Does event structure influence children's motion event expressions?

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1. Introduction

English has long been characterized as a satellite-framed language (Talmy, 1991). Its vast array of Manner verbs that co-occur with Path particles allow speakers to talk about motion with simple, single-clause syntactic constructions, regardless of the structure of an event. Thus, English speakers can describe an event that is telic, crosses a general boundary, or crosses a horizontal boundary with Manner lexicalized in the verb and Path lexicalized in an accompanying satellite. Speakers of verb-framed languages such as Spanish, on the other hand, are constrained by certain structural properties of an event (for the role of telicity, see Aske, 1989; for the role of boundary crossing, see Slobin, 1994; and for the role of horizontal boundary crossing, see Naigles et al. 1998). The efficiency with which motion can be described in English, regardless of event structure, leads to the expectation that both Manner and Path will typically be expressed in a description of a motion event by an English-speaking adult, as in (1) below.

(1)   Tomato Man *rolled down* the hill

Furthermore, acquisition studies of motion event expressions show that the expression of Manner and Path emerges early in English. In a non-linguistic study, Pulverman et al. (2002) found that English speakers as young as 14 to 17 months old attend to both Manner and Path. Choi and Bowerman's (1991) study of spontaneous speech noted expression of Path, Manner, and combinations of Manner and Path from 19 months of age. In a study of elicited narratives, Allen et al (2003) found language-specific packaging of Manner and Path among English-speaking three-yr-olds. In another elicited production task, Özçaliskan and Slobin's (1999) found roughly equal mention of Manner verbs and equal use of Manner verb + Path particle constructions between 3-year-old and adult English speakers. Finally, Hohenstein, Naigles and Eisenberg (2004), in a comparison of spontaneous production, elicited narratives and novel verb comprehension, found that by the age of 3, English-speaking children have acquired the language-specific syntactic frames for Manner and Path expression.

From previous research, we surmise that acquisition of motion event expressions, in English at least, is a fairly straightforward matter, which is unaffected by the structure of an event in terms of its telicity or crossing of boundaries. However, no acquisition studies have focused on the structure of an event with respect to differences in the relationship between Manner and Path, i.e. whether Manner and Path are causally related, and the effects that these differences have on motion event expressions. The present study, then, investigates (1) whether speakers' motion event descriptions are sensitive to causality in the relationship between Manner and Path, and (2) whether adults and children demonstrate similar patterns.

2. Method
2.1 Participants

Data were collected from 20 English-speaking three-year-olds and 20 English-speaking adults in Boston. The three-year-olds ranged in age from 3;3 to 4;3 with a mean age of 3;8. The adults ranged in age from 18 to 40. There were roughly an equal number of males and females in each participant group.

2.2 Stimuli

Narratives were elicited using six animated cartoons depicting motion events (Özyürek, Kita, & Allen, 2001). There were two main characters in the cartoons: "Tomato Man" and "Triangle Man". The motion events contained three phases: an initial phase, a target phase, and a closing phase. In the initial phase, the characters typically entered the scene. In the target phase, one character performed a target action which simultaneously incorporated both Manner and Path. In some events, the non-target character also performed an action; however, this action depicted either Manner or Path, but not both. The characters normally left the screen during the closing phase. The vignettes were short with the longest lasting 18 seconds. To give an example, the longest vignette began with both characters entering the scene on top of a cliff. First, the triangle slid off the cliff, floated in mid-air out over the water and subsequently tumbled, end over end, into the water below. Next, the tomato slid off the cliff, floated in mid-air over the ocean, and fell straight down into the water next to the triangle. In this vignette, the triangle was the target character performing the target motion event of "ROTATE DOWN."

