Verbs are sometimes redundant: Korean preschoolers' comprehension of Korean active transitive construction

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Abstract

Motivated by the two contrasting forces in shaping linguistic knowledge—efficiency and redundancy, the present study examines sentence comprehension behaviour amongst Korean children aged three to six, focusing on verbs (relative to case markers) in interpreting transitive events. Through picture-selection experiments that systematically omit and obscure portions of transitive sentences, we find (1) a reduced role of verbs in sentence comprehension and (2) age-related variations in the application of case-marking knowledge. These findings suggest that verbs may sometimes become redundant during comprehension, which is attributable to early maturation and strong automatisation of verbs. This provides support for verb-periphery strategies so as to maximise efficiency in language activities amongst Korean preschoolers.

Keywords: Efficiency; Redundancy; Child comprehension; Transitive; Verb; Korean

Introduction

Efficiency is a hallmark of shaping language. Various architectures and perspectives have proven the role of efficiency in language activities while maintaining informativeness (Christianson, 2016; Gibson et al., 2019; Hawkins, 2004; Jaeger & Tily, 2011; Levshina, 2021). This also holds for language acquisition. To illustrate, developmental profiles of linguistic knowledge are best explained as a function of two types of processing pressures: efficiency-related internal pressures from working memory load, and input-based external pressures from usage frequency (O'Grady, 2015). Linguistic cues such as word order and case-marking are acquired to efficiently balance production effort and informativity, thereby generating functional biases during learning (Fedzechkina et al., 2017). In contrast, research has revealed that redundancy can make communication robust by supporting the delivery and interpretation of intended messages in the presence of noise (Christiansen & Monaghan, 2016; Gibson et al., 2013; Pijpops & Zehentner, 2022; Shannon, 1948). Redundancy can also facilitate learning processes through increased use of linguistic materials for input directed to learners (Gerken et al., 2005; Nicolaci-da-Costa & Harris, 1983; Pate & Goldwater, 2015; Tal & Arnon, 2022; Tal et al., 2023).

The present study zooms into the two forces, seemingly operating in an opposite direction to the way that linguistic knowledge is acquired and developed in a particular way, through children's comprehension behaviour involving a verb. Amongst various linguistic cues utilised in sentence comprehension, a verb has long been recognised as crucial for sentence meaning, which provides essential lexical information in constructing event representations and specifying a sentence's argument structure (Fisher et al., 1991; Levin & Rappaport Hovav, 2005). Hence, verb information provides fundamental cues that enable comprehenders to establish a mental model of an event, incrementally integrate incoming input, and engage in anticipatory processing (Altmann & Kamide, 1999; Pinker, 1989). The informativeness—or complexity—of a verb, and its major role in clausal interpretation, likely contribute to its later acquisition by children relative to other part-of-speech categories such as a noun (Au et al., 1994; Bornstein et al., 2004; Gentner, 1982).

This study focuses on Korean preschool-aged children's sentence comprehension. Korean, which is understudied in the field, is an agglutinative, Subject–Object–Verb language with active use of particles and verbal morphology to indicate grammatical information. It is a context-dependent language, allowing scrambling and/or omission of sentential components unless miscommunication or ambiguity arises (Sohn, 1999). The sentence-final verb is privileged in perception (Choi, 1998; Fernald, 1984; Peters, 1985; Slobin, 1985), and verbs are more frequent than nouns in Korean caregiver input in general (Choi & Gopnik 1995; Kim et al., 2000). These properties allow young Korean children to acquire verbs earlier than nouns (Choi, 1998; Kim et al., 2000), to actively use verb information during language activities (Choi, 1999; Choi & Gopnik, 1995; Clancy, 2009), and facilitate the use of verbal morphology to denote grammatical information (Choi & Gopnik 1995; Kim et al., 2000), when compared to children acquiring other languages as their native language. The early maturation of verbs in Korean leads to two potential learning outcomes. One involves verb-centric strategies, where children are directed to utilise verbs as a central source in comprehension, although the verb cue has become sufficiently automatised and thus may be redundant. The other outcome involves verb-periphery strategies, where children recognise verbs as less critical during comprehension, again due to the verb cue being sufficiently automatised and redundant. These possibilities warrant empirical testing.

