Children follow 'agent-first' but it takes time to learn: Comprehension of active transitives in Korean

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Abstract   This study explores how the agent-first strategy is employed, independently of a verb, during comprehension of active transitive constructions in Korean for Korean-speaking children. For this purpose, we strategically obscured case markers and verbs (Experiment 1) and manipulated canonicity with no verb expressed in the sentences (Experiment 2). Results indicate that children can follow the strategy despite no explicit predicate involved in sentence comprehension and that the strategy develops as age increases. During this process, the degree to which children utilise case marking (nominative vs. accusative) to understand the grammatical status of the first noun may be asymmetrical.

Key words   agent-first, word order, case marking, sentence comprehension, Korean

1. Children's reliance on the agent-first tendency

Typologically, subject-initial word order is dominant (Dryer, 2013) due to the tendency that the element controlling the action (*agent*) specified by a predicate is expressed *first* in an utterance (e.g., Dowty, 1991). One question arises as to whether children follow this universal tendency with no verb expressed in a sentence. This study investigated how Korean-speaking children aged three to six follow the agent-first strategy, independently of verbs, during comprehension of active transitive constructions in Korean. We also measured their reliance on word order and case marking with respect to the observance of the strategy. Korean provides an intriguing testing ground for measuring the competition of the two structural cues, since the grammatical status of the first noun is indicated by information from either word order or case marking.

It has been reported across languages that children have strong inclination to map the first noun onto the agent role (e.g., Dittmar, Abbot-Smith, Lieven & Tomasello, 2008; Huang, Zheng, Meng & Snedeker, 2013; MacWhinney, Bates & Kliegl, 1984; Slobin & Bever, 1982). For example, in a typical English active sentence, the agent role is linked to the subject, which is placed at the first word order slot of the sentence (Brown, 1973), leading children to rely primarily on the assumption that the first noun is the agent (Slobin & Bever, 1982). Young German-speaking children show a higher rate of success when comprehending active transitive constructions only in their prototypical form on the basis of caregivers' input skewed towards sentences starting with the subject-agent pairing (Dittmar et al., 2008).

Korean also joins the existing literature (e.g., Cho, 1982; Kim, O'Grady & Cho, 1995), the reason of which may be found in the asymmetry of input to which children are exposed. Of the two possible patterns in the active transitives (subject-first; object-first), the canonical subject-first pattern is dominant: only 1.2% of the Sejong corpus consists of the scrambled, object-first sentences (Kwon, Polinsky & Kluender, 2006). The heavily skewed input towards the subject-first pattern in the active transitives may drive children to prefer the subject-first over the object-first pattern (e.g., Cho et al., 2002; also see Song, 2002 for a discussion about the agent-dominant nature of Korean).

During the course of comprehension, at least two factors seem to guide children to follow the agent-first strategy. One is word order. Children tend to employ the canonical word order as a primary strategy for sentence comprehension (Slobin & Bever, 1982).

Moreover, based on language exposure skewed towards the subject-first word order in the active transitives (e.g., Cho, 1982), children may be attuned to interpreting the first noun as the agent. Evidence supports this possibility, showing that children interpret the first noun as the agent until the age of four, regardless of the canonicity of the active transitive constructions (e.g., Kim et al., 1995; No, 2009).

The other factor is case marking. The nominative case marker -*i/ka* usually indicates that the noun in a typical active sentence is a subject (Sohn, 1999). Children appear to employ this form-function association from very early on: They acquire the nominative case marker to indicate the subject as early as 18 to 20 months old (e.g., Lee, 2004) and also use the marker to express the agent at the sentence-initial position (e.g., Clancy, 1995; Cho, 1982; No, 2009). The accusative case marker –*(l)ul* indicates a direct object in the active transitives. It was found that, however, Korean-speaking children relied less on the accusative case marker than the nominative case marker for comprehension (e.g., Jin, Kim & Song, 2015), possibly due to its characteristic of frequent omission in colloquial settings (e.g., Chung, 1994)

Based on the two factors, word order and case marking, we can hypothesise several scenarios in relation to children's comprehension of the active transitive constructions. In the canonical active transitive (1), the first nominal argument indicates the agent with case-marked nominative, followed by the theme argument with case-marked accusative. Since the agent role of the first noun is indicated by cues from both word order and case marking, children would understand this constructional pattern easily.