These stimuli were prepared in two halves, exploiting Goldberg's (1997) distinction between causal and non-causal relationships between Manner and Path (Kita et al., in preparation). In the causal group, Manner is inherent to the Path and thus causes the change in location. For example, the rolling of a tomato (Manner) forces it to ascend or descend a slope (Path). In the non-causal group, Manner is incidental to the Path and simply co-occurs with the change in location. For example, the rotation on its vertical axis (Manner) of a triangle will not force its ascent or descent of the slope (Path). Screen shots of all stimuli can be found in (2) below.
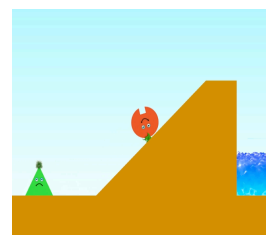
(2)
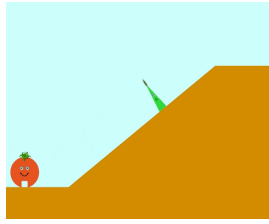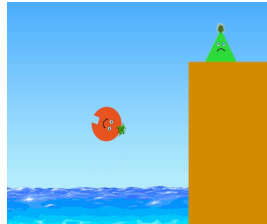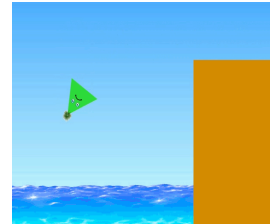*Manner-inherent events*
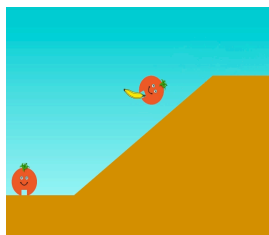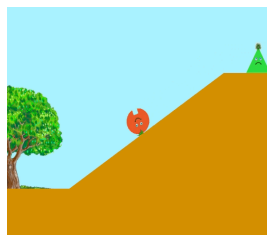
JUMP DOWN   ROLL DOWN   ROLL UP

Manner-incidental events

SPIN UP   ROTATE UP   ROTATE DOWN

2.3 Procedure

There were two tasks: a narrative task and a Manner elicitation task. In the narrative task, participants were first introduced to the two characters. After a practice period in which the task was explained and participants completed a couple of trial runs, they were shown the series of six vignettes on a laptop computer. Each vignette was shown twice and was followed by a blank screen, after which the subjects were asked to describe the events of the vignette to a naïve listener.

Children sometimes omitted key aspects in their descriptions of the vignettes. For example, a description of the initial phase could be followed by mention of the closing phase with no reference to the target phase. In such scenarios, the listener was trained to ask particular questions which would elicit the target phase. These questions made use of the information the child had already offered by asking for further descriptions of events "after" the initial phase or "before" the closing phase. The listener was trained never to ask questions that would specifically elicit Manner or Path. These questions included, "Where did Tomato Man go?" or "How did Tomato Man get there?" An example of such elicitation for JUMP DOWN is given in (3) below.

(3) Child: *One was at the top and the other was at the bottom and there was a banana* (description of scene)
    It picked up the banana (initial phase)
    and gave it to the other one down the hill (closing phase)
 Listener: *Really? So, he picked up the banana and then what happened?* (elicitation)
  Child: *He jumped down the hill* (target phase)

The narrative task was followed by the Manner elicitation task. Here the experimenter showed short clips of the target motion event and elicited the child's lexical knowledge of Manner expressions omitted during narratives.

2.4 Coding and Analysis

Narratives were scanned for mentions of the target phase. After these had been identified, utterances were divided into "speech units" comprised of a matrix clause plus any dependent clauses. Strings of speech consisting solely of tensed verbal clauses with no coordinating or subordinating markers were split into separate speech units. Once a

speech unit had been isolated, it was transcribed and coded for the semantic elements present and their syntactic combination.

Given that the stimuli included simultaneous representation of Manner and Path, we would expect English speakers to describe the events using the typologically canonical Manner verb + Path particle construction. However, speakers could also produce various other kinds of constructions not predicted by typology: speech units containing combinations of Manner and Path in typologically unexpected ways, and speech units containing Manner only and/or Path only. Typical examples of each of these options found in descriptions of the "SPIN UP" vignette follow in (4) and (5).

