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Learning Manner and Path Verbs from the Serial Verb Construction in Korean

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1. Introduction

To learn a new word, children must isolate the linguistic form from the sentence in which it occurs, identify its referent in the world, and establish a mapping between the form and the meaning. Verb learning is particularly challenging with respect to these latter two tasks. Events are often complex, with multiple co-occurring components, and verbs only encode a subset of these components. Verbs like *buy* and *sell*, for example, lexicalize different perspectives on the very same event. Decades of research, however, have demonstrated that the linguistic context in which a verb appears can help children determine which part of a complex event a verb lexicalizes, thereby helping them acquire its meaning (e.g., Fisher, 2002, Fisher, Hall, Rakowitz, & Gleitman, 1994; Gleitman, 1990; Hirsh-Pasek & Golinkoff, 1996; Landau & Gleitman, 1985, Naigles, 1990). This research has focused largely on the contribution of the *nouns* that appear with the verb: the number and position of the verb's noun phrase arguments. The number of nouns that appear with a verb can help children narrow down its meaning; for example, while 'gorp' is likely to refer to a causative action in 'He gorps her,' 'gorp' in 'He gorps.' likely refers to a non-causative action (Fisher, 2002; Gertner & Fisher, 2012; Yuan & Fisher, 2009, Yuan, Fisher, & Snedeker, 2012). The position of the noun phrases can also help. For example, given an event in which a lion chases an antelope, children can use the position of the noun phrases "the lion" and "the antelope" in the sentence to determine whether "chasing" or "fleeing" is being described (The lion gorped the antelope vs. The antelope gorped the lion) (Fisher et al., 1994).

Despite children's skill at using information from the nouns with which a novel verb appears, verb learning is additionally challenging because languages differ in the meaning components they typically encode in verbs, and the constructions in which these components are realized (e.g., Berman & Slobin, 1994; Choi & Bowerman, 1991; Papafragou, Massey & Gleitman, 2002; Slobin, 1996; Talmy, 1985, 2000). Motion events, for example, often involve two co-

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occurring components: manner and path. One may *swim* (manner) *across a pool* (path), or *kick* (manner) a ball *between the goalposts* (path). In English, most verbs lexicalize manners of motion, while paths of motion are conveyed by prepositional phrases (with few exceptions, such as *ascend*, *descend*, *enter*, and *exit*). However, in many languages, such as Korean, a verb can lexicalize either of these components, and in fact, both manner and path can appear as verbs in the very same clause, as in (1) below.

- (1) Jaein-i wungtengi-rul ttwui-e nem-ess-e.
Jane-nom puddle-acc jump-LN (go) over-Past-SE.
'Jane jumped over the puddle.'
(nom=nominative, acc=accusative, LN=linking, SE=sentence ending)

In (1), known as a Serial Verb Construction (SVC), two verbs occur in sequence (*ttwui-e nem-e*), sharing subject and object (see Zubizarreta & Oh, 2004 for a comprehensive treatment of SVCs in Korean and cross-linguistically). In this construction, the two verbs share the two noun phrases, and thus the number and position of noun phrases do not help the child determine the meaning of each of these verbs.

How then is a Korean-acquiring child hearing a novel verb to determine whether it encodes the manner or path of motion, given that both co-occur in the event as well as in the sentence? Fortunately for the learner, there is a useful cue in the sentence: the position of the verbs with respect to each other. In an SVC, the manner verb consistently appears first in the sequence, and the path verb second (Kim, 1995), as in (2):¹

- (2)
a. (MANNER-PATH) Jaein-i wungtengi-rul ttwui-e nem-ess-e. (jump over)
b. (PATH-MANNER)² *Jaein-i wungtengi-rul nem-e ttwui-ess-e. (over jump)

SVCs therefore present both a learning problem and a learning opportunity. The presence of two verbs in a sentence in sequence means that children cannot use cues like the number and position of the nouns to disambiguate the two verbs. But if, as we hypothesize in the current study, children can use the positioning of the two verbs with respect to each other as a cue, then SVCs provide a good learning context. Manners and paths of course co-occur in real world events, so the presence of a context which lexicalizes both of them and

¹ There are other kinds of SVCs as well, for example including two verbs describing sequential activities (e.g., buying and eating a sandwich). An SVC describing a motion event can also include two path verbs rather than manner and path. What is crucial for the present study is that when both manner and path are depicted in a motion event, and lexicalized in an SVC, they will appear in a consistent order.