Active Transitive Constructions in Korean

Given the two forces—efficiency and redundancy, this study tests the role of verbs in Korean preschooler's comprehension of active transitive constructions in Korean. Transitive constructions, which express basic event types involving human behaviour, are frequently employed to examine children's developmental trajectories of linguistic knowledge

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across languages (Abbot-Smith et al., 2017; Garcia et al., 2021; Özge et al., 2019; Schipke et al. 2012; Suzuki & Kobayashi, 2017). Korean active transitive construction consists of two arguments (a nominative-marked agent; an accusative-marked theme) and a verb. Each argument is marked with a dedicated case marker: the nominative case marker *-i/ka* (*-i* after a consonant) indicates the instigator of an action, and the accusative case marker *-(l)ul* (*-ul* after a consonant) indicates the undergoer of an action (Sohn, 1999). Its canonical word order (agent–theme) (1a) can be scrambled (theme–agent) (1b). If participants in an event are clearly identified in the context, a case marker (1c) or a case-marked argument (1d) can be omitted without changing the propositional meaning; moreover, in colloquial speech, verbs can be omitted if the event is clearly shared between interlocutors (Sohn, 1999).

(1) Example of Korean active transitive construction: 'Yengswu caught Minci.'

a. Canonical word-order pattern

Yengswu-ka	Minci-lul	cap-ass-ta.
Yengswu-NOM	Minci-ACC	catch-PST-SE[1]

b. Scrambled word-order pattern

Minci-lul	Yengswu-ka	cap-ass-ta.
Minci-ACC	Yengswu-NOM	catch-PST-SE

c. Omission: case marker

Yengswu-ka	Minci-~~lul~~	cap-ass-ta.
Yengswu-NOM	Minci-~~ACC~~	catch-PST-SE

d. Omission: case-marked argument

~~Yengswu-ka~~	Minci-lul	cap-ass-ta.
~~Yengswu-NOM~~	Minci-ACC	catch-PST-SE

Previous studies examined how linguistic cues such as word order and case-marking influence Korean preschool children's comprehension of this construction type through corpus analysis and behavioural experiments (Cho, 1982; Jin et al., 2015; Kim et al., 1995; Kim et al., 2017). No work has investigated whether the presence of verbs influences children's sentence comprehension with respect to efficiency and redundancy. If verb-centric strategies predominantly influence children's sentence comprehension, their understanding becomes heavily reliant on information derived from verbs, resulting in the presence of verbs crucial for the accurate interpretation of a sentence. Conversely, if verb-periphery strategies primarily guide children's sentence comprehension, their interpretation is not solely dependent on verb information, resulting in the presence of verbs not substantially impacting their interpretation of a sentence.

The current study[2]

The following picture selection experiments, conducted via *PsychoPy* (Peirce, 2007), are designed to test these predictions. Children look at two pictures depicting the same transitive event but with the agents and themes reversed in each picture, listen to auditory stimuli of one-argument sentences, and choose one of the pictures that matches the sentences. Some sentences systematically obscure case markers or verbs, which allows us to effectively measure the role of a verb in children's interpretation of a transitive event. We employ one-argument transitive patterns to factor out word order information, another powerful cue that children use to cope with transitive constructions across languages (Chan et al., 2009; Dittmar et al., 2008; Ibbotson & Tomasello, 2009; Schipke et al. 2012; Suzuki & Kobayashi, 2017), thus reducing computational complexity involving distributional cue (Wittek & Tomasello, 2005) while better illuminating the contribution of a verb to children's sentence comprehension.

Experiment 1: One-argument transitive patterns with no omission

Methods

Monolingual Korean children aged three and four years old (three-and-four-year-olds; 37 to 58 months, 17 girls, $k = 30$, $M_{age} = 49$ months, $SD = 7$ months) and five and six years old (five-and-six-year-olds; 62 to 83 months, 12 girls, $k = 23$, $M_{age} = 71$ months, $SD = 7$ months), attending a preschool in South Korea, participated in this experiment. No participants reported any learning disabilities. Adult controls ($k = 20$; 20s and 30s), all of whom were (under)graduate students in South Korea, were also recruited.

