

# Learning to GO: A Corpus Study of Motion Event Acquisition in English

Savithry Namboodiripad

## 1 Introduction

Generally speaking, there are two main schools of thought about how children learn the constraints of the verbs in their language. Some researchers, including Naigles et al. (2009), take evidence of early word recombinations to be evidence that children make use of abstract grammatical categories, making acquisition a matter of matching input to these categories. Others, including Goldberg (1999), Ninio (1999), and Tomasello (1992), look for evidence that points to children using their knowledge about a few frequent verbs as a template for the comprehension and production of verbs in general. Perhaps unsurprisingly, the former school of thought is associated with a more generative approach to language, while the latter is associated with a constructivist approach. The question of how children learn grammatical constraints is central to both of these theories because it touches on a fundamental difference between generative and functional approaches to language, and this has led to a resurgence of research on verb acquisition over the past 10 years.

What does this have to do with verbs in particular? Verb acquisition goes hand in hand with the acquisition of syntax: in order for children to have properly acquired a verb, they must learn its argument structure, which necessitates word-combination. Consider the sentences below:

- (1) a. I rolled the ball down the hill.
- b. The ball rolled down the hill.

c. The ball rolled over.

As (1) shows, the verb ROLL is flexible. In (1a), ROLL is transitive, having an agent and a patient, while in (1b), ROLL is intransitive. Verbs like ROLL do not always refer to events with a goal: (1a) and (1b) describe an event in which there is a change in location, while (1c) does not. Furthermore, English-speakers have a choice when describing the events in (1a) and (1b); they can use the manner verb ROLL, or, they can use the verb GO:

- (2) a. I made the ball go down the hill.<sup>1</sup>  
b. The ball went down the hill.

Moreover, some verbs like COME and GO, can be functional; they combine with other verbs and can be used as an auxiliary and in light verb constructions:

- (3) a. He is going to be more careful now.  
b. The lights go off at 10:30.

Consequently, children must also learn the wide range of ways that these verbs can function at the sentence level in order to fully learn their meaning. Studying verb acquisition gives us insight into how children learn to build linguistic structure and deal with flexibility in form and function.

The present study tracks the production of a subset of verbs, verbs of motion, by 18 children across 12 time points, from 14 months to 5 years. It addresses structure-building on the verb by describing the development of path and manner expressions, and presents preliminary evidence that children do not use their knowledge of the verb GO as a template for motion verbs in general. Finally, this study describes the acquisition of multifunctional verbs by describing and tracking the development of the various ways children use GO. As I will discuss, these findings do not bring down either approach to language acquisition, but they provide an important starting point for more targeted research on this topic.

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<sup>1</sup>MAKE is necessary to preserve the transitivity of this event, but this will not be discussed further in this paper

In the remaining sections of this introduction, I motivate the use of the particular constructions reported on in this study (path and manner expressions), and discuss the functional flexibility of GO. I conclude with specific predictions for this study.

## 1.1 Building Structure on the Verb: Path and Manner

As famously described by Talmy, languages differ in how they structure motion events, with some languages encoding the path of a motion on the verb, and others encoding it on a satellite construction, like a prepositional phrase (Talmy (2000)). As shown in (1), English is a satellite-framed language; the path of the motion is usually encoded on a prepositional phrase, and the manner of motion tends to be encoded on the verb. This means, in order for children to produce motion events the way adults do, they must produce a manner verb and a path-encoding satellite construction, thus building structure on the verb by adding a prepositional phrase.

Presumably, it should be trivial for English-speaking children to use manner verbs with path-encoding satellite constructions; that is how English-speaking adults do it, and the overwhelming majority of motion verbs in English encode manner (Ozcaliskan (2003)). However, there are numerous studies which suggest that English-speaking children do not start out behaving like English-speaking adults. There is evidence that children pay more attention to events where there is a change in location than where there is a change in state, indicating that there is something preferred about path at an early age. Berman and Slobin (1987), Choi and Bowerman (1991), and Bowerman and Choi (2003) have all shown evidence that children start out describing the path of motion, no matter the typological category of their language. This means that, when it comes to the encoding of motion events, English-speaking children's early production looks different than the speech of English-speaking adults. Depending on the study, children who speak verb-framed and satellite-framed languages become reliably different from one another in their motion event encoding between 20 months (Choi and Bowerman (1991)) and three years (Berman and Slobin (1987)).

Though these language-specific tendencies are statistically significant relatively early in develop-

ment, children do not follow the typological patterns as closely as adults do. Allen et al. (2003) conducted a cross-sectional elicitation study in which they asked children (age 3;8) and adults to describe animated vignettes. The vignettes consisted of an anthropomorphized red circle and green square which moved around a computer screen in various ways, always having both a path and a manner. They found that adults tended to produce sentences like in (4) below, while children produced more sentences like in (5)<sup>2</sup>:

(4) ‘Tomato Man rolls up the hill.’

(5) a. ‘And the red guy twirled’

b. ‘The red guy went up’

In (5a) the speaker produced just the manner of motion without the path, while in (5b), the speaker produced the neutral verb GO with a satellite expression encoding path. In (4), path and manner are expressed in the same phrase. From this, they concluded that the combination of manner verbs with path-encoding satellite constructions in the same phrase seems to emerge relatively late. However, in a follow-up study, Allen et al. (2007) found that English-speakers around the age of three do in fact produce manner and path in the same sentence, as long as the manner of motion is also the cause of the motion. The previous literature predicts that children should be able to do this by age three, so this is no surprise. And, in fact, the main goal of these studies was to show that language-specific patterns emerge around age three cross-linguistically (they tested Japanese and Turkish children and adults as well).

Taken together, the reports from Berman and Slobin (1987) and Choi and Bowerman (1991), who claim that path precedes manner, and the results from Allen et al. (2003), who found that children produce either manner or path, but not both, predict the developmental trajectory below:

(6) a. {GO DOWN, ROLL} → ROLL DOWN

b. {motion verb+path, manner verb} → manner verb+path

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<sup>2</sup>Examples taken from Allen et al. (2003)

(6a) and (6b) both represent the same pattern, but (6a) is just a concrete example of the categories represented in (6b). The explanation for this pattern is still unclear. In the 2003 paper, Allen et al. propose a comprehensive list of possible reasons, which include language-specific and language-independent factors: Children might have cognitive limitations during the viewing of the vignette or during the narrative which cause them either to not pay attention to the manner of motion or to forget about it as they are relaying the information. Or, rather than not being able to process the manner information, perhaps the inclusion of only path or only manner has to do with narrative preferences, indicating a child-specific stylistic choice (the evidence from the 2007 study supports this somewhat).

