: banana box ‘box in which bananas are stored’
b. Spanish: *banana caja, *caja banana

According to Snyder, the separable-particle construction as in (35a) is possible only in those languages that allow productive endocentric compounds. The results of his comparative survey are summarized in Table 6.
<table>
<thead>
<tr>
<th>Language</th>
<th>Separable particles?</th>
<th>Novel N-N compounds?</th>
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</thead>
<tbody>
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<td><strong>Sino-Tibetan:</strong></td>
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<td>Serbo-Croatian</td>
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Table 6. Cross-linguistic Survey on Separable Particles and Novel Endocentric Compounds

In order to test his proposal further, Snyder performed an acquisitional study. The prediction for child English was that no child should acquire the V-DP-Particle construction significantly earlier than novel compounding. As seen in Table 6, novel compounding is a necessary, but not

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8. Snyder has argued more recently that Basque was misclassified in his early studies (1995, 2001), and that there are reasons to believe that the language should not be regarded as allowing bare-root endocentric compounding of the English type. See Snyder (2012) for discussion.
sufficient, condition for the separable-particle construction. Rather more ambitiously, if it turns out that the availability of novel compounding is the last-acquired prerequisite for the V-DP-Particle construction, it is predicted that each child will acquire novel compounding and the V-DP-Particle construction right at the same point in time.

The results of an analysis of ten longitudinal corpora for English from the CHILDES database bore out the latter, stronger prediction. The point at which a given child begins producing transitive V-DP-Particle constructions (e.g. *throw the picture away*) is almost exactly the point when the child suddenly starts producing novel endocentric compounds (e.g. *zoo book*, for ‘book about the zoo’). Statistically speaking, the correlation is incredibly strong ($r=.98$, $t(8)=12.9$, $p<.001$), and remains strong even when the variability that can be explained by control measures (such as the age at which a given child first used a lexicalized compound, like *apple juice*) has been subtracted out by means of a partial-correlation procedure. Moreover, these findings were confirmed in a larger version of the study (Snyder 2007), based on a total of 19 children who were acquiring either American or British English ($r=.94$, $t(17)=11.1$, $p<.001$).

Snyder (2001) formulated the point of cross-linguistic variation behind the separable-particle construction and productive endocentric compounding as the Compounding Parameter.

(37) The Compounding Parameter (TCP):

The language {allows, disallows} formation of endocentric compounds during the syntactic derivation.

The basic idea behind TCP is that in English-style V-DP-Particle constructions, the main verb and the prepositional particle constitute a single word (namely, an endocentric compound) at the point of semantic interpretation, and that the operation necessary to form this structure is the same one required to produce conventional endocentric compounds.

In later studies (e.g. Snyder 2005, 2012), TCP has undergone various modifications. First, it has been reformulated as a semantic parameter, which determines the availability of a specific rule of semantic composition (which is required in order to interpret either a novel compound or a verb-particle combination). Second, the parameter has been extended to cover other characteristics of Talmy’s (1985) satellite-framed languages. Since the latter is crucially related to verb-particle constructions (and more broadly, to spatial expressions), we briefly review relevant studies in the next subsection.

3.2. Motion Predicates and Productive Compounding
In Talmy’s verb-framed / satellite-framed typology, another possible satellite is a path PP, which in English can be added to a pure manner-of-motion verb, like *slid* or *rolled* in (38).

(38) English:  
The rock slid/rolled/bounced down the hill.

(39) Spanish:  
La botella entró a la cueva (flotando).  
the bottle moved-in to the cave (floating)

‘The bottle floated into the cave’

In Spanish, as in (39), the addition of a path PP requires the use of a compatible directed-motion verb (*entró* ‘entered’), and forces information about the manner of motion into an optional adjunct (*flotando*).

The examples of path PPs in (38) can all be interpreted as atelic, because the sentence can be true even if the rock does not reach the very bottom of the hill. In Talmy’s work, no sharp distinction is made between telic (resultative) phrases (e.g. *walk to the store*) and atelic path phrases (e.g. *walk in circles*). In light of the significant overlap between Talmy’s verb-framed/satellite-framed typology and TCP with respect to the crosslinguistic variation in verb-particle constructions, Snyder and his colleagues conducted acquisitional investigations to determine whether both telic and atelic path phrases are influenced by the setting of TCP.

Beck & Snyder (2001) investigated the acquisition of telic (resultative) path PPs (or “Goal PPs”) in English. While in English, resultative path PPs can convert Activity verbs into Accomplishment predicates (as discussed earlier), this is not possible in Spanish (Aske 1989).

(40) a. English:  
John walked to the summit (in an hour).

b. Spanish:  
Juan caminó hasta la cima (*en una hora).

Beck & Snyder (2001) compared the ages of acquisition, in ten English-learning children from CHILDES, for the goal-PP construction with *to* and for novel noun-noun compounding. The results were as expected: Eight of the ten children acquired the two constructions at about the same time, and the remaining two children both acquired compounding earlier than the goal-PP construction. These results are consistent with the view that the positive setting of TCP is a crucial prerequisite also for the English type of goal-PP construction.