We created 12 test sentences, with six instances per condition ($N_{NOM}V$; $N_{ACC}V$), as in (2a–b). All six verbs used in the sentences were actional and sufficiently frequent in use (cf. Shin, 2020). We controlled for the animacy of arguments, by using animals, to prevent children from using animacy as a clue for the arguments' thematic roles.

(2) Example of test sentences: Experiment 1

a. $N_{NOM}V$

koyangi-ka	cha-yo.
cat-NOM	kick-SE

'The cat kicks (the dog).'

b. $N_{ACC}V$

kangaci-lul	cha-yo.
dog-ACC	kick-SE

'(The cat) kicks the dog.'

The sentences were recorded by a male native Korean speaker who was unaware of the experimental purpose. To ensure consistency, each pair of sentences sharing the same verb was matched for overall duration and pitch, minimising any vocal variation that could potentially impact participants' comprehension. A 100-ms interval was maintained between the words in each sentence. Prior to the experiment, all

[1] Abbreviation used throughout the article: ACC = accusative case marker; CASE = case marker (unspecified); N = noun; NOM = nominative case marker; PST = past tense marker; SE = sentence ender. A grey symbol with strikethrough (e.g., ~~NOM~~) = an item obscured by acoustic masking.

[2] See this repository for the data and code of this study.

sentences, along with their corresponding pictures and recordings, were assessed for naturalness and felicitousness and accurate conveyance of intended events by 10 native Korean speakers.

Participants were instructed to assist the main human character on the computer screen in learning Korean; the specific task involved listening to the character's utterances and selecting the matching picture by pressing large arrows on the keyboard. A training session with three practice items, unrelated to the test stimuli, was conducted prior to the main task to familiarise participants with the procedure. The main session commenced once participants successfully completed all three practice items. Each sentence was paired with two pictures depicting the same action but with reversed thematic roles (Figure 1). The sentence corresponding to the target picture was orally presented 2000 ms after the pictures appeared. Two sub-lists of stimuli were created, with participants randomly assigned to one; the stimuli within each list were presented in a random order.

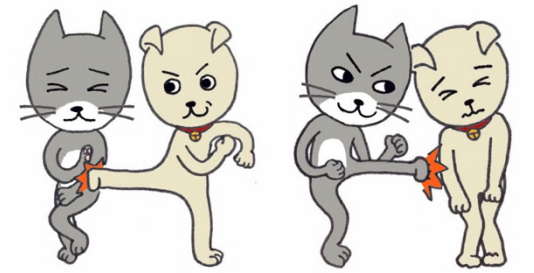


Figure 1. Sample of test sentences: $N_{NOM}V$

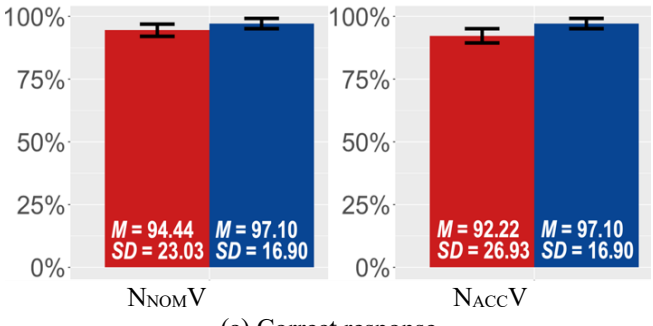
Participants' responses were coded as 1 (correct) or 0 (incorrect). All data were fitted to logistic mixed-effects models using *lme4* (Bates et al., 2015) in R (R Core Team, 2024), with *Condition* ($N_{NOM}V$; $N_{ACC}V$) and *Group* (three-and-four-year-old; five-and-six-year-old) as fixed effects (centred around the mean and deviation-coded: –0.5 for $N_{NOM}V$ and 0.5 for $N_{ACC}V$ in *Condition*; –0.5 for three-and-four-year-old and 0.5 for five-and-six-year-old in *Group*) and with *Participant* and *Item* as random effects. All the models included the maximal random-effects structure allowed by the design for each model (Barr et al., 2013). Each model's R^2 value was computed through Nakagawa's R^2 (Nakagawa et al., 2017; conditional R^2 considering both fixed and random effects).