² There are very few exceptions to this order, such as, 'tili pakta,' (in hit, "hit in" or "ram in"). Manner-path is the overwhelmingly prevalent sequence in Korean as well as in other languages that have SVCs (Kim, 1995; Zubizarreta & Oh, 2007).

allows the learner to distinguish them by their position may be extremely beneficial. (Of course, a prerequisite for being able to use SVCs to acquire manner and path verbs is that the construction appears in child-directed speech. While corpus studies specifically including SVCs are rare, the available evidence indicates that it does; Choi (2011) finds not only that SVCs are common in child-directed speech, but also that children begin to use SVCs in their own productions as early as three years of age (see also Oh, 2003).)

To determine whether Korean children and adults can use the position of a verb within an SVC to determine if it encodes a manner or path, we conducted two verb learning experiments. In both experiments, we presented participants with an SVC with either two novel verbs (Experiment 1) or one novel verb paired with a familiar verb (Experiment 2). In Experiment 1, participants had to map the two novel verbs to manner and path, respectively. In Experiment 2, the novel verb appeared in either first position (manner position) or second position (path position) in the SVC, with the other position occupied by either a familiar path verb or familiar manner verb, respectively.

2. Experiment 1: Two novel verbs

In Experiment 1, we presented children with two novel verbs in SVCs. To succeed, children had to map the first novel verb to a manner meaning and the second novel verb to a path meaning.

2.1. Methods

Participants. Adults ($n = 23$), and children ($n = 48$, ages 5;2 to 6;11, mean age 6;0) participated. Adult participants were students at universities and child participants were recruited via local preschools located in Seoul.

Materials & Procedure. Each participant viewed four trials, each composed of two subphases: a Complex Event Familiarization, and a Test phase. See Table 1.

Complex Event Familiarization. First, participants viewed a video depicting a complex novel event in which an actor performed an action with two simultaneous subcomponents: a novel path (e.g., traversing an S-shaped path around two small trees) and a novel manner (e.g., monkey-like walk). Participants heard a novel verb in an SVC with two novel verbs, e.g., “Jane-nom trees-acc moopi-e kato-n-ta” (Jane is *moop-kato*-ing the trees). Across four trials, eight novel verbs were introduced and the presentation order of these verbs was counterbalanced across participants.

Test. Next, participants viewed two side-by-side videos simultaneously, one depicting the manner they had seen before (monkey-walk) but no salient path (moving in place), and the other depicting the path (S-shaped path) but no salient manner (walking normally). Participants were asked to point to “*mooping*” and “*katoing*.” The order of presentation of these two questions was counterbalanced. An adult experimenter pressed the response key matched with

the event they selected on behalf of both the adult and child participants. E-prime (2.0, Psychology Software Tools, Inc.) was used to present the videos and to collect pointing responses.

Table 1. Schematic of representative trial of Experiment 1. (Linguistic stimuli are provided as English translations for readability.)

Complex Event Familiarization	Test
 <p data-bbox="578 680 781 730">Manner: monkey walk Path: under curtain</p>	 <p data-bbox="873 680 1060 705">Manner Path</p>
<p data-bbox="557 751 805 806">Ginny is moop-katoing the curtain!</p>	<p data-bbox="862 751 1078 806">Which one is mooping? Which one is katoing?</p>

Coding & Analysis. The mean proportion of trials on which participants provided a correct response was computed and compared to chance (50%). (All participants provided two responses, one to each of the scenes; there were no trials on which participants only provided one pointing response, or pointed twice to the same scene in response to each of the two distinct prompts.)