(1) kyengchal-i   totwuk-ul   cap-ass-ta.
police-NOM   thief-ACC   catch-PST-SE[1]
'The police caught the thief.'

Contrastively, the scrambled active transitive construction (2) has the first argument as the theme with case-marked accusative and the second argument as the agent with case-marked nominative. The information from the scrambling is not compatible with

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[1] Abbreviation: ACC = accusative case marker; NOM = nominative case marker; PST = past tense marker; SE = sentence ender.

children's initial assumption regarding the status of the first noun, which may lead to difficulty in comprehending this construction type compared to the canonical counterpart.

(2) totwuk-ul   kyengchal-i   cap-ass-ta.
thief-ACC   police-NOM   catch-PST-SE
'The police caught the thief.'

We designed two experiments to explore how the two factors contribute to children's reliance on the agent-first strategy during sentence comprehension in Korean. To better explore this issue, we made methodological enhancement. Experiment 1 assessed pure word order effects on sentence comprehension in general with only two nouns audible by obscuring case markers and verbs. Experiment 2 measured the impact of each factor on comprehension of the active transitive, independently of verb effects, by obscuring verbs.

2. Experiment 1: two nouns only

2.1. Methods

Participant   Monolingual 3-4-year-olds (n = 28, mean: 4;1, SD: 0.64) and 5-6-year-olds (n = 18, mean: 6;1, SD: 0.72) were recruited from one preschool in Seoul, Korea. Adult native speakers of Korean (n = 20) were also recruited as a control group.

Stimuli   Five sentences were created without case markers and verbs to suppress information about case marking and verbs (3). To make this happen, we devised a novel situation where a main character was hungry and ate food with yum-yum sounds at every case marker and verb. As there were only two nouns and the pictures were semantically reversible, they can be interpreted as either agent-first or theme-first.

(3) wenswungi(yum-yum) kaykwuli(yum-yum) (yum-yum)
monkey(-NOM)   frog(-ACC)   (pat-SE)
'The monkey (is patting) the frog.' or 'The frog (is patting) the monkey.'

We controlled for the animacy of arguments to make the context for the experimental stimuli more child-friendly. All the test sentences were normed by 10 native speakers of Korean prior to the actual experiment. Each item was accompanied by a pair of two pictures involving the same action but reversed thematic roles. In

each pair, a sentence corresponding to a target picture was presented aurally twice with a one-second interval.

Procedure A picture selection task was conducted via *Psychopy* (version 1.85.2; Peirce, 2007). Participants were asked to select the picture that matched the sentence that they heard by pressing big arrows posted on the keyboard. A training session with 3 practice items (subject-verb, object-verb, verb only) proceeded before the main task to familiarise participants with the experimental procedure. The whole experiment was suspended if they did not pass the training. Before the actual experiment session, an additional context was given visually to the participants where a main character became hungry and ate food. The experimenter provided participants with positive feedback, irrespective of whether their answers were correct or wrong.

Analysis Participants' responses were coded as 0 (theme-first) or 1 (agent-first). All the data were submitted to logistic mixed-effects models by using the *lme4* software package (Bates, Maechler & Bolker, 2011) with responses as fixed effects and with participants and test items as random effects. All statistical modeling and hypothesis testing were performed in R (R Core Team, 2016).

2.2. Results and Discussion

Each group demonstrated distinct behaviour in understanding two-noun-only sentences (Table 1). 3-4-year-olds showed at-chance performance, indicating that their judgment was not skewed particularly towards agent-first or theme-first. Meanwhile, 5-6-year-olds showed above-chance performance, which was close to the performance by adults. The difference of response rates between the child groups was statistically significant, $\beta = 1.30$, $SE = 0.33$, $p < .001$, suggesting that the 5-6-year-olds relied on the agent-first strategy more than the 3-4-year-olds for comprehending this two-noun-only pattern.