We also collected child participants' response time—the duration from the end of an aurally presented sentence to the participant's selection of a picture, irrespective of the accuracy of the choice—to measure processing cost. This metric, indicative of processing complexity (Kaiser, 2014), serves as a proxy for the comprehender's utilisation of cognitive resources during the task, often reflecting efficiency and automatisation in handling target knowledge (Grodner & Gibson, 2005; Kharkwal & Stromswold, 2014; Shapiro et al., 2003). Response time data were refined by first removing outliers below 100 ms or above 10000 ms and then excluding datapoints beyond ±3SD (data loss: 10%). The refined data were log-transformed for data normalisation and further residualised to adjust for variability in sentence length and individual reading speed (Baayen & Milin, 2010). Following the approach by Trueswell et al. (1994), we performed residualisation by predicting response times for each child participant across all trials. This was done using a linear mixed-effects model, which considered sentence length (number of syllables) as a fixed effect and *Participant* as a random effect. Residual response times were then calculated by subtracting these predicted times from the log-transformed response times for each participant. The pre-processed data were then fitted to linear mixed-effect models, following the same specifications used in the response data.

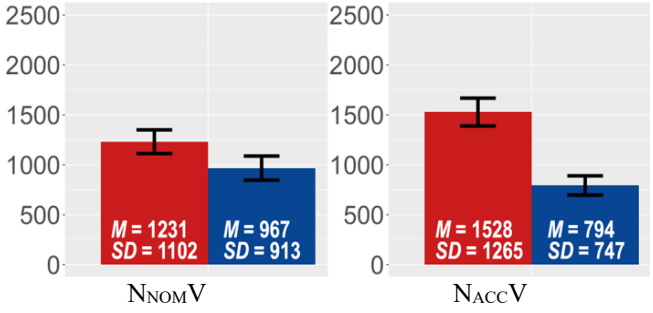
We note that adults' performance, although being briefly reported in the results section, was not included in the statistical analysis.

Results

Figure 2 presents children's correct responses and response times measured in Experiment 1.



(a) Correct response



(b) Response time

Figure 2. Results (Experiment 1). X-axis: condition; Y-axis: mean rate of accuracy (a), mean response time (b, ms). Red: three-and-four-year-old; Blue: five-and-six-year-old. *M*: mean; *SD*: standard deviation. Error bars indicate 95% confidence intervals. *Note*. Adult controls: [correct response] $M = 93\%$ ($N_{NOM}V$), $M = 100\%$ ($N_{ACC}V$); [response time] $M = 359$ ($N_{NOM}V$); $M = 411$ ($N_{ACC}V$).

For response rate (Figure 2a), both groups showed at-ceiling performance. Statistical models ($\alpha = 0.05$) revealed no significant by-condition or by-group differences (all *p*s > 0.05). For response time (Figure 2b), the five-and-six-year-

olds spent less time selecting the pictures than the three-and-four-year-olds, and the by-group difference in response time was larger in $N_{ACC}V$ than $N_{NOM}V$. The global model (α = 0.05; R^2 = 0.168) revealed a main effect of *Group* (β = –0.404, *SE* = 0.102, *t* = –3.961, *p* < 0.001) and an interaction effect between *Condition* and *Group* (β = –0.497, *SE* = 0.204, *t* = –2.435, *p* = 0.015). Post-hoc analyses (α = 0.025) revealed a by-group difference in $N_{ACC}V$ (β = –0.654, *SE* = 0.139, *t* = –4.716, *p* < 0.0005, R^2 = 0.168). A by-condition difference for the three-and-four-year-olds was insignificant given the adjusted alpha level (*p* = 0.030).

These findings indicate that, while the children had a strong command of case-marking when interpreting a sentence expressing transitivity, the three-and-four-year-olds demonstrated less efficiency than the five-and-six-year-olds when handling the accusative case marker in the one-argument transitive construction.

