Processing embedded clauses in Korean: silent element or a dependency formation?

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Long-distance dependencies such as Relative Clauses (RCs) are difficult to process, as they involve linking a silent element and an overt phrase (e.g., *the **fact** that __ worried the president*). Indeed, readers are known to prefer Complement Clauses (CCs) which do not involve a long-distance dependency (e.g., *the fact that the deficit worried the president*) [1,2,3]. The difficulty of long-distance dependencies could arise from (i) the need to *identify* a silent element, or from (ii) the need to create a non-local link between the silent element and the head noun (or both).

We disentangle the two by examining RC/CC ambiguities in Korean, a head-final language where RCs and CCs *precede* the noun. We exploited the fact that Korean has 'null' pronouns and created a temporarily ambiguity between **RCs** and **CCs** [Regions 1-5]: the head noun [Region 6] disambiguates as a RC in (A,C) (the *teacher* can eat an apple) and as a CC in (B,D) (a *fact* cannot eat an apple). If the difficulty of long-distance dependencies is due to the silent element, our manipulation should eliminate the asymmetry between RCs and CCs. Second, we exploited the fact that Korean uses an honorific marker on the verb when the subject is honorable [Region 3: eat-<u>HON</u>-COMP]. Our RC/CC had two embeddings (=the teacher/fact that the **beggar/president** claimed __ ate an apple); we manipulated the honorable status of the embedded subject (beggar/president). Because of the word order [Regions 1-3], the Mismatch (A-B) could cue readers early on into the (correct) possibility of there being another discourse referent, whereas the Match could lead readers to (wrongly) assume that the president is eating the apple (C-D).

SELF-PACED READING RESULTS (n=56). (i) **What happens when readers encounter the honorific-marked verb (Region 3)?** A main effect of Honorific (β=-0.11, *SE*=0.03, *t*=-3.90), with Mismatch conditions being read significantly slower than the Match conditions, an effect that continued into the spillover region (β=-0.11, *SE*=0.02, *t*=-5.03). This indicates that the mismatch between the subject (beggar) and the honorific-marked verb led to processing difficulty. In the Match conditions, readers probably (wrongly) assumed that the president was the one eating the apple. The Mismatch cases may have simply been parsed as an error, but it is also possible that it led readers to consider the more complex parse of a double embedding. (ii) **What happens when readers encounter the disambiguating head noun (Region 6)?** Here we still observe a main effect of Honorific (β=-0.08, *SE*=0.03, *t*=-2.71), with Mismatch sentences read slower, but, importantly, there is also a main effect of Clause Type (β=0.22, *SE*=0.05, *t*=4.64), with RCs being read significantly slower than CCs. This is our central finding: because, for both clause type, encountering the head noun reveals the need to identify and interpret a silent element, and so the difference in reading times can be traced to the difference between RCs and CCs, namely the cost of creating a link between the head noun and the silent element. The main effect of Clause Type continued in the spillover region (β=0.10, *SE*=0.03, *t*=4.05), but, interestingly, here it was accompanied by a Clause Type X Honorific interaction (β=0.11, *SE*=0.05, *t*=2.24). At this point, the difference between the RC and the CC in the Mismatch cases was no longer significant (β=0.05, *SE*=0.03, *t*=1.23), suggesting the non-local link in the RC was formed easily when an additional (silent) discourse referent was predicted earlier. In contrast, the RC-Match sentences were still read significantly slower than the CC-Match sentences (β=-0.16, *SE*=0.04, *t*=4.45), reflecting a continued cost of linking the silent element to the head noun (teacher) after it was linked to another discourse referent (president), a reanalysis that is not needed in the CC case.