The proposal they make which is most relevant to the present study is that “children may find it morphologically or syntactically more difficult to represent both Manner and Path in one sentence” (Allen et al. (2003): 69). In other words, children might be having trouble adding the satellite construction to the manner verb. This would mean that the explanation for why English-speaking children do not produce path and manner in the same sentence is directly related to the larger question of how children learn how to build structure on the verb. If children are using their knowledge about the structure of a specific verb as they learn to produce these constructions, then the developmental trajectory in (6) can be explained if children are using GO+path as a template for manner verb+path.

## **1.2 Acquiring Flexible Verbs: The Production of GO**

If children are indeed using their knowledge about GO to build structure on manner verbs, it is important to characterize this knowledge – how flexibly do children use GO, or, rather, what is their conception of GO? It might be that children start out with a very concrete idea of what GO means, namely, that it is used to describe events in which there is a change in location, and then they could acquire the more functional uses of GO later. Or, children might learn that GO is functional from hearing adults use it in situations in which there is no change in location, which would mean that they start using GO functionally early in development.

There has been one comprehensive study of the acquisition of GO, Theakston et al. (2002), which looked at slightly different questions than the ones I describe above. Theakston and colleagues motivate a corpus study of the semantic and syntactic uses of GO by claiming that understanding the extent to which children use GO flexibly can empirically distinguish claims made by constructivists and generativists about storage and acquisition of inflected verbs. Because of this, they are more interested in the relationship between specific word forms and the function these word forms take – this is more central to the question of storage. They find that children’s use of GO resembles adult use of GO in terms of the variety of constructions, but children do not use these constructions with all of the morphosyntactic variants of GO. This is evidence against early flexibility, supporting a constructivist approach to language.

The advantage of the study in Theakston et al. (2002) is that it describes a large number of syntactic and semantic functions of GO. However, the sheer number of categories that they have makes their results difficult to interpret in terms of concrete versus abstract uses of GO, and they do not go into detail about the constructions they describe. Moreover, the finding that children use GO in the same types of constructions that adults do is curious; the children in their study are from ages 2 - 3, but perhaps looking at a larger age range could yield different results. Additionally, the relationship between general use of GO and GO as part of a motion event is unclear from Theakston et al. (2002)’s study,

### **1.3 Goals of this Study**

In the conclusion to Allen et al. (2007), the authors state that, after Bowerman and Choi (2003) ‘no other study has thoroughly investigated the complexity or frequency of use of syntactic structures that children employ in spontaneous conversations to describe events in which Manner and Path occur simultaneously in any of the three languages in our study’. Though the study Allen and colleagues cite was published in 2003, much of Bowerman’s data was collected in the 70s – this means that the extensive experimental work on path and manner has been based on evidence from corpus studies which were conducted about 40 years ago. In this study, I use data from a relatively

recent longitudinal corpus of 18 children to describe the variety of constructions children use when talking about complex motion events.

Further, I use this data to call into question previous findings from the cross-sectional elicitation studies of path and manner. I show, contra a claim made by Allen et al. (2003), that children do not seem to have trouble building structure on manner verbs, so morphosyntactic difficulty is not a sufficient explanation for why children seem to prefer GO in situations where adults use manner verbs. I also present evidence against the developmental trajectory predicted by the path and manner development literature – namely, I find that GO+path does not precede manner verb+path across children – and discuss the implications of this result for theories of language acquisition. Finally, based on evidence that children do seem to be treating GO more flexibly than other verbs which describe motion events, I investigate children’s production of GO in order to see when and how children start using GO in a more functional way.

I argue throughout this paper that the constructions I describe are relevant to larger questions about the development of syntax, and hope that the relatively rich descriptions I provide lead to more targeted experimental work.

## **2 Methods**

### **2.1 Corpus**

The 18 children in this corpus study were recorded in their homes during spontaneous play at 12 different time points from 14 months to five years. Below is a table showing the approximate ages of the children for each session:

SESSION	AGE
1	1;2
2	1;6
3	1;10
4	2;2
5	2;6
6	2;10
7	3;2
8	3;6
9	4;2
10	4;6
11	4;10
12	5;2

Table 1: Approximate age (in years;months) per session

All of the children were from the Chicago area; they represent both genders, and come from a variety of socio-economic classes, as measured by family income and maternal education. Each child was recorded from 60 - 90 minutes per session. The speech was transcribed automatically from the recordings, which a team of RAs checked by hand.

Only utterances containing verbs which could possibly be describing a crossing-space event were part of the present study; 150 out of the 753 verb types produced in this dataset were categorized as being “crossing space”, having an either required or optional goal, as determined by criteria from FrameNet (Baker et al. (1998)) and Levin and Rappaport Hovav (2005). Each utterance which had one of these 150 possibly crossing-space verbs was extracted automatically, and then coded by hand in Excel, as described in the next section.

## 2.2 Coding

There were two main goals of coding this dataset: The first was to exclude utterances which were not a part of the search space, and the second was to enrich relevant utterances, by coding the types of satellite constructions which accompanied verbs and cataloging the various uses of GO. The search space included all utterances which expressed a crossing space motion event, and all

instances of GO<sup>3</sup>. In some cases, it was easy to exclude utterances, for example, when flexible nouns were mischaracterized as verbs ('is it boat' (24s5)<sup>4</sup>). The remaining cases were coded for whether they expressed a crossing space event based on syntactic and semantic criteria.

A verb was coded as (1) for the category Crosses Space if it could be determined as describing a crossing space event, and if there was an expressed goal. For example, in the utterance "we got to go home" (24s6), "home" is the goal of the event. Requiring an overt goal is an overly exclusionary criterion, as children do not have very long utterances to begin with, and even adults do not regularly include goals in every sentence which describes a change in location. To remedy this while still having a clean category, a verb was coded as (2) for Crosses Space if it described a crossing space event, but a goal was not expressed. This was determined through a combination of verb meaning and context, as in the utterance "but you can go with me." (29s8).