Experiment 2: case-less one-argument transitive patterns

Methods

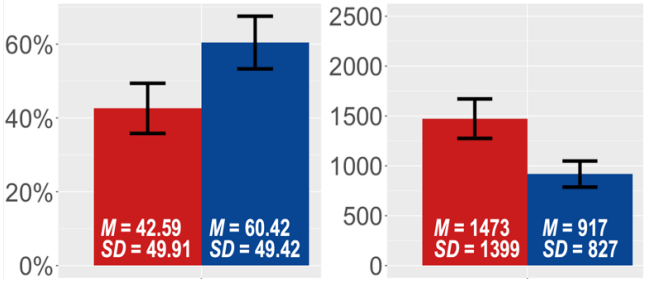
All the children and adults in Experiment 1 joined this experiment, which took place three to seven days after Experiment 1. We devised a novel situation in which the main character was suffering from a cold and coughed occasionally, by strategically placing a coughing sound over the case marker in a sentence. Six sentences were created as in (3), using the same verbs as in Experiment 1 but with different combinations of animals. All sentences were normed by 10 adult Korean native speakers, confirming that the picture-aided sentences were interpreted as the transitive events described in each picture with the intended verbs.

(3) Example of test sentences: Experiment 2 ($N_{\sout{CASE}}V$)
napi-*cough* an-ayo.
butterfly-~~CASE~~ hug-SE
'The butterfly hugs (the honeybee).' or '(The honeybee) hugs the butterfly.'

Before the experimental session, participants were given a pictorial context in which the main character caught a cold and kept coughing. The scoring for these conditions, which can in principle be interpreted in more than one way, was based on the high likelihood of agent-first interpretation (0: theme-first; 1: agent-first). Refining response time data resulted in data loss (12%). All the other details of the experiment and statistical analysis were the same as those in Experiment 1.

Results

Figure 3 presents children's agent-first responses and response times measured in Experiment 2. Numeric differences between these groups were insignificant (α = 0.05) for both agent-first response (*p* = 0.073) and response time (*p* = 0.126). This indicates that, despite the numeric differences, the children's performance in this condition was largely consistent.



(a) Agent-first response (b) Response time

Figure 3. Results (Experiment 2). X-axis: condition; Y-axis: mean rate of agent-first response (left), mean response time (right, ms). Red: three-and-four-year-old; Blue: five-and-six-year-old. *M*: mean; *SD*: standard deviation. Error bars indicate 95% confidence intervals. *Note*. Adult controls: [agent-first response] *M* = 67%; [response time] *M* = 549.

Experiment 3: verb-less one-argument transitive patterns

Methods

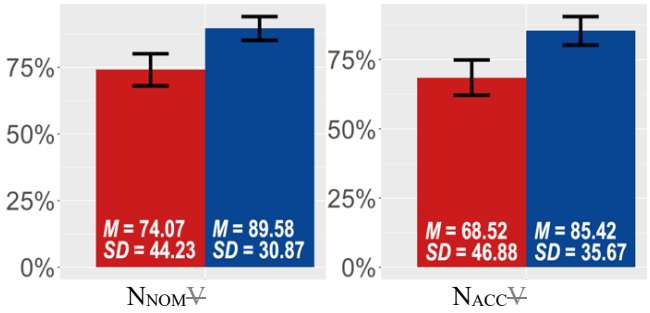
All the children and adults in Experiments 1 and 2 joined this experiment, which took place three to seven days after Experiment 2. We created 12 test sentences, with six instances per condition (N_{NOM}~~V~~; N_{ACC}~~V~~), as in (4a–b). We used the same verbs as in Experiment 1 but with different combinations of animals for the agent/theme roles.

(4) Example of test sentences: Experiment 3
a. $N_{NOM}V$
khokkili-ka *yum-yum*.
elephant-NOM ~~kick~~
'The elephant (draws the tiger).'
b. $N_{ACC}V$
khokkili-lul *yum-yum*.
elephant -ACC ~~kick~~
'(The tiger draws) the elephant.'

