Antecedent Structure Complexity Effect in Processing of Sluicing

Hyosik Kim (Northwestern University), Ming Xiang (University of Chicago) and Masaya Yoshida (Northwestern University)

[Introduction] One of the long-standing questions in the study of the processing of ellipsis constructions is whether processing of an ellipsis site is influenced by the structure of the antecedent of the ellipsis site. Some previous studies have shown that the structure of the antecedent does not influence the processing of the ellipsis site and suggested that structures may not be built in the ellipsis site [1,2,6,7]. On the other hand, other studies have suggested that the structure of the antecedent may influence the processing of the ellipsis site [5,8,9]. In the present study, we investigate whether structural properties of antecedent clauses influence the processing of the ellipsis site. The result of an online Maze experiment shows that the structural complexity of the antecedent and the processing complexity of the ellipsis site correlate, i.e., when the antecedent involves more complex structures, the processing of the ellipsis site is slower. We argue this result suggests that the parser is accessing the structure of the antecedent when the ellipsis site is processed.

[Experiment] Previous studies on the processing of wh-dependencies have shown that when the wh-phrase moves over a complex NP as in (1a), the processing of a wh-gap dependency is more difficult compared to when the wh-phrase moves out of a subordinate clause (CP) as in (1b) [3,4]. The processing difficulty was captured by the increased reading time at the verb 'pleased' in (1a). [3,4] argued that the successful processing of wh-dependency requires reactivation of the wh-filler, and the difficulty of the reactivation depends on the distance of the filler and the gap. They reasoned that having a CP boundary in (1b) creates an intermediate gap at the CP boundary, and this intermediate gap helps the parser to reactivate the filler.

(1) a. ... **who** [$_{NP}$ the consultant's claim about that the new proposal] had pleased GAP.
b. ... **who** the consultant claimed [$_{CP}$ that the new proposal had pleased GAP].

Taking advantage of this paradigm, we can potentially test whether the structure of the antecedent of the ellipsis site influences the processing of the ellipsis site. If the parser has access to the structure of the antecedent during the processing of the ellipsis site, the processing of the ellipsis site should be more difficult when the antecedent involves more complex structure. On the other hand, if the parser does not access the structure of the antecedent, the complexity of the antecedent should not create the difficulty of the processing of the ellipsis site.

An online Maze experiment (a word-by-word reading task where participants see two words at a time and must choose the correct one to continue [10]) was conducted (n=83) in which, the structure of the antecedent (CP vs. NP vs. none) was manipulated as an independent variable in a 1x3 factorial design in Sluicing context. A sample set of stimuli is summarized in Table 1.

A linear regression model was used to test the *Antecedent Structure Complexity* effect on processing of Sluicing. The result is presented in Figure 1. There are two major observations. First, at the region of the connective 'but', the NP condition was read significantly slower than the CP condition ($\beta = 129.20$, SE= 50.63, t= 2.552, $p<0.05$). This suggests that the antecedent structure of the NP condition is harder to process than that of the CP condition, replicating the findings observed by [3,4]. Second, importantly, the same complexity effect was observed at the spillover region 'it' such that the reading times were slower in the NP condition than in the CP condition ($\beta = 127.61$, SE= 53.01, t= 2.407, $p<0.05$). This suggests that the processing of the ellipsis site was affected by the antecedent structure complexity.

[Conclusion] This study shows that the structure with a NP-containing wh-dependency is harder to process than the structure with a CP-containing wh-dependency, and this structural complexity influenced the processing of the ellipsis site. We take this as evidence that readers indeed had access to the structural information of the antecedent and recovered it when processing the ellipsis site.

Condition	example
CP	The manager asked who the **consultant claimed** that the new proposal had pleased, but the worker couldn't tell who, although it seemed obvious.
NP	The manager asked who the **consultant's claim** about the new proposal had pleased, but the worker couldn't tell who, although it seemed obvious.
None	The manager asked who the new proposal had pleased, but the worker couldn't tell who, although it seemed obvious.