There were two categories which were about motion, but which did not have a change in location: An utterance was coded as (3) for Crosses Space if the verb could be determined to describe a motion event without a change in location: "this goes around and around" (43s5). In a sentence like 'fall out' or "go in", the event being described is a boundary crossing. There is a change in location, but, as these events are achievements, there is no sustained manner, only a goal or source, so such utterances, which described a boundary crossing, were also given their own category. Finally, if a verb was not being used to describe a crossing space event at all, as in the case of the utterance "this go raar." (77s5), it was coded as (0).

For each crossing space event, I coded whether path and/or manner was encoded on a verb or a satellite expression. For example, in the sentence "and we're going to climb up the walls" (92s9), the manner is expressed on the verb, and the path is expressed on a satellite construction, so I would code V in the MANNER category and S in the PATH category. Every manner verb was coded for each child through session 5, though some children combined path and manner later than that, and their utterances were coded further.

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<sup>3</sup>Light verbs like 'take' and 'get', which could possibly express a crossing space meaning, were excluded because they were very frequent but mostly expressed in place events; the cost to code them outweighed the benefit.

<sup>4</sup>24s5 is subject 24, session 5; I will be using this format throughout.

All verbs were coded for whether they expressed path, manner, or motion, based on a combination of criteria from Levin and Rappaport Hovav (2005), Allen et al. (2003), and Ozcalşkan (2003). A verb was coded as a manner verb if it could result in a change in location, though a path was not necessarily entailed, as in the case of ROLL – a ball can roll to a location, but it can also roll over, causing a change in orientation, but not a change in location. Path verbs were categorized based on whether the motion was marked for direction of location; this was straightforward for most verbs, but comparing COME, which was categorized as a path verb, and GO, which was categorized as a motion verb, illustrates the criteria by which these decisions were made. Allen et al. (2003) and others classify COME as a path verb, and GO as a motion verb, but they do not provide clear motivation behind this decision.

COME in a neutral context describes an event which starts in a distal location and ends in a proximal location to the speaker (or wherever the event is anchored). GO can be thought of as having the exact opposite meaning; it can describe an event which starts in a proximal location and ends in a distal one. However, this directional meaning is more central to the meaning of COME than it is to the meaning of GO, as is illustrated by a direct comparison of (7b) and (8a) below:

- (7) a. come here  
b. ?? come there
- (8) a. ? go here  
b. go there

The change in location is more marked for direction for COME than it is for GO. The examples in (9) below highlight this more clearly: “came over there” is less acceptable as a description of someone arriving at a more distal location, while “went over here” is by comparison a far more acceptable

- (9) a. ? She came over there.  
b. She went over here.

Implicit in the motivation for categorizing COME as a path verb are the criteria for the categorization of motion verbs; verbs which do not describe a manner, but are used to describe a change in location were coded as motion verbs – verbs which were neutral for path and manner.

Using the criteria described earlier, every instance of GO was coded first for whether or not it was being used to express a crossing space meaning. If the event had an overt or implied goal, then the sentence was coded for path and manner. Otherwise, it was coded as being either an auxiliary or as part of a light verb construction. There were two additional categories which were somewhere in between being a canonical GO and fully functional: serial verb constructions and a GO AND construction, both of which will be discussed further in the results section.

The coding is summarized below. The bracketed list to the right of the “→” symbol contains the possible values which could apply to the category name, which is listed to the left.

- For optionally crossing-space verbs:
  - Crosses Space → {+goal, -goal, no goal, boundary, in place}
  - IF Crosses Space = {+goal, -goal, no goal, boundary}:
    - a) Path → {V, S}
    - b) Manner → {V, S}
- For each instance of GO
  - General Purpose → Auxiliary, SerialVerb, GO AND, +General Purpose, -General Purpose

Not having the full transcript was a serious limitation to being able to determine many of these categories, as much of the context was absent, including parent interaction. However, this meant that the coding was based on a combination of the meaning of the verb and what the children combined with the verb in their utterances. Because the default was to exclude any verb which could not be definitively categorized, the coding ended up being relatively conservative.

### 3 Results: Path and Manner

Below is a table of the types of constructions which the children represented in this corpus used to talk about crossing space motion events; the middle column shows the session where the construction was first produced in the corpus, and the third column shows how many children out of 18 produced the construction:

CONSTRUCTION	ONSET	# OF SUBJECTS
motion verb	1;2	18
manner verb	1;2	18
path verb	1;6	17
motion verb + manner satellite	1;10	18
motion verb + path satellite	2;2	18
motion verb + manner verb	1;10	18
motion verb + path verb	2;2	14
manner verb + manner	2;2	7
manner verb + path	1;10	18
path verb + path	2;2	14
path verb + manner	2;10	3

Table 2: Major construction types produced in this corpus

Only manner verbs combined with path verbs, but, for all other categories, manner and path includes both verbs and satellite constructions. Following the typological pattern of English, manner was less common on satellite constructions than verbs were. The following sections will show examples of the categories presented above. The first subsection lists the types of verbs which the children produced when talking about motion events, and the section second gives examples from the corpus of the ways that children combined path, manner, and motion.

#### 3.1 Path and Manner Verbs

After filtering out verbs which could not be determined to express a crossing space motion event, there were 32 verbs expressing manner, 4 verbs expressing path, and 2 verbs expressing neither. The relative frequencies of the verb types is not surprising; English has far more manner verbs than path or motion verbs. The types are shown below, in order of frequency, with the second column

containing the approximate age at which the verb was first used across the entire corpus, and the third column indicating how many of the 18 children used this verb in a crossing space motion event.

### **Motion Verbs**

There were two verbs which were categorized as being neutral in terms of path and manner, GO and MOVE.

VERB	ONSET	# OF SUBJECTS
GO	1;2	18
MOVE	1;10	2

Table 3: Motion Verbs

A possibly surprising result is that MOVE was not very common in this corpus – far less common than was GO, which was the most frequent verb. Though MOVE is neutral in its motion type, that alone is not enough for a verb to be used in a more functional way. The developmental distribution and function use of GO will be discussed more in the following sections, but it is important to note that every child used this verb.

### **Path Verbs**

Four verbs were categorized as encoding path, but only one, COME, was used by the overwhelming majority of children:

VERB	ONSET	# OF SUBJECTS
COME	1;6	17
FALL	1;10	6
BACK	1;10	2
CROSS	2;6	1

Table 4: Path Verbs

There are several children who use COME in serial verb constructions: “come get me”, which is evidence that COME is being used somewhat functionally. The coding of all of the functional uses

of COME is not yet complete, and therefore not included in this paper, but it is the only other verb in this data which behaved somewhat like GO.