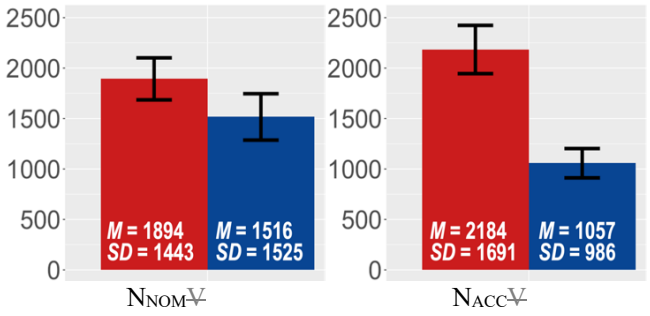
Before the experimental session, another context was introduced to motivate the inclusion of a yum-yum sound. Participants observed a pictorial story in which the main character became hungry and ate food. It was then explained that, even though he was hungry and eating, he was eager to tell something to us. Refining response time data resulted in data loss (8%). The other procedures about the experiment and statistical analysis followed those as in Experiment 1.

Results

Figure 4 presents children's correct responses and response times measured in Experiment 3.



(a) Correct response



(b) Response time

Figure 4. Results (Experiment 3). X-axis: condition; Y-axis: mean rate of accuracy (a), mean response time (b, ms). Red: three-and-four-year-old; Blue: five-and-six-year-old. *M*: mean; *SD*: standard deviation. Error bars indicate 95% CIs. *Note*. Adult controls: [correct response] M = 98% ($N_{NOM}V$); M = 100% ($N_{ACC}V$); [response time] M = 517 ($N_{NOM}V$); M = 567 ($N_{ACC}V$).

For response rate (Figure 4a), while both groups performed above-chance in each condition, the five-and-six-year-olds uniformly performed better than the three-and-four-year-olds in both conditions. The global model (α = 0.05; R^2 = 0.173) revealed only a main effect of *Group* (β = 1.115, *SE* = 0.413, t = 2.697, p = 0.007) confirming this by-group difference. For reaction time (Figure 4b), the three-and-four-year-olds spent more time selecting the pictures than the five-and-six-year-olds in both conditions. The global model (α = 0.05; R^2 = 0.086) revealed only a main effect of *Group* (β = –0.345, *SE* = 0.120, t = –2.876, p = 0.004), confirming this by-group difference. Additional analyses (α = 0.025) revealed a significant by-group difference in $N_{ACC}V$ (β = –0.510, *SE* = 0.179, t = –2.845, p = 0.005, R^2 = 0.069).

These findings indicate two points. First, the children in this experiment demonstrated a good command of the verb-less one-argument transitive sentences. Second, the three-and-four-year-olds dealt with these sentences less efficiently than the five-and-six-year-olds, particularly within $N_{ACC}V$.

Comparisons across Experiments 1 to 3

To more precisely investigate our inquiry in this study, we compared various conditions across Experiments 1 to 3 (α = 0.025). The selection of these conditions as pairs was based on the types of grammatical cues being compared: (i) presence or absence of a verb ($N_{NOM}V \rightleftharpoons N_{NOM}V$; $N_{ACC}V \rightleftharpoons N_{ACC}V$); (ii) presence or absence of case-marking ($N_{NOM}V \rightleftharpoons N_{CASE}V$; $N_{ACC}V \rightleftharpoons N_{CASE}V$); (iii) case-marking vs. verb ($N_{NOM}V \rightleftharpoons N_{CASE}V$; $N_{ACC}V \rightleftharpoons N_{CASE}V$). To make the following comparisons ($N_{ACC}V \rightleftharpoons N_{CASE}V$; $N_{ACC}V \rightleftharpoons N_{CASE}V$) possible, the scoring for $N_{CASE}V$ changed to the high likelihood of theme-first interpretation (0: agent-first; 1: theme-first); this differs from the dominant scoring system (0: theme-first; 1: agent-first).

Table 1 presents model outcomes involving children's response rates across the three experiments.

