The Processing of Filler-gap Dependency in Korean Control Constructions

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Background. When online processing of English control constructions, such as (1) and (2), comprehenders immediately utilize verb information to establish the dependency between a filler (antecedent NP *John*) and a gap (the invisible embedded subject PRO) [1]. Most Recent Filler strategy [2] predicts that the comprehender assigns the most recent filler (i.e., object NP *Mary*) instead of the distant filler (i.e., subject NP *John*), resulting in the object-control construction (2) being processed more effortlessly, evidenced by faster reading times [3]. However, in the Korean counterparts (3) and (5), verb information is delayed until the end of the sentence, making immediate use of verb information impossible. Consequently, Korean comprehenders may rely on alternative cues to form filler-gap dependencies.

The role of complementizers in the real-time processing of Korean control constructions is the current focus. Notably, in Korean, complement clauses take different complementizers depending on the control verb that follows them [4]. Subject-control verbs (e.g., promise) follow the complementizer *kilo*, whereas object-control verbs (e.g., persuade) follow the complementizer *tolok*. Previous research [5] has shown that Korean readers use modal suffixes attached to embedded verbs in combination with control verbs to identify the referent of PRO during online processing of control constructions. Further investigation is warranted, however, given certain methodological concerns, such as lack of measurement of the comprehension accuracy in the task. Additionally, use of preverbal cues in the absence of control verb information has yet to be examined.

Method. To address these issues, this study used a timed stop-making-sense task [1], where participants read sentences region by region and pressed a rejection button to move on to the next trial as soon as they perceived the sentence to cease making sense, and an untimed coreference judgment task, where participants read a sentence and selected an agent of the embedded verb between two antecedents. Also, to isolate the complementizer effect, I replaced a specific control verb in stimuli with a neutral verb *ha* 'do', which can take either complementizer. The stimuli comprised 32 target sentences, distributed in a 2 X 2 Latin square design with the factors Complementizer (*kilo* vs. *tolok*) and Plausibility (Plausible vs. Implausible), alongside 64 fillers (Table 1). The plausibility of the context in regions 1 through 5 was manipulated to either align (Plausible) or conflict (Implausible) with the complementizer information presented in R6 by alternating the subject NP and the object NP. Sixty-eight native speakers of Korean participated in the experiment.

Results. (1) Reading times (Fig.1): At R6 (Complementizer region), the main effect of Complementizer did not reach significance ($p = .08$). However, both the main effect of Plausibility and the interaction of Plausibility and Complementizer were found to be statistically significant ($p < .05$). Specifically, at R6, Plausible sentences were read faster when the complementizer was *tolok* as opposed to when it was *kilo*, indicating that object-control sentences were processed more effortlessly than their subject-control sentences. **(2) Rejections (Fig.2):** At R6, there was a significant main effect of Complementizer ($p < .001$) and a significant main effect of Plausibility ($p < .001$). *Tolok* sentences exhibited lower rejection rates than *kilo* sentences, regardless of Plausibility, indicating an object-control bias. **(3) Coreference judgment (Fig.3):** I found a significant Complementizer effect ($p < .01$) and a Plausibility effect ($p < .001$). One intriguing observation is that comprehenders interpreted more accurately when the complementizer was *kilo* rather than *tolok*, regardless of Plausibility.

Discussion. These findings indicate that control information induced by complementizers is sufficient to elicit filler-gap dependency formation in the online processing of Korean control constructions, even in the absence of control verb information. The contradictory outcomes observed between timed (online) and untimed (offline) tasks suggests the possibility that the processing strategies of comprehenders can differ depending on the characteristics of the task they are participating in.

(1) John[1]   promised   Mary[2]   [PRO[1/*2]   to wash dishes.]   (Subject-control)
(2) John[1]   persuaded   Mary[2]   [PRO[*1/2]   to wash dishes.]   (Object-control)

Table 1. Experimental Design and a Set of Example Stimuli (Critical regions: Regions 6 & 7)