### Manner Verbs

As with the motion and path verbs, the only verbs listed here were those which were part of a crossing space event. In the first table, verbs which were only used by one child were excluded, though those verbs are in a separate table below.

VERB	ONSET	# OF SUBJECTS
BRING	1;10	18
CARRY	1;6	11
HOP	1;2	11
CLIMB	1;10	14
JUMP	2;6	4
BOUNCE	2;6	9
KICK	2;6	7
PULL	1;2	3
LAUNCH	3;2	3
WALK	1;6	4
RIDE	1;10	4
POUR	2;2	4
RUN	1;10	4
PUSH	1;10	4
DRIVE	2;2	5
THROW	1;10	5
ROLL	2;2	2
FLY	2;2	2
CHASE	4;6	2
LIFT	2;2	2
SKATE	3;6	2
SLIDE	1;10	2
SWIM	1;10	2

Table 5: Manner Verbs: 17 of the 23 verbs were produced at or before age 2;2

Because there is more variability in the manner verbs, the alignment between frequency (represented by order) and onset/use across subjects is not as clean as it was with the other verb types. For example, PULL is used very early: one child uses it in some single-word utterances in the very first

session, however, only three subjects use it over all.

VERB	ONSET
TOW	2;2
BIKE	4;6
STEP	2;2
SKI	3;6
MARCH	2;2
ICESKATE	4;2
WOBBLE	4;2
BOAT	4;6
BANISH	3;6

Table 6: Manner Verbs used by only one child

Perhaps unsurprisingly, the manner verbs which were only used by a single child each (not the same child) tended to be produced later in general.

### 3.2 Building Structure on the Verb: Combinations of Path and Manner

The data above showed the variety of verbs which children use to encode path and manner. In this section, I show the variety of constructions which children used when talking about motion events.

COME combines often with path satellite constructions, but manner verbs do not often combine with manner-expressing satellite constructions. Below is an example of manner+manner:

(10) I hopped a lot! (48s7)

Path+path:

- (11) a. this hose come from you (43s5)  
b. can I come up there? (103s4)  
c. going to come back out (50s5)

There are not enough verbs in this dataset to be able to tell if this is revealing something interesting about how path and manner combine with each other, or if this is a property of COME. As mentioned above, COME can be very functional (and this has also been noted by Spears (1982)), so it might be that COME is not in the same category as the other verbs, and is thus more amenable to combination.

All of the children combined path with manner; here is one set of examples in which manner is encoded on the verb, and path is encoded on a satellite construction:

- (12) a. she runned away (24s4)
- b. my truck drive forward (84s6)
- c. i got to climb up ladder (42s5)

Though the sentence below is not a very good example because it is ambiguous as to whether it is describing a boundary crossing or a true crossing space event, there was also an example of manner encoded on the verb, combined with two path-encoding satellite constructions:

- (13) can I hop back in? (48s7)

### **Path and Manner on GO**

All children combined both path and manner with GO. Below are some examples of GO+manner, which was less common than GO+path:

- (14) a. I really going fast on my bike mom (103s9)
- b. go slow (37s10)

In (15), the child is producing both path and manner on satellite constructions, and the main verb is the GO:

- (15) go shooting up. (92s9)

A few children produced an interesting borderline case of manner, which was coded as “instrument”. In this type of sentence, the child would say “go on X” or “go X”, where X was something that could be used to change a location. Some examples from the corpus are listed below:

- (16) a. want go horsies (24s5)  
b. let’s go on the airplane (25s2)

These are borderline cases because, even in adult speech, such sentences are ambiguous. They could mean “enter the airplane”, or they could mean “go [by means of] airplane” or “go [by means of] horsies”, in which case these sentences should be coded as expressing manner.

### **Interim Discussion: Early Speech about Motion Events**

The data presented in this section showed that there is a great deal of variability with it comes to what verbs are really frequent: on the level of the verb, only GO and BRING were produced by all children. Interestingly, there was not much variability between subjects when it came to production of path and manner constructions: every child produced 6 out of the 11 constructions I described, which is all the more remarkable given the spontaneous nature of the data. Most of the manner verbs in this dataset were produced by age 2;2, and the onset of the latest path and manner combination was at 2;10. This is about a year younger than the children in the studies presented in Allen et al. (2003) and Allen et al. (2007), indicating that researchers interested in looking at path and manner development should use younger children in order to see the full developmental trajectory of talk about motion events.

The variety and apparent productivity of the path and manner combinations in this data show that speech about motion events is a fruitful area for further research on the acquisition of syntax. Children spontaneously combine verbs with satellite expressions and verbs with verbs very early in development, and the robust nature of many of these constructions (those which were produced by every child), is evidence against the claim made by Allen et al. (2003), that children have trouble with the morphosyntax of combining path and manner.

## 4 Results: Developmental Trajectory of Path and Manner

In the section above, I presented the range of verbs and constructions found in this dataset which children use to talk about motion events. In this section, I show that the developmental trajectory predicted by the path and manner literature (repeated in 17) is not robust across children.

(17) {motion verb+path, manner verb} → manner verb+path

So, evidence for the trajectory in (17) would be manner verb+path being produced after GO+path.

As expected, there was a great deal of individual variation in this data. Because children go through developmental stages at different times, treating mean length of utterance (MLU) as the independent variable, rather than age, allows for better comparison across children.<sup>5</sup> Below is a chart of the onset of path, manner, and motion verbs, as well as the onset of GO+path and manner verb+path, with MLU on the x-axis.

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<sup>5</sup>MLU scores were calculated separately (not by me) for all utterances in the first 10 sessions; MLU was calculated by word, not morpheme (so “Seals goes bounces” would have a length of 3, not a length of 6).