2.2. Results

Adults, as predicted, mapped the novel verbs correctly (78% of the time), assigning the verb that had appeared in first position in the SVC to a manner interpretation, and the verb that had appeared in second position to a path interpretation. Their performance is significantly better than chance ($t(22) = 5.35$, $p < .001$). Children, however, correctly mapped the verbs just 56% of the time, marginally different from chance ($t(47) = 1.81$, $p = .077$). See Figure 1.

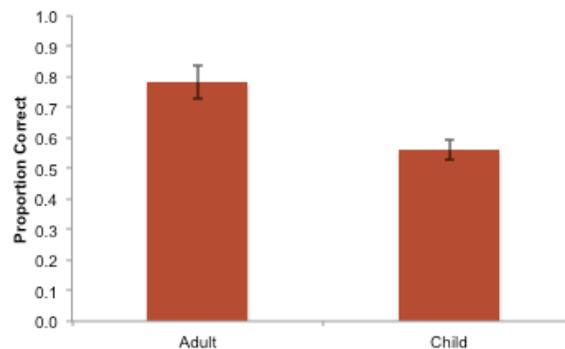


Figure 1. Mean proportion of correct responses for adults and children mapping two novel verbs. Error bars represent standard error of the mean.

2.3. Discussion

Adults were able to use this subtle positional cue to map two novel verbs' meanings in SVCs describing motion events. Children, however, struggled to do so. Still, their marginally above-chance performance suggests that children may have been sensitive to the position of the two verbs in the SVC, but that, perhaps, the task demand was too high: we required children to map two novel verbs at the same time, and to produce pointing responses. Therefore in Experiment 2, we asked participants to map only one novel verb on each trial. We paired the novel verb with a familiar verb in the SVC. We also measured children's looking time to the test events in addition to pointing responses to determine whether a measure with lower task demands would show evidence of learning.

3. Experiment 2: One novel verb

In Experiment 2, we asked whether Korean speaking children and adults can use a novel verb's position within an SVC to determine whether it encodes a manner or path, when the other verb in the SVC is a known verb. We simplified the task from Experiment 1 in three ways. First, participants only had to map one novel verb on each trial. Second, building on recent evidence that children as young as 1.5 years can use the sentence in which a novel verb appears to determine aspects of its meaning, even without a concomitant visual event (Arunachalam & Waxman, 2010; Arunachalam, Escovar, Hansen, & Waxman, 2011; Scott & Fisher, 2009; Yuan & Fisher, 2009; Yuan, Messenger, & Fisher, 2011), we presented the SVCs in the context of a conversation between two actors. The dialogues were designed to allow children to parcel out the phonological forms of the novel verbs without the distraction of simultaneously viewing a complex dynamic scene. Third, we included looking behavior as a dependent measure in addition to pointing. We suspected that for children, at least, a task with lower task demands would yield better results.

We presented Korean-speaking 4- to 6-year-olds and adults with a dialogue containing a novel verb in an SVC without any concomitant event. The novel verb appeared either in the first position in the SVC (manner position), or in the second position (path position), and the other position was filled by a known verb. They then viewed a complex event depicting both a salient manner and salient path (as in Experiment 1). During test, participants were asked to find "mooping," given one scene depicting just the salient manner they had just seen, and the other just the salient path. If children are sensitive to the positional regularity of the novel verb within the SVC, they should map the novel verb to the manner event if it had appeared in the SVC's first position in the dialogues, and to the path event if it had appeared in the SVC's second position. To succeed in this paradigm, participants must (1) use the information presented in the dialogues to determine the novel verb's position within the SVC (first—manner, or second—path), (2) map the novel verb to the appropriate component of the complex scene (manner or path), and (3) identify that component in

isolation at test.

3.1. Methods

Participants

Adults ($n = 17$), and children ($n = 42$, ages 4;4 to 6;4, mean age 5;2) participated. The children were recruited from local preschools and kindergartens, located in Seoul and Suwon, Korea. The adults were recruited via the subject pool at Ajou University (Suwon, Korea) and received course credit for their participation.