Table 1. Performance by age group: Experiment 1

Condition	Group	Agent-first response (%)	SD
	3-4-year-old	55.71	0.50
Two-noun-only	5-6-year-old	82.22	0.38
	adult	91.00	0.29

When there was a cue only from word order facts, 5-6-year-olds interpreted the first noun as the agent, which indicates that they employed the agent-first strategy reliably. The reason is ascribable to accumulated language exposure (cf. Dittmar et al., 2008) such that 5-6-year-olds performed a similar way to what adults did. In contrast, 3-4-year-olds were rather undetermined about their preference for the grammatical status of the first noun. Their balanced judgment of agent- and theme-first word order may be due to the insufficient amount of information in the test items which they could rely on, increasing uncertainty about their assumption on the status of the first noun.

Then what if information about case marking becomes available which is (in)consistent with the strategy? Experiment 2 was conducted to address the question by manipulating canonicity (canonical vs. scrambled) of test items. To precisely measure the impact of each factor on children's performance in relation to the agent-first strategy, we obscured verbs by creating sentences which lacked verbs altogether, with case marking audible.

3. Experiment 2: active transitives without verbs

3.1. Methods

Participant Monolingual 3-4-year-olds (n = 30, mean age: 4;1, SD: 0.63) and 5-6-year-olds (n = 19, mean age: 6;1, SD: 0.72) were recruited from a preschool in Seoul, Korea. Another 20 adult native speakers of Korean participated as a control group.

Stimuli 12 active transitives (six canonical and six scrambled) and additional 12 fillers were created without verbs to mask verb effects (4a-b). For this purpose, we devised another novel situation in which a main character was sick and coughed at the place of a verb not to articulate the verb. As this condition included a contrast of canonicity, two psudo-randomised sub-lists were made to evade possible interference from the same action within the same list.

(4a) Canonical active transitive

kkwulpel-i   talamcwi-lul   (cough)
honeybee-NOM squirrel-ACC   (paint-SE)
'The honeybee (paints) the squirrel.'

(4b) Scrambled active transitive

kkwulpel-ul   talamcwi-ka   (cough)

honeybee-ACC squirrel-NOM (~~paint~~-SE)

'The squirrel (~~paints~~) the honeybee.'

Procedure & Analysis Before starting the experimental session, participants were given another visual context where a main character caught a cold and kept coughing. Their responses were coded as 0 (wrong) or 1 (correct). The other specifications were the same as those in Experiment 1.

3.2. Results and Discussion

Children performed worse in the scrambled than in the canonical active transitive patterns: β = -0.61, *SE* = 0.31, *p* < .05 for the 3-4-year-olds; β = -2.09, *SE* = 0.67, *p* < .01 for the 5-6-year-olds. Across the age groups, we found a statistical difference only in the canonical pattern, β = 0.98, *SE* = 0.43, *p* < .05, indicating that the by-group performance with regard to canonicity diverged.

Table 2. Performance by age group: Experiment 2

Condition	Group	Correct response (%)	SD
Canonical active transitive	3-4-year-old	67.78	0.47
	5-6-year-old	84.21	0.37
	adult	90.00	0.30
Scrambled active transitive	3-4-year-old	53.33	0.50
	5-6-year-old	45.61	0.50
	adult	90.00	0.30

These findings suggest that children employed the agent-first strategy reliably during comprehension of the active transitive constructions. Their judgment of the status of the first noun in the canonical pattern was consistent with the strategy, supported both by word order (the noun = the agent) and by case marking (the nominative case marker indicating the agent). However, the scrambled pattern (the first noun = the theme object) was incompatible with the strategy. The reason behind the children's lower rates of success in the scrambled than in the canonical patterns may lie on the possibility that their heavy reliance on the agent-first strategy overrode evidence against the strategy existent in the scrambled pattern.