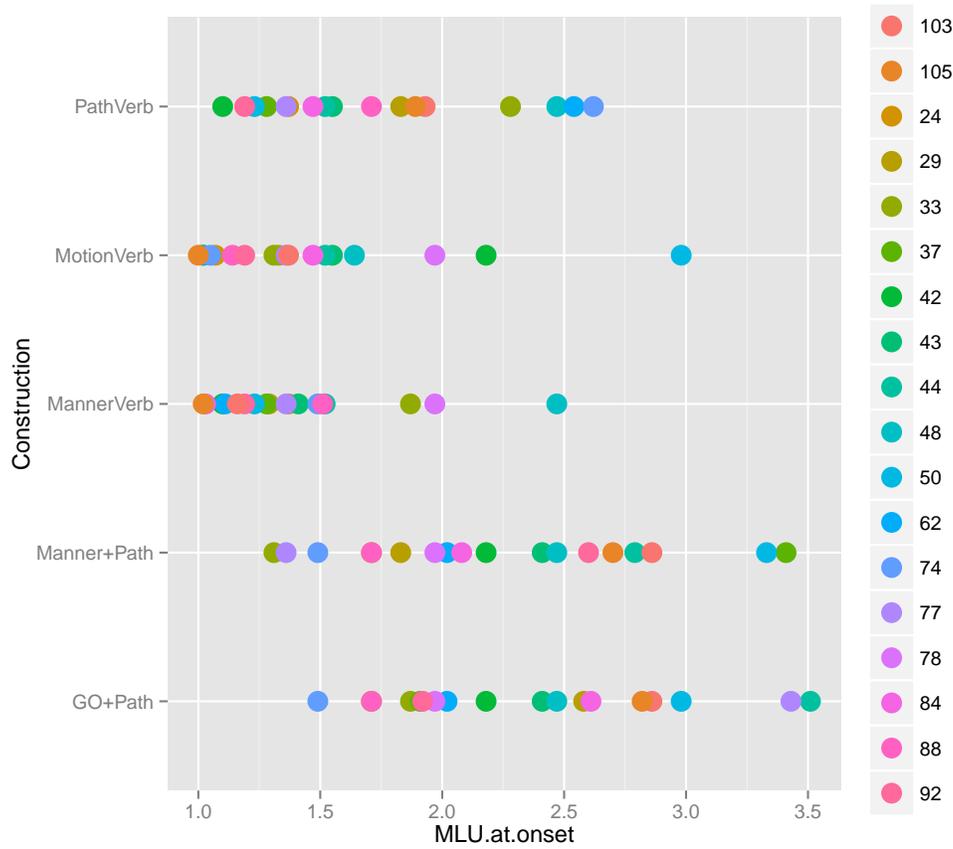


Figure 1: The onset of verbs encoding motion type (top three rows) and constructions encoding motion type (bottom two rows) by subject.

The evidence for GO+path preceding manner verb+path is not clear from the aggregate data presented in this graph. We see that onset of motion verbs (which means GO exclusively in this case, since MOVE was produced after GO for every child) and manner verbs both are clustered around the 1 - 1.5 word stage, with path verbs coming in slightly later. However, the crucial comparison is between manner+path and GO+path; in order to support the developmental trajectory predicted by previous research, we should see, for most children, that GO+path precedes manner+path. To this end, Figure 2 shows, for each session, how many subjects had produced GO+path and manner verb+path.

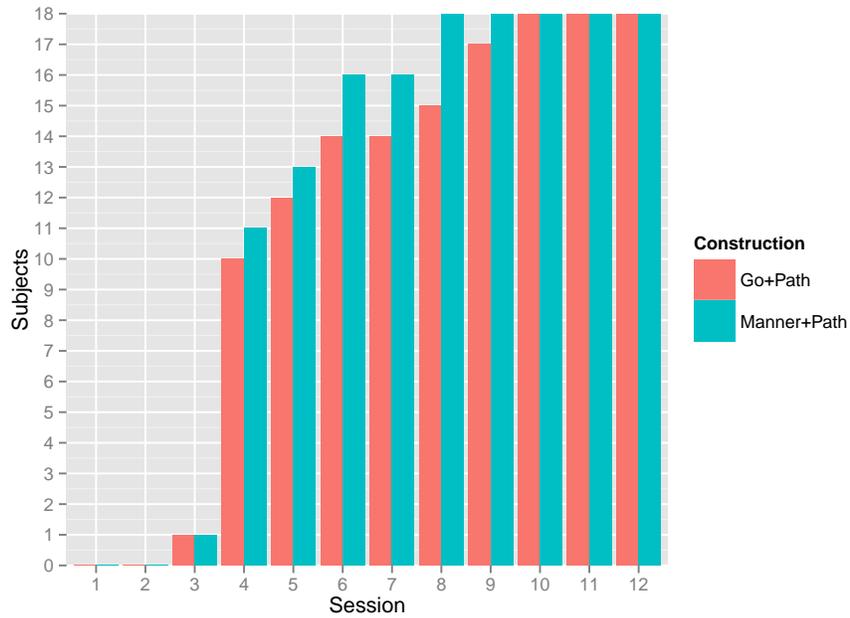


Figure 2: The number of subjects who had already produced GO+path and manner verb+path by session

As Figure 2 shows, when taking the subjects as a group, the onset of manner verb+path comes before the onset of GO+path. By session 8 (age 3;6), all children have produced at least one instance of manner verb+path, while that same milestone only comes at session 10 (age 4;6) for GO+path. While the relative production of these constructions matters, we need to look to the relative use of these constructions on an individual basis to see if the majority of children are actually following the pattern we see above.

The table below lists the difference in MLU between the onset of manner verb+path and onset of GO+path. Positive numbers are evidence that GO+path precedes manner verb+path, and negative numbers indicate the opposite pattern.

Subject	Manner+Path - GO+Path
77	2.07
29	0.75
44	0.72
33	0.56
84	0.53
105	0.12
24	0
42	0
43	0
48	0
62	0
74	0
78	0
88	0
103	0
50	-0.35
92	-0.68
37	-1.5

Table 7: For each subject, the difference in MLU at onset of manner verb+path and onset of GO+path

For most children, path combined with GO and with manner verbs in the same session. This does not tell us anything about relative ordering of these constructions; these children could have acquired these constructions in either order, or at the same time – the acquisition of these constructions might have happened in between sessions. For six of the subjects, manner+path came after GO+path, in line with the prediction made by the previous research. However, the predicted developmental trajectory is definitely not present across subjects.

### **Interim Discussion: GO as a Template**

The data above is a first step towards thinking about the role of GO in the development of path and manner. There is no definitive evidence for a causal role for GO, as 3/18 children combined manner with path before combining GO with path, and we cannot conclude anything about half of the children, for whom GO+path and manner verb+path first appeared in the same session – though this indicates that GO is playing a causal role for a very short amount of time, if at all. If

children are using their knowledge of GO to learn how to build structure on manner verbs, they are definitively not doing so universally.