Materials & Procedure

The procedure began with two practice trials involving familiar SVCs (*run-exit* and *push-move up*), followed by four test trials involving a novel verb occurring with a known verb either in the first or second position within the SVC (e.g., *run-moop*). Two of the trials involved single-participant motion verbs, and the other two involved caused motion verbs, in which the agent caused an object to move in the intended manner and path. Condition assignment was within-subject: each participant was presented two trials in which the novel verb appeared in first (manner) position, and two trials in which the novel verb appeared in second (path) position. Four presentation lists were created to counterbalance the position of the novel verb within the SVC and the assignment of the novel verbs to meaning (e.g., ‘moop’ was the manner verb in presentation lists one and three while it was the path verb in presentation lists two and four). Trial order was also counterbalanced. E-prime (2.0, Psychology Software Tools, Inc.) was used to present the videos and to record participants’ pointing responses.

Each trial consisted of three phases: (1) dialogues, (2) complex event, and (3) test. See Table 2.

Dialogues. Participants first viewed a video of a man and a woman conversing. These dialogues contained a novel verb in an SVC. Its position varied by condition: on half of the trials, it appeared either in the First Position (e.g., *moop-go over*), and in the other half, in the Second Position (*run-moop*); a known verb filled the other position. The novel verb was presented a total of 6 times during this phase. The novel verb’s position in the SVC and the number of noun phrase arguments was held constant throughout the dialogue, but the novel verb appeared with different event participants (e.g., Ally, Jini) and different known verbs.

A dialogue example (novel verb in 2nd position: “moop” = S-shape path):

MAN: ecey, kilssey, Ally-ka pwuekh-ul ttwui-e moop-iess-tay.

yesterday, well, Ally-Nom kitchen-Acc jump-L moop-PAST-quote
‘Yesterday, Ally jump-mooped the kitchen.’

WOMAN: cengmal? Ally-ka pwuekh-ul ttwui-e moop-iess-e?

really? Ally-Nom kitchen-Acc jump-L moop-PAST-SE-Q
‘Really? Ally jump-mooped the kitchen?’

kilem Jini-nun?
then Jini-Top?
And Jini?

MAN: Jini-nun pokto-rul talli-e moop-iess-tay.
Jini-Top hallway-Acc run-L moop-PAST-quote.
'Jini run-mooped the hallway.'

WOMAN: mwueraku? Jini-nun pokto-rul talli-e moop-iess-tako?
what? Jini-Top hallway-Acc run-L moop-PAST-quote?
'What? Jini run-mooped the hallway?'

MAN: kilekey malya. Ally-nun pwuekh-dul ttwui-e moop-iess-ko, Jini-nun
pokto-rul talli-e moop-iess-tay.
that right. Ally-Top kitchen-Acc jump-L moop-PAST-Con, Jini-Top
hallway-Acc run-L moop-PAST-quote.
'That's right. Ally jump-mooped the kitchen, and Jini run-mooped the
hallway.'

Complex Event Familiarization. Next, participants viewed a video depicting a complex novel event with both a novel manner and a novel path (identical to Experiment 1). Participants heard, "Look! Mooping!" Note that presentation of the novel verb in this phase does not help the child determine the verb's meaning. While it indicates that the referent of the novel verb is present on the screen, it does not identify which event component is being labeled. Note also that during the dialogue phase, none of the verbs mentioned with the novel verb described the complex event: while the dialogues incorporated a known verb, e.g., run-*moop*, the complex event depicted a novel manner (i.e. not running) as well as a novel path. Children could not have simply remembered the sentences from the dialogue phase and mapped the novel verb to an event that was not mentioned during the dialogues.

Test. Next, participants viewed the same test phase as in Experiment 1: two side-by-side videos simultaneously, one depicting the manner they had seen before (monkey-walk) but no salient path (moving in place), and the other depicting the path (S-shaped path) but no salient manner (walking normally). Participants were asked to find 'mooping'. Their eye gaze was video-recorded, and pointing responses were entered by the experimenter into E-prime via the keyboard.