These results are inline with previous findings that Relative Clauses are harder to process than Complement Clauses (cf. [1,2.3]). We extend prior results by showing that this difference holds in a head final language, where the silent element appears before the head noun [4-11]. Most importantly, our findings disentangle difficulties of long-distance dependencies by isolating the difficulty of forming a non-local link (in the RC) from the difficulty of identifying silent elements (present in both the RC and CC conditions). These findings suggesting that over and above the costs of managing a silent element, linking that element to form a long-distance dependency with the head noun is costly (cf. [1]).

Region: 1 [[SUBJ-2	2 [OBJ-3	3-4 VERB-3]	5 VERB-2]	6 SUBJ-1]	7	8-10 VERB-1
(A) Relative Clause (RC) / Honorific Mismatch						
거지가	사과를	드셨다고 강하게	주장한	**선생님은**	사람들에	의해 널리 알려졌다.
The beggar-NOM	apple-ACC	eat-HON-COMP strongly	claim-ADN	**teacher-TOP**	people	by was widely known
The teacher who **the beggar** claimed ate an apple was widely known by people.						
(B) Complement Clause (CC) / Honorific Mismatch						
거지가	사과를	드셨다고 강하게	주장한	**사실은**	사람들에	의해 널리 알려졌다.
The beggar-NOM	apple-ACC	eat-HON-COMP strongly	claim-ADN	**fact-TOP**	people	by was widely known
The fact that **the beggar** claimed an honorable person ate an apple was widely known by people.						
(C) Relative Clause (RC) / Honorific Match						
회장님이	사과를	드셨다고 강하게	주장한	**선생님은**	사람들에	의해 널리 알려졌다.
The president-NOM	apple-ACC	eat-HON-COMP strongly	claim-ADN	**teacher-TOP**	people	by was widely known
The teacher who **the president** claimed ate an apple was widely known by people.						
(D) Complement Clause (CC) / Honorific Match						
회장님이	사과를	드셨다고 강하게	주장한	**사실은**	사람들에	의해 널리 알려졌다.
The president-NOM	apple-ACC	eat-HON-COMP strongly	claim-ADN	**fact-TOP**	people	by was widely known
The fact that **the president** claimed an honorable person ate an apple was widely known by people.						
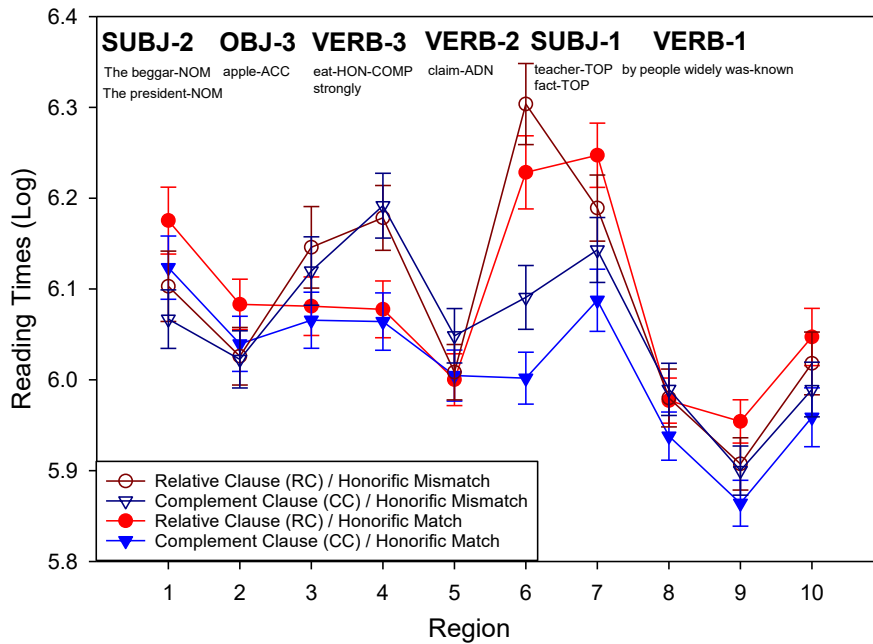
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