Because the verb-specific information about GO does not seem to be used across the board by children as they learn how to produce manner+path, these results seem to support a generative view of language acquisition. However, further examination of one particular hypothesis about the role of verb-specific knowledge, the Pathbreaker Hypothesis, shows that a more detailed analysis would be needed in order to make a claim about the role of verb-specific knowledge.

### **The Role of Item-specific Knowledge: The Pathbreaker Hypothesis**

Clark (1978), Tomasello (1992) and others have observed that children tend to use few, highly frequent verbs early in development, and that they use these verbs generally, often with a bleached meaning – Clark calls them GENERAL PURPOSE VERBS. This observation has fed into the debate about whether children use frequent verbs to learn about argument structure more generally. Goldberg, who is one of the originators of the Pathbreaker Hypothesis, and others (Tomasello (1992), Yuan and Fisher (2009), Wonnacott et. al. (2010)) have provided experimental and naturalistic evidence showing that children use item-specific knowledge about syntactic constructions to learn novel and nonce verbs. For example, Yuan & Fisher found that children around age 2 can learn that the nonce verb BLICK is transitive from hearing it in a syntactic frame with two NPs: “Jane blicked the baby!”

However, the evidence for pathbreaking in production is decidedly mixed. In a longitudinal corpus study of one English-speaking child and 15 Hebrew-speaking children, Ninio (1999) found evidence that children get from the one-word to two-word stage by first combining noun with a few frequent verbs before they start combining nouns and verbs more productively. On the other hand, Naigles et al. (2009), in a diary study of 10 English-speaking children, did not find such a pattern across children.

So, returning to the developmental pattern predicted by the path and manner literature, if GO+path precedes manner verb+path, this would be commensurate with GO as a pathbreaker. The results I

presented above show that, if GO does act as pathbreaker, it definitely does not do so universally, and, at best, probably only does so for a minority of cases. However, the pathbreaking literature does not predict that children would all act the same – in fact, by positing that the structure of known verbs helps children learn the structure of novel verbs, this approach predicts that children would use whatever verbs they have experience with at a pathbreaker (which, as the verb production results show, can vary wildly). In fact, in his work on the acquisition of transitivity, Ninio (1999) shows that children vary as to the verbs they use as pathbreakers.

Thus, one interpretation of these results is that we simply need more information about the individual children. Another likely possibility is that not all children use pathbreakers. It might be that the children who do not use GO as a pathbreaker have a higher vocabulary than children who do. The children who have higher vocabularies would be using more manner verbs earlier, and perhaps they get enough information from these verbs to start building structure, while children with lower vocabularies must rely on verbs like GO. A preliminary look at the vocabulary of the children in this corpus does not show a clear relationship between vocabulary size and pathbreaking, but more rigorous analyses remain to be done.

Regardless, the developmental trajectory predicted by the path and manner literature is by no means robust, though the relationship between path and manner development and pathbreaking verbs seems to be a fruitful area of study, as researchers in both areas seem to have similar intuitions. Previous research has mainly looked at the production of flexible verbs and the acquisition of transitivity, but as path and manner constructions are complex (especially in comparison to simple noun-verb combinations) and found across children, researchers interested in item-specific knowledge could test the robustness of pathbreaking using experimental methods as they have done for other constructions.

## 5 Results: Acquiring the Flexible Use of GO

In the previous section, I considered the function of GO in motion events, and showed that item-specific knowledge about GO is not used across subjects. However, there does seem to be something special about the way children use GO; it was used far more flexibly in speech about motion events than were other verbs:

- (18) a. go shooting up. (92s9)  
b. want go horsies (24s5)

GO combined with manner and path, on both verbs and satellite constructions, for almost all children, while path verbs and manner verbs did not exhibit the same level of flexibility. This suggests that children know that GO can be used in diverse syntactic constructions, which is possibly related to the fact that children hear GO being used in many contexts other than just speech about motion events. In this section, I present data which shows that children start out using GO to talk about events with a change in location, and they then start using GO flexibly, as more of a functional category rather than a full lexical verb. I then describe the constructions in which children use GO and plot the relative time course of their production.

Most children used GO early and often, both as a description of a crossing space event and as a functional element in a sentence. However, only two of the children used it from the beginning:

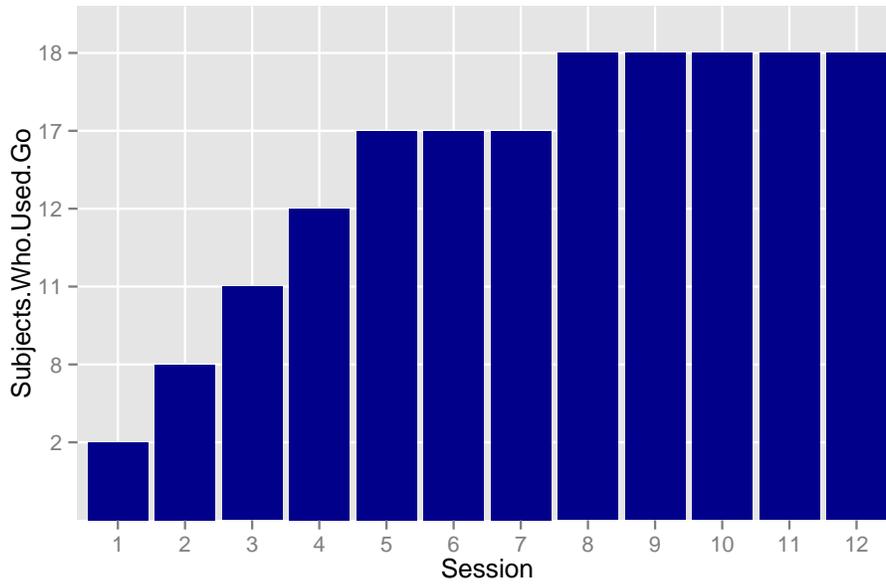


Figure 3: Number of subjects who used GO across sessions

By session 8, all of the children had produced GO, though, as mentioned earlier, 17/18 used it by session 5 (age 2;6).