(4) Canonical speech units

Manner verb + Path particle	*He started spinning up the hill*
Manner verb + Path prepositional phrase	*He spun to the top*
Complex Manner construction + Path particle	*He does a spin up the hill*
Manner verb + intervening element + Path particle	*He turned his way up the hill*

(5) Non-canonical speech units

Path expression + Manner adverbial	*The triangle ascends the hill twirling*
Manner expression + Path subordinate clause	*He does a little twist as he goes up*
Manner expression only	*Triangle Man spun around*
Path expression only	*Grinch goes up first*

Speech units were coded for whether the construction was canonical or non-canonical, and if it was non-canonical, whether both Manner and Path appeared in the same speech unit or not.

It was common for participants to include more than one relevant speech unit describing the target phase in their narratives. A full narrative describing "ROTATE DOWN" is given in 6.

(6) *There's like a little steep cliff. And the Green Guy goes off the cliff <u>and kind of tumbles down</u>, <u>like goes around in circles</u>, <u>then falls into the water</u>. And then the Tomato Guy goes off the cliff, but he like goes across, and he like just falls straight down.*

Example 6 includes three different speech units, all underlined, describing the target phase. The first, "*and kind of tumbles down*," contains a canonical speech construction. The second, "*like goes around in circles*," contains a non-canonical speech construction expressing Manner only. The third speech unit, "*then falls into the water*," contains another non-canonical speech construction expressing Path only.

Three analyses were conducted. In order to investigate whether differences in causal relationships between Manner and Path affect constructions used by adults and children,

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the first analysis compared use of construction types to express Manner and Path across both groups of stimuli (Manner-inherent and Manner-incidental) and across ages. Second, in order to explore whether causal differences affected the completeness of the narrative, inclusion of Manner and Path in narrative was compared across stimulus groups and ages. Finally, in order to assess children's lexical knowledge, responses in the Manner elicitation task were analyzed.

3. Results
3.1 Use of Construction Types

In the first analysis, the mean proportion of events containing canonical and/or non-canonical constructions used at least once by each participant for each event were calculated for all narratives mentioning both Manner and Path. Canonical constructions were of types outlined in (4). Non-canonical constructions were divided into two groups: those that contained Manner and Path in the same speech unit (non-canonical MP) and those that contained Manner and Path in different speech units (non-canonical M / P). Proportions do not add up to one since narratives could contain multiple target speech units of different construction types. Figure 1 shows the results from the adults and Figure 2, the results from the children.