Table 1. Model output: By-condition comparison, response rate (α = 0.025; significant effects only)

		β	*SE*	*Z*	*p*	
$N_{NOM}V \rightleftharpoons N_{NOM}V$	Condition	–1.731	0.590	–2.931	**	
R^2 = 0.347						
$N_{ACC}V \rightleftharpoons N_{ACC}V$	Condition	–2.191	0.741	–2.956	**	
R^2 = 0.543						
$N_{NOM}V \rightleftharpoons N_{CASE}V$	Condition	–3.312	0.543	–6.097	***	
R^2 = 0.491						
$N_{ACC}V \rightleftharpoons N_{CASE}V$	Condition	–3.363	0.544	–6.185	***	
R^2 = 0.502						
$N_{NOM}V \rightleftharpoons N_{CASE}V$	Condition	–1.582	0.354	–4.471	***	
R^2 = 0.240	Group	0.934	0.366	2.549	*	
$N_{ACC}V \rightleftharpoons N_{CASE}V$	Condition	–1.698	0.359	–4.729	***	
R^2 = 0.272	Condition ×Group	–1.915	0.715	–2.679	**	

Note. * < 0.025; ** < 0.005; *** < 0.0005

For the comparisons involving the presence/absence of a verb ($N_{NOM}V \rightleftharpoons N_{NOM}V$; $N_{ACC}V \rightleftharpoons N_{ACC}V$) or case-marking ($N_{NOM}V \rightleftharpoons N_{CASE}V$; $N_{ACC}V \rightleftharpoons N_{CASE}V$), only a main effect of *Condition* was found, indicating that the children in this study performed uniformly worse in conditions missing either structural cue compared to those with both cues. Notably, in comparisons between a verb and case-marking ($N_{NOM}V \rightleftharpoons N_{CASE}V$; $N_{ACC}V \rightleftharpoons N_{CASE}V$), main effects of *Condition* and *Group* were found in the $N_{NOM}V \rightleftharpoons N_{CASE}V$ model, and a main effect of *Condition* and an interaction effect between *Condition* and *Group* were found in the $N_{ACC}V \rightleftharpoons N_{CASE}V$ model. Post-hoc analysis (α = 0.0125) of the latter revealed that, whereas the three-and-four-year-olds performed consistently across both conditions (p = 0.211), the five-and-six-year-olds performed significantly worse in $N_{CASE}V$ (cf. the scoring was converted to the high likelihood of theme-first interpretation; 39.58%) than in $N_{ACC}V$ (85.42%) (β = –2.590, *SE* = 0.625, t = –4.142, p < 0.000025, R^2 = 0.441).

These findings indicate two key aspects of the children's comprehension of transitive constructions. First, the presence of case markers exerted a larger effect on comprehension than the presence of a verb. Second, there was an age effect: while the presence of the nominative case marker enhanced the interpretation of the nominal as an agent role than the presence of a verb for both groups, the presence of the

accusative case marker enhanced the interpretation of the nominal as a theme role than the presence of a verb only for the five-and-six-year-olds.

Regarding response time, we found a main effect of *Group* in all three accusative-case-marker-related models ($N_{ACC}V \rightleftharpoons N_{ACC}\cancel{V}$ [$\beta = -0.594$, $SE = 0.109$, $t = -5.430$, $p < 0.0005$, $R^2 = 0.132$]; $N_{ACC}V \rightleftharpoons N_{\cancel{CASE}}V$ [$\beta = -0.502$, $SE = 0.106$, $t = -4.726$, $p < 0.0005$, $R^2 = 0.122$]; $N_{ACC}\cancel{V} \rightleftharpoons N_{\cancel{CASE}}V$ [$\beta = -0.388$, $SE = 0.123$, $t = -3.158$, $p = 0.001$, $R^2 = 0.043$]), but not in the nominative-case-marker-related models. This indicates that, while the children spent a comparable amount of time selecting pictures across the conditions, the three-and-four-year-olds spent significantly more time than the five-and-six-year-olds when the sentence involved the accusative case marker.

