## Semantic interference in dependency formation: NP types in cleft sentences

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**[INTRODUCTION]** We used similarity-based interference effects to test how NP types of an intervenor modulates the processing of filler-gap dependencies [1], under the cue-based retrieval mechanism [2]. This interference effect arises when a distractor that has partially or wholly matching features with a target noun phrase (NP) is retrieved in parallel to the filler, leading to processing overload. Warren & Gibson (2002, 2005)'s complexity rating study ([3,4]), meanwhile, observed that parsers were sensitive to the gradient status of a distractor in discourse, following the Givenness Hierarchy ([5,6]). For example, a distractor that is most central in the discourse (e.g. *pronouns*) caused the least processing cost, followed by less central NPs on the hierarchy (e.g. *definites*) [pronouns > first names > full names > definites > indefinites]. On this view, this paper explores whether the interference effect of a distractor is truly a similarity effect or is in fact a more fine-grained discourse-level of the semantic hierarchy, or both.

**[EXPERIMENT]** A self-paced moving window experiment had a 2 x 3 design (n=36), crossing two types of the filler in the clefted position (NP1) and three types of a distractor in the embedded NP position (NP2) as shown in (1): [definite descriptions, indefinite descriptions] x [pronouns, definite descriptions, indefinite descriptions]. Experimental materials consisted of 24 sets of 4 items in each 6 conditions, and each item was followed by a comprehension question.

*(1) It was {the actor/an actor} who {we/the director/a director} graciously thanked before the show.*

The reading time on the critical verb (e.g. *thanked*) did not reveal a main effect of NP1 ($t$=-0.62, $p$=.54) but showed a reliable effect of NP2 type. The pronoun NP2 condition was read significantly faster than definite and indefinite conditions ($t$=-3.60, $p$ < .001). Surprisingly, the reading time of the definite NP2 was slower than the indefinite NP2, which conflicts with the prediction of the givenness hierarchy. The statistical analysis showed a marginal effect of definiteness between the definite and indefinite conditions ($t$=1.78, $p$=.07). In addition, the definite-definite description took the slowest reading time ([Fig 1]). The response times to comprehension questions showed a similar pattern with the reading time on the verb in that (i) there was no main effect of NP1 ($t$= 0.34, $p$ > .05*)* and (ii) sentences involving a pronoun in NP2 were responded significantly faster than those with a definite or indefinite NP2 ($t$= -5.34, $p$ < .001*).* The comparison between definite and indefinite conditions, however, revealed no significant difference ($t$= -0.15, $p$ > .05) [Fig 2].

**[DISCUSSION]** The result showed that NP types of the filler (definite vs. indefinite) did not modulate the processing of the filler-gap dependencies in clefts sentences, unlike previous findings of the effect of semantic and syntactic status of the fillers in the processing of other filler-gap dependencies such as islands and *wh*-questions [7,8]. In terms of the NP types of the distractor, the givenness hierarchy predicted a faster reading time of the pronoun than definite and indefinite conditions. However, the slower reading time of a definite than an indefinite was not predicted by the givenness hierarchy. The similarity-based interference effect was also observed only in the definite-definite condition, but not in the indefinite-indefinite condition.

These overall patterns of reading times suggest that the definite NP type of distractors appears to be sensitive to the similarity-based interference effect, in addition to a definiteness effect. This observation could be attributed to the absence of contexts. A sentence without contexts may give rise to the processing load of definites, but not indefinites: definites tend to refer to old or established referents in the discourse [9]. Thus, parsers are likely to automatically look for a referent when they encounter a definite. Since no contexts were given, they would fail to find the referent, and this can be the source of increased processing difficulty. Indefinites, on the other hand, introduce a new referent and thus do not trigger a search for the referent. Parsers do not have to trace back and no additional processing load is required for indefinite. In terms of the response times to the comprehension questions, the similarity-based interference and definiteness effects of definite distractors disappeared. It suggests that working memory load due to these effects no longer affect post-sentence level processing. The extra memory load of

definiteness implies that the process of the accommodation of the definite attractors seem to arise during on-line building of sentence representations, but not post-sentence level processing.

*Figure 1. Mean reading times in the critical verb (ms)*

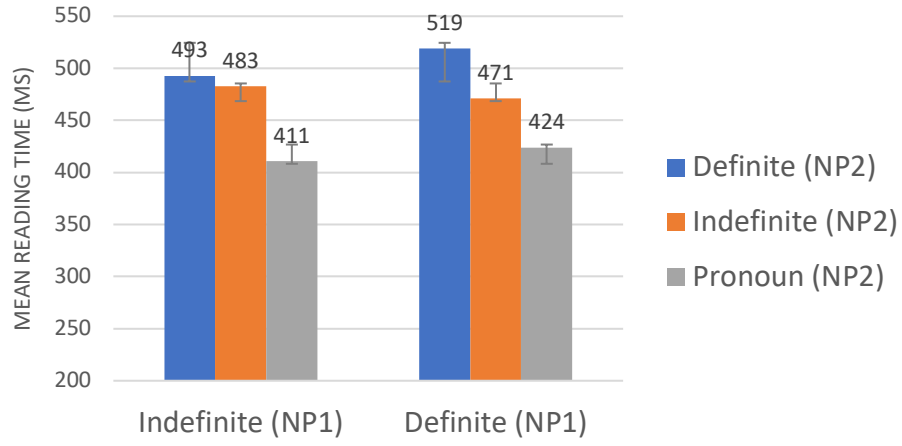
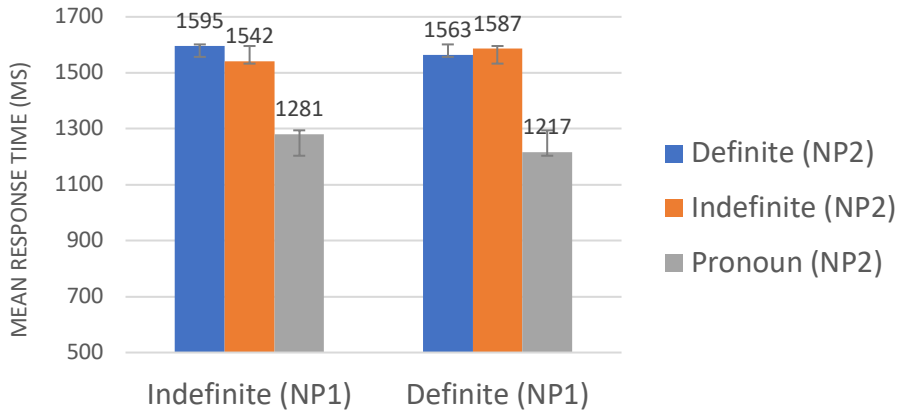



*Figure 2. Mean response times to comprehension questions (ms)*

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