Complementizer	Plausibility	Sentence
kilo (Sbj-control)	Plausible	(3) Today $_{R1}$/ waiter-NOM $_{R2}$/ customer-DAT $_{R3}$/ quickly $_{R4}$/ order-ACC $_{R5}$/ **take-KILO $_{R6}$/ do-PST-DECL-COMP $_{R7}$**/ say-PRS-DECL $_{R8}$ "It is said that a waiter[1] decided PRO[1] to take an order quickly from a customer[2] today."
kilo (Sbj-control)	Implausible	(4) Today $_{R1}$/ customer-NOM $_{R2}$/ waiter-DAT $_{R3}$/ quickly $_{R4}$/ order-ACC $_{R5}$/ **take-KILO $_{R6}$/ do-PST-DECL-COMP $_{R7}$**/ say-PRS-DECL $_{R8}$?"It is said that a customer[1] decided PRO[1] to take an order quickly from a waiter[2] today."
tolok (Obj-control)	Plausible	(5) Today $_{R1}$/ customer-NOM $_{R2}$/ waiter-DAT $_{R3}$/ quickly $_{R4}$/ order-ACC $_{R5}$/ **take-TOLOK $_{R6}$/ do-PST-DECL-COMP $_{R7}$**/ say-PRS-DECL $_{R8}$ "It is said that a customer[1] had a waiter[2] PRO[2] take their order quickly today."
tolok (Obj-control)	Implausible	(6) Today $_{R1}$/ waiter-NOM $_{R2}$/ customer-DAT $_{R3}$/ quickly $_{R4}$/ order-ACC $_{R5}$/ **take-TOLOK $_{R6}$/ do-PST-DECL-COMP $_{R7}$**/ say-PRS-DECL $_{R8}$?"It is said that a waiter[1] had a customer[2] PRO[2] take an order quickly today."
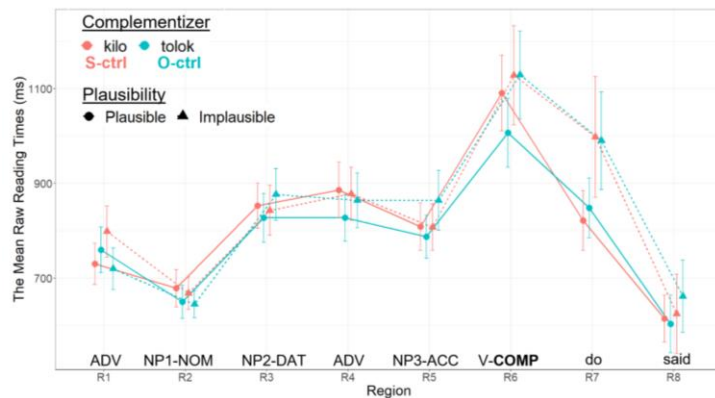
Figure 1 (Top Left). Mean reading times. Error bars indicate standard error of the mean.

Figure 2 (Bottom Left). Cumulative percentages of rejection in the critical regions.

Figure 3 (Bottom Right). Mean rates of correct judgments by Complementizer and Plausibility. The error bars show standard errors.
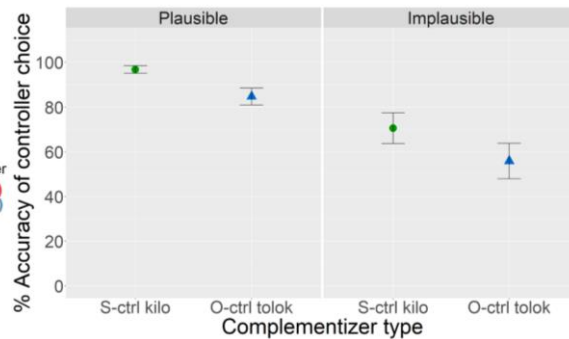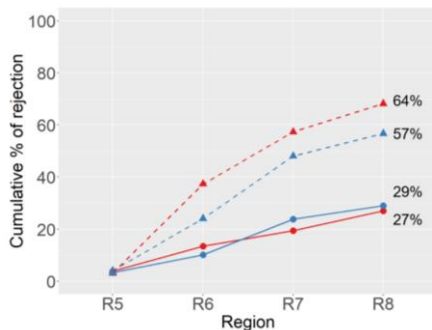
References: [1] Boland, J. E., Tanenhaus, M. K., & Garnsey, S. M. (1990). Evidence for the Immediate Use of Verb Control Information in Sentence Processing. *Journal of Memory and Language 29*(4): 413–32. **[2]** Frazier, L., Clifton, C., & Randall, J. (1983). Filling gaps: Decision principles and structure in sentence comprehension. *Cognition, 13*(2), 187-222. **[3]** Sakamoto, T. (1991). *Processing empty subjects in Japanese: Implications for the transparency hypothesis.* City University of New York. **[4]** Park, J. U. (2011). *Clause Structure and Null Subjects: Referential Dependencies in Korean.* Doctoral dissertation, Georgetown University **[5]** Song, J. & Yun, H. (2016). The Predictive Processing of Korean Control Sentences. *Journal of Cognitive Science 17*(3): 389–422.