GO is frequent, and it is used to talk about crossing-space events early, as the figure below shows:

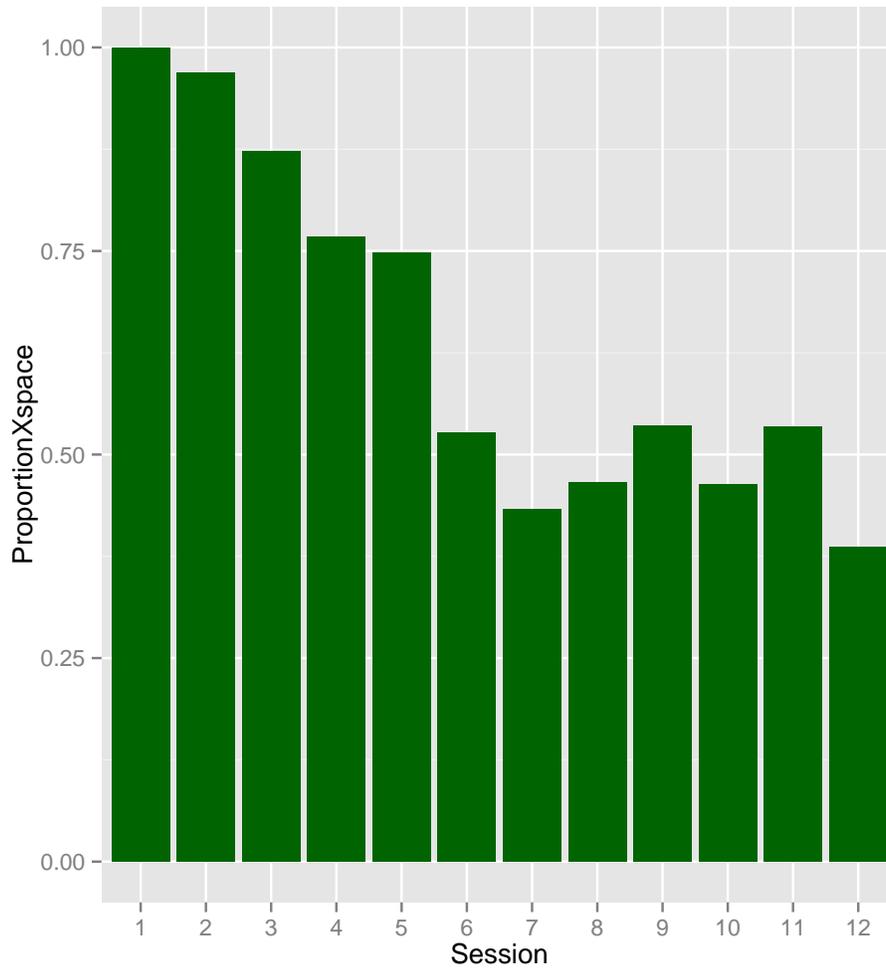


Figure 4: The proportion of uses of GO with an overt or implied goal

This data is pooled across subjects; it represents the average of the averages, so the pattern in the first five sessions could be a function of new GO-users being added to the pool. The crossing-space use of GO is preferred during the first five sessions (until age 2;6), after which the crossing-space use of GO levels out to being used about half the time.

For every child, the first session in which GO was produced contained only the canonical, crossing space use of GO. In what other ways did they use GO after having mastered its crossing-space meaning? As mentioned in the Coding section, five categories of GO came out of this corpus. Three of these categories were used in a way which could have either an overt or implied goal.

First, there was the canonical use of GO, as in “I go to the store with you” (77s10). There was also a serial verb use, in which go was followed by another verb: “go show Jana” (92s4). The final crossing-space use of GO from this data was a construction which I am calling GO AND, in which AND is not really coordinating two separate events: “go and wipe yourself, girl” (44s7) is not really describing a GOING and a WIPING event, rather, GO has a slightly more bleached meaning here. The two most abstract and functional uses of GO were GO as a general purpose verb, “I go potty” (78s8), and as an auxiliary: “I’m going to color this” (92s10).

The canonical and auxiliary uses of GO do not need further description, but the serial verb, GO AND, and general purpose constructions are less common, and therefore merit some discussion. There were 784 utterances in which GO was used in a general purpose or bleached way, and all of the children produced this construction. If GO was not being used to talk about an event in which there was a possible goal, and if it was not being used as an auxiliary, the utterance was coded as being general purpose. The bulk of these utterances were cases of GO being used to mean BELONG:

- (19) a. this goes right there? (24s8)
- b. um, I found some pieces that go together (37s12)
- c. where’s the whale go? (103s6)

There were also a few utterances which were quotative:

- (20) a. “she’s going buzz” (105s7)
- b. “and it goes roar!” (103s8)

One diagnostic for whether the sentences above actually have an in place or crossing space meaning is to add “...over there” to the end of the sentence. If these sentences are expressing in place actions, then “over there” should change the location of the entire event, not the location of the subject of the verb GO:

- (21) a. um, I found some pieces that go together over there

- b. she's going buzz over there

In (21a), the finding event is what is “over there”; the pieces are not going “over there” together. Likewise, in (21b), “she” is buzzing “over there”, she is not buzzing her way over there. However, for the serial verbs, adding “over there” does change the location of the subject of GO:

(22) a. let's go eat! (24s5)

- b. let's go eat over there

(23) a. you got to go get them (29s10)

- b. you got to go get them over there

(24) a. he fitting to go jump (33s10)

- b. he fitting to go jump over there

There were 317 instances of GO used in a serial verb construction, and 17 out of the 18 children produced it. GO GET was by far the most common verb pairing for these serial verbs; the following example might be a speech error, but it looks like evidence that “go get” might be an unanalyzed chunk for some children:

(25) hey careful go getting the tape (37s12)

Here, the child inflected the construction as if GO GET was a verb, as opposed to “going to get the tape” or even “getting the tape”.

This serial verb construction also was used in talk about motion events:

(26) no, I just want to go bike-riding (43s10)

(27) a. seals goes bounce (29s5)

- b. they going run (24s7)

(26) is a relatively straightforward example of GO attaching to a gerund, but the examples in (27) are not grammatical in adult speech; GO is inflected, rather than BOUNCE or RUN. These

productions might be waystations on the path to grammatical sentences like the ones in (28) and (29) below:

(28) a. seals go bouncing

b. seals bounce

(29) a. they going to run

b. they going running

c. they running

Unfortunately, there are not enough examples to investigate this in a more systematic way.

The final construction of interest is GO AND; 6 children produced a total of 13 of these constructions:

(30) a. he go and pull Santa. (92s4)

b. go and wipe yourself girl. (44s7)

c. I go and play (42s8)

d. I'll go and get some cereal. (44s9)

(31) a. everybody went and had to stand on this thing (24s11)

b. go and sit down and go get some homework she said? (44s12)

In (31a), we see that inflected forms of GO also participate in this construction. (31b) is an example of a GO AND and serial verb construction in the same sentence; it seems like these constructions are related. They both communicate crossing space events (they pass the “over there” test), but GO AND is possibly contributing something more to the semantics of the sentence than just a simple coordination of a GOING event.