Meanwhile, like the findings of Experiment 1, the degree of the children's reliance on the agent-first strategy varies by age. We found in the canonical pattern that the rate of success for the 5-6-year-olds was significantly better than that for the 3-4-year-olds. This difference stands as an indication that the ability of employing information from the canonical word order and the prototypical case marking for the strategy may grow as age increases. The performance gaps between the two patterns across the age groups further suggest that the 5-6-year-olds may have a more entrenched heuristic that the first noun is the agent than the 3-4-year-olds have, yielding the bigger drop of the rate of success from the canonical to the scrambled patterns for the 5-6-year-olds than the 3-4-year-olds.

This interpretation is also supported by the comparison of children's performance across the experiments. Whereas the 3-4-year-olds relied slightly more on the agent-first strategy in the canonical active transitive (55.71% in Experiment 1 vs. 67.78% in Experiment 2; β = 0.53, *SE* = 0.31, *p* = .082), no statistical difference was found in the 5-6-year-olds' performance (82.22% in Experiment 1 vs. 84.21% in Experiment 2). The 5-6-year-olds' consistent performance across the two conditions implies that they employed the strategy reliably in both conditions, which in turn suggests that it may be at around 5 or 6 years from their birth when children have confidence on the strategy possibly because of accumulated language experience.

4. General Discussion

We found that children can follow the agent-first strategy in comprehension of active transitive constructions despite no explicit predicate involved. Even though verbs were obscured, they showed better performance in the canonical pattern (agent-theme), which is consistent with the strategy, than in the scrambled pattern (theme-agent), which is contradictory to the strategy, in conjunction with information about case marking. We also found that children's performance varied by age with respect to the existence of case marking and canonicity, indicating that the strategy is learnt as age increases. Comparison of the two-noun-only and the canonical active transitive conditions showed that, whilst the 3-4-year-olds relied on the strategy only with the mediation of case marking, the 5-6-year-olds showed almost the same rate of success, irrespective of the existence of case marking. Moreover, the difference of performance by canonicity in Experiment 2 was bigger for the 5-6-year-olds than for the 3-4-year-olds.

Our children's overall performance suggests that their comprehension behaviour may be conservative. They employed the strategy so reliably, rather than being guided by the information from other sources in relation to canonicity, that they misunderstood the first noun as the agent in scrambled active transitives, becoming less sensitive to evidence against their initial interpretation. This conservatism fits well with previous reports on preschool children's difficulty in revising the initial interpretative commitment when they encounter conflicting information which arrives later within the same sentence (e.g., Choi & Trueswell, 2010; Snedeker & Trueswell, 2004).

In this process, Korean-speaking children may employ information from case marking selectively. It was observed that they performed worse in the scrambled than in the canonical patterns. One possibility behind the scrambled pattern is that they sometimes did not pay attention to the sentence-initial accusative case marker as reliably as they relied on the sentence-initial nominative case marker. This possibility is supported by the homogeneous at-chance rate of success in the scrambled pattern. The 3-4-year-olds' increased degree of reliance on the agent-first strategy from the two-noun-only condition to the canonical active transitive condition, despite its marginal significance, also lends support to the asymmetrical impact of case marking on children's comprehension of active transitives.

Our children's behaviour in relation to case marking thus implies that the sentence-initial nominative case marker may give the children a fix on the mapping between the subject and the agent for the first noun. When children comprehend an active transitive construction incrementally, they seem to be guided by the prototypical function of the nominative case marker—indicating the noun to which it is attached as both the subject and the agent—on the basis of accumulated language exposure (cf. Cho, 1982; Lee, 2004; Lee & Cho, 2009; No, 2009). Future research on the exclusive role of the sentence-initial nominative case marker in children's sentence comprehension would benefit from various experimental settings where different case markers are involved (e.g., locatives or datives) or the nominative case marker provides another form-function pairing in different constructions (e.g.,

passives).

5. References

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