Figure 1: Mean proportion of events with canonical and non-canonical (MP, M / P) constructions in adult narratives
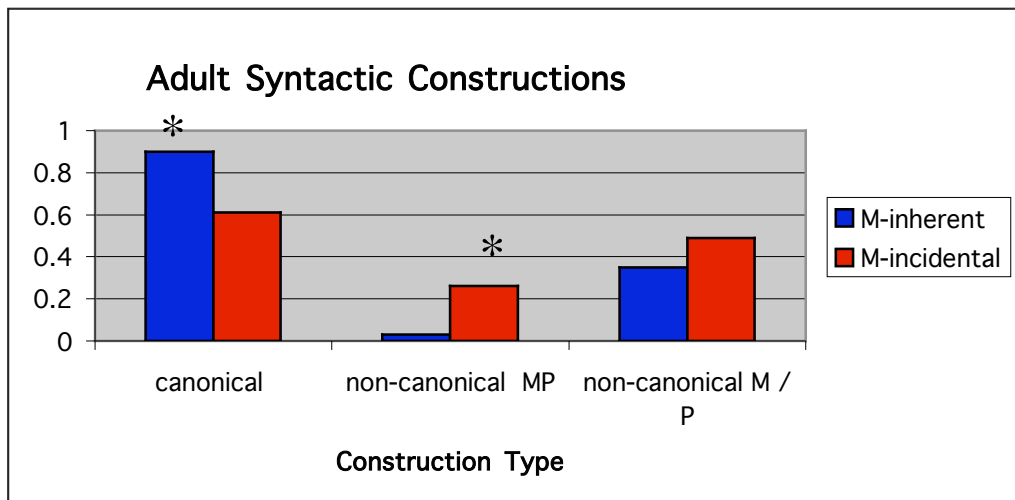
Figure 2: Mean proportion of events with canonical and non-canonical (MP, M / P) constructions in child narratives
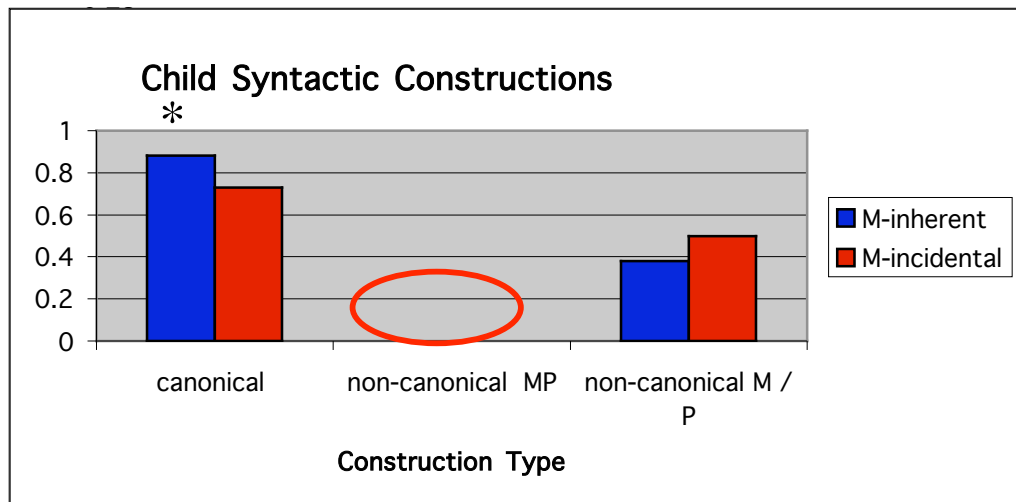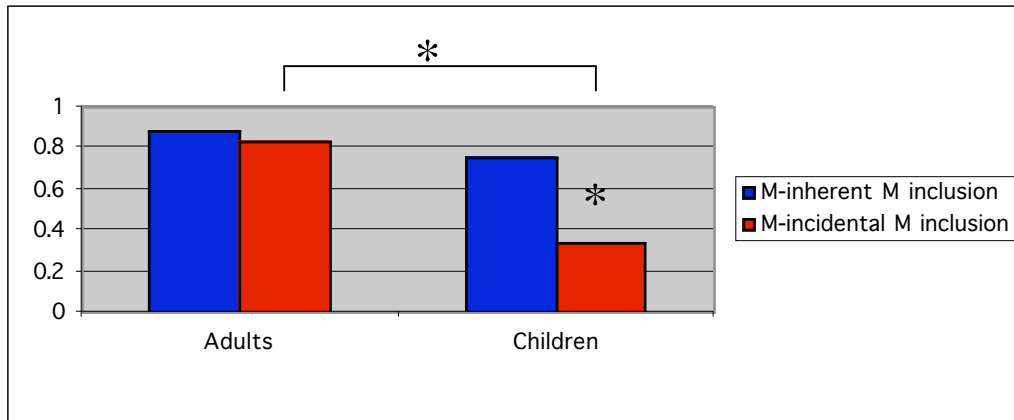

Different repeated measures ANOVAs were conducted with EVENT TYPE (Manner-inherent and Manner-incidental) as within subjects and AGE as between subjects variables for each construction type. The analysis of canonical constructions revealed that both adults and children used more canonical utterances for Manner-inherent events than for Manner-incidental ones (main effect of EVENT TYPE: F= (1,29) =7.910, p<.01). The analysis of non-canonical MP constructions, which did not include the child results since they never used non-canonical MP constructions, revealed that adults used more non-canonical MPs for Manner-incidental than for Manner-inherent events (t(19)=3.06, p<.01). Finally, in the analysis of non-canonical M / P constructions, there were no main effects of AGE or EVENT TYPE; thus, both children and adults used this construction type to a similar extent and at the same frequency for both event types.