Discussion

Motivated by the two contrasting forces in shaping linguistic knowledge—efficiency and redundancy, we examined the role of verbs in Korean preschooler's comprehension of transitive constructions through picture selection experiments with a novel methodology that systematically omits and obscures portions of transitive sentences. Given the experimental setting in which participants' interpretation was contextualised through pictures prior to hearing the stimuli, the children's picture-selection performance underscores three crucial aspects of interpreting transitive events by Korean preschool-aged children.

First, we found that, although the children showed a good command of either case-less (Experiment 1) or verb-less (Experiment 3) transitive sentences, the presence of case markers influenced their response rates more substantially than the presence of verbs (main effects of *Condition* in $N_{NOM}\cancel{V} \rightleftharpoons N_{\cancel{CASE}}V$ & $N_{ACC}\cancel{V} \rightleftharpoons N_{\cancel{CASE}}V$). This finding suggests that verb cues may not be essential (compared to case-marking cues) for Korean children aged three to six to deal with transitive constructions in Korean. This could be attributed to the early maturation and strong automatisation of verbs, likely influenced by the properties of Korean caregiver input (Choi & Gopnik, 1995; Kim et al., 2000) and further supported by the perceptual advantages involving verb-finality in Korean (Choi, 1998; Fernald, 1984; Peters, 1985; Slobin, 1985), rendering verb cues redundant. If this argument is valid, the first finding lends empirical support to the verb-periphery strategies in sentence comprehension for Korean preschool-aged children.

The second aspect pertains to age effects on the interpretation of the two case markers used in this study. The pairwise comparisons showed that the nominative case marker facilitated the noun-as-agent interpretation more effectively than verbs for both child groups (the main effect of *Group* in $N_{NOM}\cancel{V} \rightleftharpoons N_{CASE}V$), while the accusative case marker more clearly supported the noun-as-theme interpretation than verbs only for the five-and-six-year-olds (the interaction effect between *Condition* and *Group* in $N_{ACC}\cancel{V} \rightleftharpoons N_{\cancel{CASE}}V$). This finding suggests an asymmetry involving the development of case-marking knowledge relating to transitive events, with the accusative marker becoming entrenched later than the nominative marker. This is consistent with previous studies on children's acquisition of the two case markers, showing that children acquire and use the nominative case marker earlier and more reliably than the accusative case marker (Cho, 1982; Jin et al., 2015; Kim et al., 2017), which is ascribable to the relatively weaker cue validity of the accusative case marker compared to the nominative case marker (Chung, 1994; Shin & Mun, 2023).

The third aspect concerns response time. We found that, despite a comparable amount of time selecting pictures across the experimental conditions, the three-and-four-year-olds spent considerably more time than the five-and-six-year-olds when processing transitive sentences with the accusative case marker, regardless of the presence of verbs (as shown in the accusative-case-marker-related models in the pairwise comparisons). Notably, both child groups responded consistently to transitive sentences that lacked case markers but included verbs (Experiment 2). These findings, echoing the asymmetry between the two case markers discussed earlier, point to additional age-related effects on applying case-marking knowledge to interpret transitive constructions, independent of verb cues. Considering existing research that highlights a reduced role of verbs in sentence comprehension in Korean (Kim ,1999; Hwang & Kaiser, 2014; Shin & Kim, 2021) and other Subject–Object–Verb languages (Kamide et al., 2003; Özge et al., 2019), our findings provide novel evidence for Korean preschool-aged children's use of the verb-periphery strategies, rendering verbs redundant and maximising efficiency in language activities at hand.

Taken together, this study's findings suggest that verbs may occasionally become redundant during comprehension. This is ascribed to early maturation and strong automatisation of verbs. Our results thus provide support for verb-periphery strategies to enhance efficiency in language activities amongst Korean preschoolers. In addition to the major implications of the current study, we believe this study would help mitigate the sampling bias prevalent in the field (Blasi et al., 2022; Kidd & Garcia, 2022), providing a nuanced perspective on this topic beyond the limited range of languages, particularly English.

Nonetheless, our conclusions require further validation through extensive investigations. We believe more empirical research is warranted in light of detailed profiles of caregiver input, individual differences, and task effects, also potential extension of this approach to other Subject–Object–Verb languages with comparable morphosyntactic properties.

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