Coding & Analysis. For each trial, the first point served as dependent measure. If a participant failed to point on a particular trial, that trial was excluded from analysis; a total of four trials were excluded for this reason (from three participants). For each participant, we calculated the proportion of Manner event selection in each condition, and submitted it to an Analysis of Variance treating Syntactic Position (2: first, second) as a within-participant factor for adults and children, separately.

Eye gaze responses were coded by two coders, who reached 90% agreement on the direction of eye gaze data of three randomly selected children's coding. During the Response period, the onset of the novel word began at 1.5 sec after

the scenes appeared on the screen (averaged across trials). Therefore, we created two analysis windows during the Response period: (1) 0-1.5 seconds, and (2) 1.5-3 seconds. We computed the mean proportion of frames during which each child looked to the Manner Event during each of these analysis windows, and compared them across conditions. Our prediction was that during Window 1, there would be no difference between the Manner and Path conditions, because children had not yet been prompted with the novel verb, but that in Window 2, differences would emerge, with children in the First Position condition looking more at the Manner Event than children in the Second Position condition.

Table 2. Schematic of representative trial of Experiment 2. (Linguistic stimuli are provided as English translations for readability.)

Dialogue	Complex Event Familiarization	Test
	 <p>Manner: monkey walk Path: under curtain</p>	 <p>Manner Path</p>
<p>1st position: ...moop went-over</p> <p>2nd position: ...run mooped</p>	<p>Look, mooping!</p>	<p>Which one is mooping?</p>

3.2. Results

Pointing. Adults, as in Experiment 1, successfully used the positional cue to map the novel verbs to meaning, preferring the Manner Event 82% of the time in the First Position condition, and just 35% of the time in the Second Position. This difference between conditions is significant ($F(1, 16) = 18.62, p < .001$).

Children, however, preferred the Manner Event at test in both conditions, with children in the First Position Condition pointing to the Manner Event 69% of the time, and those in the Second position condition 64% of the time. This lack of effect of Syntactic Position is borne out statistically. An Analysis of Variance with Syntactic Position as a within-subject fixed factor reveals no significant effect of Syntactic Position: $F(1, 40) = 0.46, p = .50$. See Figure 2.

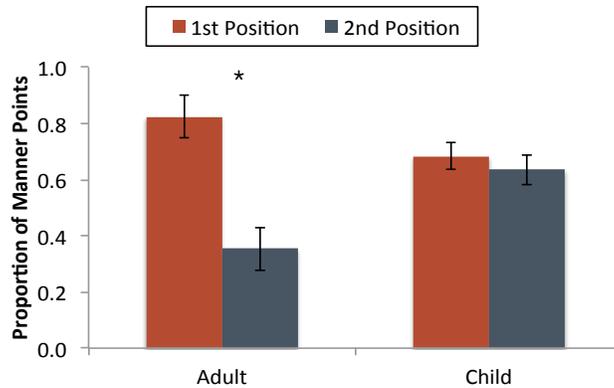


Figure 2. Mean proportion of points to the Manner Event, grouped by Syntactic Position, for adult and child participants. Error bars represent standard error of the mean.

Eye gaze.

The pointing results suggest that children failed to use the syntactic cue to assign the verbs to meaning. However, children’s eye gaze patterns reveal a slightly different picture. Recall that we analyzed the data in two windows, the first from 0 to 1.5 seconds from the beginning of the Response period, before children could have reasonably heard and integrated the test question while viewing the test scenes, and the second from 1.5 to 3.0 seconds from Response. See Figure 3. In Analysis Window 1, children’s preference for the Manner Event did not differ significantly between conditions, $F(1, 24) = 3.59, p = 0.070$. But in Analysis Window 2, it did, in the expected direction, with participants preferring the Manner Event on First Position trials 65% of the time, compared to 49% of the time on Second Position trials, $F(1, 24) = 4.75, p < .039$. This outcome matches our predictions. See Figure 3.