It is clear from the change in the use of canonical constructions that children were sensitive to the difference between Manner-inherent and Manner-incidental stimuli. However, unlike their adult counterparts, they did not employ non-canonical MP constructions for Manner-incidental stimuli. Furthermore, neither group changed use of non-canonical M / P constructions. However, children might have marked Manner-incidental events in an alternative way. One possibility is that they simply omitted either Manner or Path from their narratives. We turn to this prospect next.
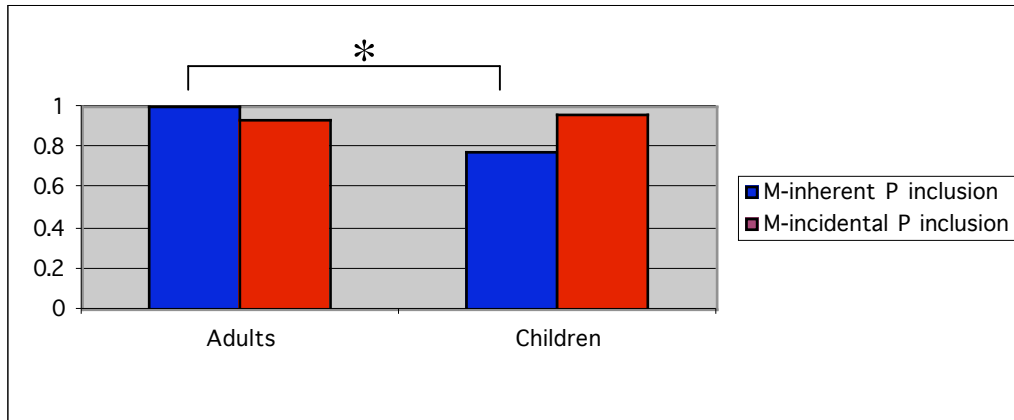
3.2 Semantic Inclusions

In the second analysis, mean proportions of events with mention of Manner and Path were calculated for each participant in all narratives. Figure 3 shows the results for Manner inclusion and Figure 4, the results for Path inclusion.

Figure 3: Mean proportion of events with mentions of Manner

Figure 4: Mean proportion of events with mentions of Path

Two repeated measures ANOVAs were conducted with EVENT TYPE (Manner-inherent and Manner-incidental) as within subjects and AGE as between subjects variables for each type of semantic inclusion. The first ANOVA revealed interaction between AGE and EVENT TYPE (F= (1,38)=32.428, p<.01). Posthoc t-tests with Bonferroni adjustment revealed that children mentioned Manner less often for Manner-incidental than Manner-inherent events (t(19)= -7.14, p<.01) and less often than adults did for Manner-incidental events (t(19)= -5.55, p<.01). The second ANOVA also revealed interaction between AGE and EVENT TYPE (F= (1,38)=10.68, p<.01). Posthoc t-tests with Bonferroni adjustment revealed that children mentioned Path less often than adults did for Manner-inherent events (t(19)=3.39, p<.01).

We see, therefore, that children mark sensitivity to Manner-incidental events by including Manner less often in descriptions of these events. In addition, children include Path less often than adults for Manner-inherent events. Since there were only two Path expressions included in the stimuli (UP and DOWN), and all children used each of these at least once in their narratives, we can conclude that lack of lexical knowledge did not cause omission of Path in child narratives. However, the same cannot be assumed for

Manner omissions. It could be that children mentioned Manner less often than their adult counterparts because they did not possess sufficient lexical knowledge to express it. We deal with this issue in the following section.

3.3 Manner Elicitation Task

The Manner elicitation task was only completed for those participants who did not mention Manner while performing a given narrative. During this task, the experimenter asked participants to describe the actions of the target character, focusing on "how" the character moved, while they viewed short clips of the target motion event. Although some responses were more appropriate than others, e.g. *spinning* versus *rolling* or *squiggled* for the SPIN UP event, 100% of children produced some kind of lexical expression for Manners previously omitted. Thus, we provisionally conclude that insufficient lexical knowledge did not account for Manner omissions among children in descriptions of Manner-incidental stimuli; however, we return to this issue in section 4.3.