In fact, there is syntactic evidence that GO AND is not a case of simple coordination, because this construction can violate the Coordinate Structure Constraint:

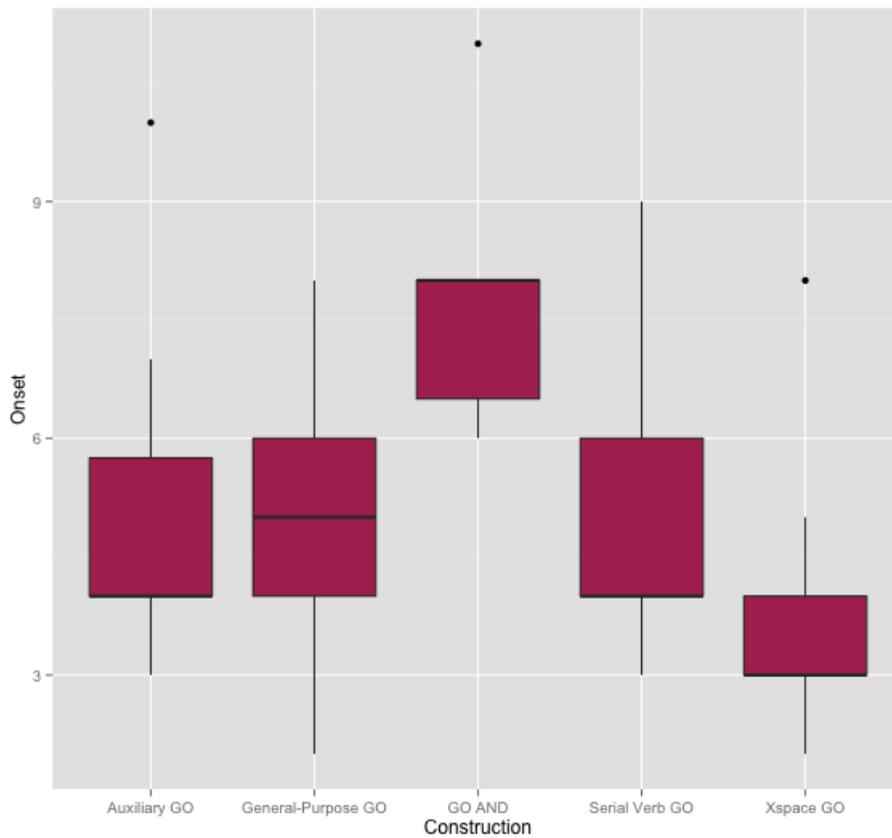
(32) What did you [go]<sub>VP</sub> and play \_\_\_?

- (33) a. \* Where did you skip and run \_\_\_? (where you are only asking about the running, not the skipping)
- b. Where did you skip \_\_ and run \_\_\_?

As (32) shows, there can be a gap in the second VP without there being a gap in the first, while (33a) is far less acceptable than (33b) is.

The constructions described above have varying levels of complexity, which we might predict to be reflected in their age of onset, with more complex constructions being acquired later. Below is a set of box plots which show the relative time course of the production of these constructions for each subject; the session of onset is on the y-axis.

Figure 5: The onset of each GO construction, all subjects



These constructions are more or less ordered across the bottom of the chart by their level of abstract or bleached meaning, from right to left. As the previous graphs showed, crossing-space, or canonical GO is the earliest-acquired construction; the average onset session was session 3, or age 1;10. Children started using auxiliaries around session 5, or age 2;6, and serial verbs were produced around the same time as well. The most variability was in the onset of general-purpose GO, which included high frequency phrases like “go potty”, which some children used very early. GO AND is the least frequent and latest-produced construction.

### **Interim Discussion: GO as a function word**

The path and manner data show that children are aware that GO is a flexible verb which can be part of various constructions, and, in this section, I showed that children start off using GO to talk about crossing space events (contra Theakston et al. (2002)). However, around age 2;6, they only use GO in this way about half the time, though the onset of GO+path and GO+manner precedes this age, indicating that children might use the flexible production of structure on GO in path and manner expressions as a precursor to functional use of GO in the constructions described above.

Of the five different constructions in which GO participates, serial verb constructions and GO AND have not been systematically studied by researchers interested in language acquisition. The serial verbs in particular are interesting from a cross-linguistic perspective; the relationship between serial verbs and auxiliaries is close in many languages, and they are often difficult to distinguish. Seiss (2010) presents interesting cross-linguistic data to this point. In terms of time course of development, we see a similar age of onset for these constructions.

There is evidence that the use of serial verb constructions might help children learn information about event structure; Choi and Arunachalam (2013) found that Korean children and adults could use cues from serial verb constructions to figure out whether a novel verb encoded path or manner. They report that children begin to use serial verb constructions in Korean as early as age three; serial verb constructions appear in this corpus at session 3, age 1;10. Knowing more about what types of constructions appear in child English can allow for studies which compare relative acquisition of

serial verbs across languages, much like the extensive path and manner literature.

## 6 Conclusion

Speech about motion events is early, frequent, and complex, which makes its acquisition something which more language acquisition researchers should pay attention to – especially those who have a stake in what acquisition can tell us about linguistic representations. This study presented a variety of data which showed the diversity and relative time course of speech about motion events and GO. First, I provided evidence that children combine path and manner early, in line with Bowerman and Choi (2003), and suggest that this means children do not seem to have problems combining manner verbs with path-encoding satellite expressions at a young age. Then, I showed that, though the work on path and manner development predicts that GO+path should precede manner verb+path, this is not a robust finding in this corpus. I suggested that the role of pathbreaking verbs in path and manner constructions should be investigated nonetheless, though the corpus data is not an ideal means to do this. Finally, I presented data that children use GO to talk about crossing-space events before they use it functionally, though children combine GO with other constructions in crossing space events earlier. This corpus also yielded positive evidence for constructions which have not been fully explored as of yet in the acquisition literature, including “instrumental” manner (“want go horsies”), serial verb constructions (“he fitting to go jump”), and GO AND (“he go and pull Santa”). Providing positive evidence for rare constructions across subjects is what corpora do best, and mechanistic explanations of these constructions will be left to future statistical and experimental work.

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