3.3. Discussion

These results demonstrate that adults can use the position of a novel verb in the SVC to determine whether it encodes manner or path. Children’s abilities to do so are more fragile, manifesting in their gaze behavior but not their pointing behavior. The difference between conditions in children’s eye gaze reveals that they indeed were sensitive to the novel verb’s position in the SVC.

Why then did they show a bias to point to the manner scene, especially given that Korean is typically described as a path language, in which speakers should favor path descriptions of motion events? We suspect that this result is due to the plausibility of manner meanings as candidates for a new verb. The class of path verbs is smaller than the class of manner verbs, and we suspect this is because of conceptual rather than linguistic reasons. It is therefore unsurprising that children would be more likely to entertain a manner than a

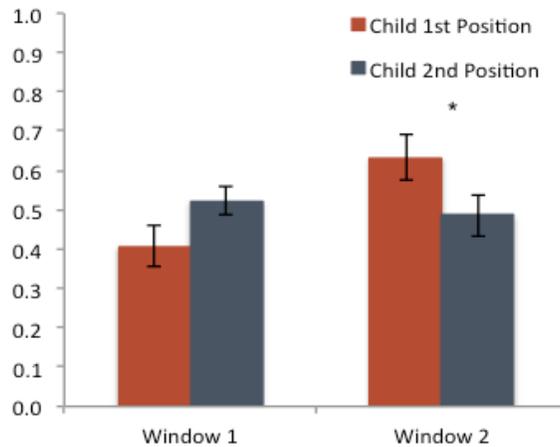


Figure 3. Mean proportion of looks to the Manner Event before (Window 1) and after (Window 2) children heard the target verb in the test query. Error bars represent standard error of the mean.

path meaning when faced with a novel verb. Although the findings on children’s use of familiar verbs to describe motion scenes is mixed, there is at least some evidence that 3-year-olds are biased to produce a manner verb over a path verb when asked to label an event (Oh, 2003).

Even if children are reluctant to explicitly choose a path interpretation as a candidate for a novel verb when asked to point, we suspect that their eye gaze patterns, which differed by condition, reflect their abilities to construe a novel verb as lexicalizing either manner or path, depending on its position in the SVC. It may be that our explicit request for a response caused children to overwrite their original hypothesis about the verb’s meaning. In a real-world learning situation, if children can hold onto their original hypothesis long enough to accrue additional evidence, we suspect that they would be able to map novel verbs to a path interpretation based on its position with an SVC.

4. General Discussion

To our knowledge, this is the first study to test Korean-speaking adults’ and children’s use of the positional information available within an SVC—specifically, the consistent ordering of manner and path verbs—to discover the meaning of a novel verb. Korean-speaking adults showed robust abilities to do so, whether one or two verbs in the SVC were novel. Children showed some abilities to do as well, although these may be more fragile. In addition to providing the first evidence on acquiring manner and path verbs from the serial verb construction, this study makes three further contributions. First, a methodological point: We document that in a difficult learning task, children’s

pointing and gaze behavior may lead to different conclusions. This is an important point to consider when interpreting results from either measure alone, and suggests that we must continue to use multiple methods and pursue conflicts in these multiple measures when they arise.

Second, because the two verbs in an SVC cannot be differentiated on the basis of the typical cues studied in the syntactic bootstrapping literature (e.g., the number and position of the noun phrases in the sentence, or the presence of a sentence complement), this study broadens the scope of linguistic cues available to young learners when acquiring a novel verb (see also Arunachalam, Syrett, & Waxman, under revision).

Third, the literature on motion verb acquisition has focused on how language-specific lexicalization biases constrain learners to focus on just the manner component of an event (if acquiring a language like English), or just the path component (if acquiring a language like Korean, Spanish, or Greek) (e.g., Naigles & Terrazas, 1998; Papafragou & Selimis, 2010). Serial Verb Constructions, if available in a language, provide both manner and path verbs in a single utterance, but because of their consistent and predictable ordering, SVCs offer an opportunity for children to acquire *both* manner and path verbs in the very same learning situation.

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