4. Discussion

Given that we expect both Manner and Path to be expressed in canonical syntactic frames by English speakers as young as three years old, this paper investigates whether English speakers are sensitive to event structure, more specifically whether they are sensitive to differences in causal relationships between Manner and Path, how such sensitivity is realized, and whether adults and children exhibit similar patterns. The main findings from this study are that English speakers are indeed sensitive to such differences in Manner-Path relationships and that children are both similar to and different from adults in the realization of this sensitivity.

4.1 Similarities between Adults and Children

From the first analysis, we see that both adults and children overwhelmingly prefer canonical syntactic constructions (Manner verb + Path particle) to describe motion events. In this respect, our findings concur with those of previous studies. By the age of three, children are adult-like in their expression of simultaneous occurrences of Manner and Path. However, we also see that this preference is stronger for motion events where Manner is inherent to the change in location. When Manner is incidental to the change in location, both adults and children use significantly fewer constructions of this type.

We can conclude, then, that children, as well as adults, are sensitive to when Paths of motion are caused by Manners of motion and express this relationship with a canonical syntactic construction. Conversely, both groups are also sensitive to changes in this relationship, and employ the same canonical construction for such changes less often. Although neither group expresses Manner and Path in different speech units to a greater degree for Manner-incidental events, they do differ in their marking of incidental Manners.

4.2 Differences between Adults and Children

When adults are describing events in which Manner does not cause the change in location, they often use non-canonical constructions such as those in (5), where Manner and Path appear separately in a matrix plus subordinate clause relationship or where Manner appears as an adjunct in a gerund-like construction. Since matrix-subordinate structures, in particular, are used to describe simultaneous but not necessarily related actions, it seems that adults can more accurately transmit the incidental nature of the Manner with such syntactic choices. Children, in contrast, do not appear to have any facility with these constructions, as they do not make use of them at all. There are two possible reasons for this. Firstly, the constructions may be too complex for children to produce, and secondly, they may not be sufficiently exposed to them in the input. For young English speakers, a combination of both explanations is likely. Allen et al. (2003) show how three-year-old Turkish speakers, while exposed to matrix-subordinate constructions as the canonical syntactic frame, produce fewer such constructions than their adult counterparts. Hence, we see how even with abundant exposure, the distribution of such complex constructions takes time to develop to adult-like levels.

Given the difficulty of producing Path and incidental Manner in the same speech unit, one might expect English-speaking children instead to utilize stacked independent clauses expressing Manner and Path separately. This would perhaps not communicate the simultaneity of the components as well as matrix-subordinating constructions, but might at least convey an absence of causal relations. However, children do not employ more of such constructions for Manner-incidental events either. The obvious question, then, is what children do instead.

From the second analysis of mentions of Manner and Path, we see the way in which children mark Manner-incidental stimuli. Figure 3 demonstrates how Manner is included much less often in child narratives of Manner-incidental stimuli than in child narratives of Manner-inherent stimuli and less often than in adult narratives of either kind. Quite simply, when children are faced with the task of describing the non-causally related co-occurrence of Manner and Path, they are quite likely to omit the Manner component.

There are two potential explanations for the phenomenon above: pragmatics and memory load. First, children may conclude that in cases where Manner is merely incidental, Path is the most important element, and they need only mention that which carries the character forward in the story line. Alternatively, children may understand the incidental nature of the Manner and may also realize that the only syntactic frame available for them to express both Manner and Path is a set of consecutive independent clauses, but fail to hold the Manner component in short-term memory long enough to articulate it. In other words, with each clause and therefore each semantic component representing a separate processing unit, children may possess insufficient memory for the required number of processing units. With the current data and analyses, it is impossible to tease apart these two explanations for omissions of Manner in descriptions of Manner-incidental motion events.

Finally, since Path is defined as the core schema of a motion event taking the Figure to its Goal (Talmy, 1991), adults almost always include this component as shown in their ceiling levels for Path inclusion. However, children may not be fully cognizant of the importance of Path. Furthermore, we can predict child narratives to be less complete in

general than adult narratives. Comparable levels of below ceiling inclusion of Manner and Path during child narratives of Manner-inherent events reflects this, suggesting that children include both items less often than adults do. Therefore, in addition to the findings particular to Manner-incidental events given above, we can also reasonably expect there to be a difference in inclusion of Path between adults and children, as shown in Figure 4.