In an attempt to extend the above findings by Beck & Snyder (2001), Snyder, Felber, Kang & Lillo-Martin (2001) investigated children’s acquisition of non-resultative (atelic) path phrases. Through the analysis of longitudinal CHILDES corpora for ten English-learning children, Snyder
et al. found that the age of acquisition (i.e. the first use, followed soon after by regular use) of a motion verb with a non-resultative path PP is closely correlated with the age of acquisition of novel noun-noun compounding \((r=.91, t(8)=6.26, p<.001)\). Furthermore, this correlation remains significant even after partialling out the age of acquisition for the use of verbs with non-path PPs \((r=.80, t(7)=3.52, p=.01)\). Thus, the results from child language provide support for the view that in a language of the English type, both resultative and non-resultative path PPs depend, for their interpretation, on syntactic compounding, and that all of these properties, as well as the separable-particle construction, are linked to the same point of cross-linguistic variation.

3.3. **V-DP-Particle and V-Particle-DP Constructions**

Going back to the discussion of verb-particle constructions (41), a number of acquisition studies have focused on which order (V-Particle-DP, V-DP-Particle) is acquired earlier by children learning English.

(41) **English:**

a. Mary lifted the box up.

b. Mary lifted up the box.

Brown & Hanlon (1970:50) briefly noted that V-DP-Particle had consistently come first in the three children they were studying at the time. Hyams, Schaeffer & Johnson (1993) and Broihier et al. (1994) (cf. also Bennis et al. 1995) reported the same order of acquisition in the longitudinal corpora for several additional children. Snyder & Stromswold (1997) examined corpora for 12 children, and found that the V-DP-Particle order was consistently acquired either prior to, or at the same time as, the V-Particle-DP order. None of the children acquired V-Particle-DP first.

In an attempt to account for the observed ordering effect within a parametric model, Snyder & Stromswold (1997) proposed that, while the V-DP-Particle construction depends only on some parametric property A, the V-Particle-DP construction depends on the combination of property A with a second property, B. Although an in-depth syntactic analysis was beyond the scope of their study, Snyder and Stromswold suggested that property A is a general prerequisite for complex-predicate constructions (which we now can interpret as the positive setting of TCP), and also that property B might be a parametric property of government theory.

Irrespective of the details, the parametric proposal of Snyder and Stromswold was that the parameter-settings required for the V-DP-Particle construction in English are a proper subset of those required for the V-Particle-DP construction. This in turn predicts that there could be a language just like English except that it only allows the V-DP-Particle order. This would
correspond to a language with Property A but not Property B. On the other hand, it should not be possible to have a language just like English except that it allows only the V-Particle-DP order. To get this order, the language would need both A and B, and by having A it would necessarily also allow the V-DP-Particle order.

It comes as something of a surprise, then, when we turn to Swedish and find that it does indeed permit the V-Particle-DP order but not the V-DP-Particle order (e.g. Svenonius 1996):

(43) Swedish:

a. Johan skrev upp numret.
   Johan wrote up the.number
   ‘Johan wrote down the number.’

b. *Johan skrev numret upp.
   Johan wrote the.number up

This discrepancy between the evidence from child English and the evidence from adult Swedish raises a number of important syntactic questions: Do verb-particle constructions actually have the same grammatical basis in Swedish as they do in English? If so, is there another point of parametric difference between English and Swedish that, in the case of Swedish, might prevent the V-DP-Particle order from surfacing? These questions are not specific to discussions of language acquisition, of course, but rather are fairly typical questions for generative research on grammatical variation.

3.4. Summary

In this section we have seen the comparative and acquisitional evidence converge on a direct implicational relationship from separable-particle constructions to fully productive root compounding. We have also seen evidence from child language that both resultative and non-resultative path PPs in English depend on the availability of productive, endocentric compounding. Thus, evidence from children’s acquisition of verb-particle and related constructions supports the existence of an abstract parameter with multiple consequences for the surface grammar.

5. Conclusion

In this chapter we discussed cross-linguistic variation in, and acquisition of, two syntactic phenomena that centrally involve prepositional elements: stranding, and the verb-particle construction. In the domain of stranding, comparative and acquisitional evidence converged on a
direct link from prepositional complementizers to stranding, and also on a direct link from stranding to verb-particle constructions. In the domain of particles, the comparative and acquisitional evidence again converged, this time on a direct link from verb-particle constructions to fully productive root compounding. These findings together suggest that stranding and verb-particle constructions are both dependent on the availability of productive endocentric compounding, which in turn suggests that children might perhaps rely on evidence from compounding to help them determine whether stranding and verb-particle combinations (of the English types) are permitted in their target grammar. Even though the exact source of the relationships among these grammatical structures remains to be further investigated (see e.g. Tokizaki 2013 for a recent approach), the relationships cannot even be expressed unless a point of syntactic variation is permitted to be highly abstract, as envisioned in Chomsky (1981), with consequences for superficially unrelated constructions. The domain of spatial language has been, and promises to remain, a fruitful area for acquisitional and comparative investigation of the innate constraints on language variation.

References


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