Table1. A sample set of stimuli

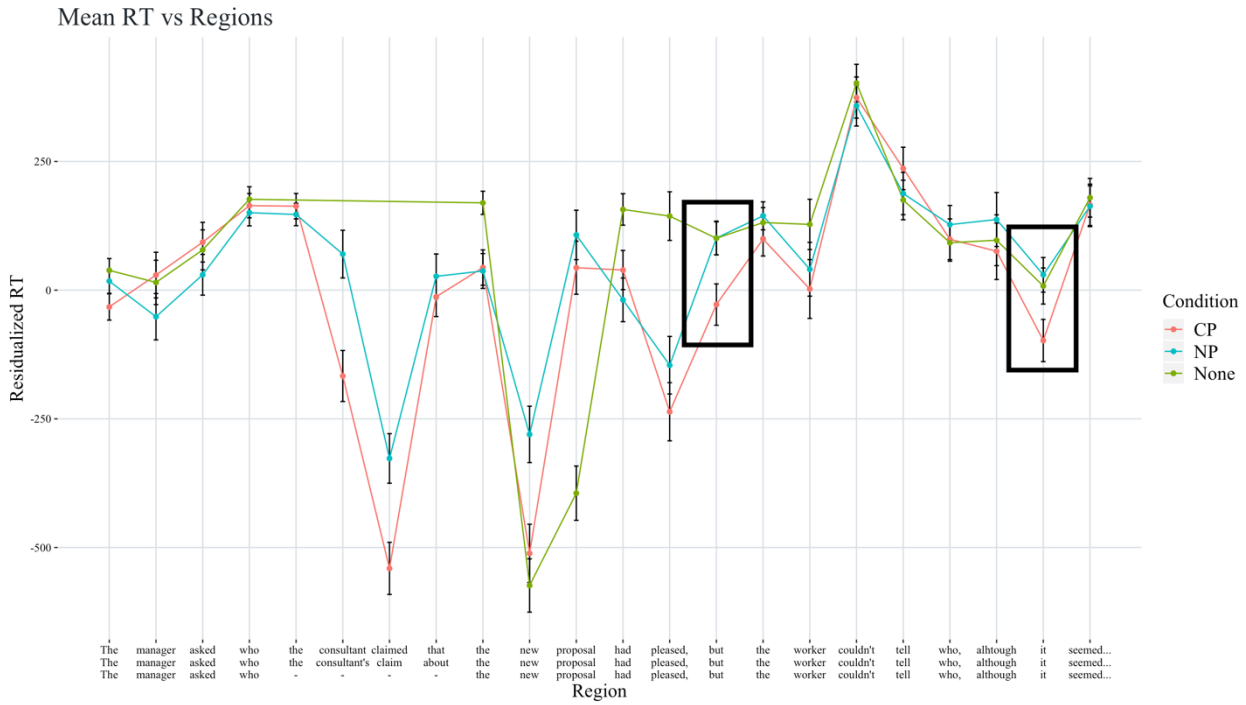

Figure1. Residualized Reaction Time

[References]

[1] Frazier, L. & Clifton, C. 2000. *Journal of Psycholinguistic Research*.
[2] Frazier, L. & Clifton, C. 2001. *Syntax*.
[3] Gibson, E., & Warren, T. 2004. *Syntax.*
[4] Keine, S. 2015. *University of Massachusetts, Amherst*.
[5] Kim et al. 2018. *Language Cognition and Neuroscience.*
[6] Martin, A. E., & McElree, B. 2008. *Journal of Memory and Language*.
[7] Martin, A. E., & McElree, B. 2011. *Journal of memory and language.*
[8] Murphy, G. 1985. *Journal of Pragmatics.*
[9] Paape, D., Nicenboim, B., & Vasishth, S. (2017). *Glossa: a journal of general linguistics*
[10] Boyce, V., Futrell, R., & Levy, R. P. (2020). *Journal of memory and language.*