4.3 Future Directions

Two assumptions underlying the conclusions presented in this study are that (1) three-year-olds do not possess the syntactic capability to produce matrix-subordinate clauses with which to express non-causal relationships between Manner and Path, and (2) they do not hear a sufficient number of such examples in the input. The corpus presented here is, however, somewhat limited and unable to speak to the second assumption at all. To confirm these propositions, it would be useful to consult a much larger corpus, e.g. the Childes database, for instances, or lack of instances, of such complex constructions.

Furthermore, while we see that children are sensitive to Manner-incidental events and use canonical syntactic constructions less often to describe them, we still cannot explain their preference to omit Manner from their narratives rather than simply including both Manner and Path in consecutive independent clauses. Pragmatics and memory load have been proposed as possible explanations; however, lexical knowledge cannot be completed discounted. Although the Manner elicitation task revealed that all children produced *some* kind of expression to describe a previously omitted Manner, it remains to be seen how adult-like these responses actually were. Some children created novel verbs, e.g. *squiggled*, which may have been easily inserted into available syntactic frames and thus included in the narrative. However, other responses were very heavy, e.g. *twisted to the side and to the side,* and it is not clear at this stage how easily such items could have been incorporated into a given syntactic frame. If they could not, lexical constraints would remain a potential explanatory factor for Manner omissions.

5. Conclusion

In summary, this paper has investigated the impact of event structure on motion event expressions among English-speaking children. We have shown that by the age of three, children, like adults, are sensitive to differences in the relationship between Manner and Path, i.e. whether Manner is inherent or incidental to the change in location. This sensitivity is realized when both adults and children use significantly fewer canonical syntactic frames. However, while adults employ more non-canonical constructions when describing cases of incidental Manner, children tend to omit incidental Manners. Further investigation is needed to assess whether such omission is motivated by understanding of pragmatics, constraints on memory load, or the nature of lexical knowledge.

References

Allen, S., Özyürek, A., Kita, S., Brown, A., Turanli, R., & Ishizuka, T. (2003). Early speech about manner and path in Turkish and English: Universal or language-specific? *Proceedings of the 27th Annual Boston University Conference on Language Development, 1*, 63-72.

Choi, S., & Bowerman, M. (1991). Learning to express motion events in English and Korean: The influence of language-specific lexicalization patterns. *Cognition, 41*, 83-121.

Goldberg, A. E. (1997). The relationship between verbs and constructions. In M. Verspoor, K. D. Lee & E. Sweester (Eds.), *Current issues in linguistic theory, 150: Lexical and syntactical constructions and the construction of meaning*. Philadelphia: John Benjamin.

Hohenstein, J. M., Naigles, L. R., & Eisenberg, A. R. (2004). Keeping verb acquisition in motion: A comparison of English and Spanish. In G. Hall & S. Waxman (Eds.), *Weaving a lexicon*. Cambridge: MIT Press.

Kita, S., Özyürek, A., Allen, S., Brown, A., Furman, R., & Ishizuka, T. (in preparation). Linguistic effects on representational gestures: How English speakers express motion events in speech and gesture.

Ozcaliskan, S., & Slobin, D. (1999). Learning how to search for the frog: Expressions of Manner of motion in English, Spanish, and Turkish. *Proceedings of the 23rd Annual Boston University Conference on Language Development, 2.*

Özyürek, A., Kita, S., & Allen, S. (2001). Tomato Man movies: Stimulus kit designed to elicit manner, path and causal constructions in motion events with regard to speech and gestures. Nijmegen, The Netherlands: Max Planck Institute for Psycholinguistics, Language and Cognition group.

Pulverman, R., Sootsman, J. L., Golinkoff, R. M., & Hirsh-Pasek, K. (2002). Infants' non-linguistic processing of motion events: One-year-old English speakers are interested in manner. *Proceedings of the 31st Stanford Child Language Research Forum.*

Talmy, L. (1991). Paths to realization: A typology of event conflation. *Proceedings of the Seventeenth Annual Meeting of the Berkeley Linguistics Society*, 480-519.