NP types of distractors and the processing of English cleft sentences

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Abstract

This study examines how NP types of a distractor, intervening along the path between filler and gap, modulates dependency formation. In Experiment 1, we manipulated the NP type of the distractor as per the Givenness Hierarchy: *pronoun* ("central"), *definite*, (less central), and *indefinites* ("peripheral") We found that the critical verb was read significantly faster when the distractor was a pronoun than when it was definite or indefinite. Reading times were also marginally slower when the distractor was definite compared with indefinite, a finding which conflicts with the predictions of the Givenness Hierarchy. This difficulty might arise from absence of a prior context. Indeed, in Experiment 2 the definiteness effect was absent in conditions where contextual support provided an appropriate referent.

Keywords: definiteness, givenness hierarchy, filler-gap dependency, similarity-based interference

Introduction

The processing of filler-gap dependencies has been one of the primary means of investigating the linguistic components involved in working memory mechanisms behind the maintenance of wh fillers and retrieval of the stored filler at the gap site. In this study, we tested interference effects of NP types during dependency formation, under cue-based retrieval models (Lewis & Vasishth, 2005). 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. For example, a distractor, *the client* in (1), can be retrieved when the filler, *the lanyer*, is retrieved at the gap site due to its shared features with the filler, such as singular, definite, and animate.

(1) It was *the lawyeri* that the client interviewed _____i in a small office. FILLER DISTRACTOR GAP

Two key hypotheses have been previously proposed to account for interference effects caused by feature-matching distractors. On the one hand, Gordon, Hendrick & Johnson (2001) proposed that distractors which are of the same NP featural type as the filler, (e.g., definite), causes increased processing difficulty due to their feature-matching properties (so called "similarity-based"

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interference effects). Meanwhile, Warren & Gibson (2002, 2005)'s complexity rating study, observed that the parser is sensitive to the gradient status of a distractor in discourse, following the Givenness Hierarchy ("GH": Ariel, 1990; Gundel, Hedberg, & Zacharski, 1993). For example, a distractor that is most central in the discourse (e.g. *pronoun*) causes the least processing cost, followed by less central NPs on the hierarchy (e.g. *definite, indefinite descriptions*) [pronouns > first names > full names > definites > indefinites] (Warren & Gibson, 2002: p.87). Gordon et al (2001)'s experiment therefore does not allow for teasing apart the givenness hierarchy effects from similarity-based effects. 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 1

This experiment had a 2 x 3 design, crossing two NP types of the filler in the clefted (NP1) position and three NP types of a distractor in the embedded NP (NP2) position: [definite descriptions, indefinite descriptions] x [definite descriptions, indefinite descriptions].

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

The similarity-based interference hypothesis predicts that matching NP2s which featurally match with NP1s should lead to increased processing difficulty, as reflected in longer reading times at the main verb (e.g. *thanked*). The discourse hierarchy, in contrast, predicts a main effect of NP2 type: the fastest reading times when NP2 is a pronoun (e.g. *we*) condition, longer when it is a definite description (e.g. *the director*), and longest when it is an indefinite description (e.g. *a director*).

Thirty-six native speakers of English were recruited using Amazon's Mechanical Turk. The task was a self-paced reading using a moving window display. Participants read items like (2), each of which was followed by a comprehension question. The experiment lasted approximately 25 min. Experimental materials consisted of 24 sets of 4 items in each of the 6 conditions, plus 26 filler sentences.

A linear mixed-effects model revealed no main effect of NP1 type (t=-0.62, p=.54) at the critical verb region (e.g., *thanked*). In terms of the NP2 type, the pronoun condition was approximately 60ms faster than the indefinite condition and 90ms faster than the definite condition. The model revealed a significant effect of NP2, in that the pronoun condition was read significantly faster than the averaged definite and indefinite conditions (t=-3.60, p < .001). Surprisingly, the overall reading times of definiteness conditions in NP2 type averaged 29ms faster than the overall reading times of indefiniteness conditions. A marginal

effect of definiteness was found between the definite and indefinite conditions (t=1.78, p=.07).

These findings cannot be not fully accounted for either by the GH or the similarity-based interference effect. The GH predicted more processing difficulty of indefinite descriptions than definite descriptions. The similarity-based interference effect predicts higher reading times in the definite-definite condition and, the indefinite-indefinite condition, which we did not observe. We conclude that the difficulty of definiteness found by Gordon et al. is due *neither* to similarity *nor* givenness and hypothesize that it instead arises from the absence of a prior context which would provide a (unique) referent for a definite NP, thus making difficult to satisfy the uniqueness presupposition for the (English) definite determiner (Löbner, 1985). We test this in Experiment 2.

Experiment 2

Experiment 2 focused exclusively on the definite-indefinite contrast, aiming to examine whether the difficulty of definiteness in Experiment 1 is attenuated with the right contextual support. We included contexts favoring either definite intervenors (unique referent) or indefinite intervenors (two possible referents) and crossed this with NP2 type (definite or indefinite), in a 2x2 design in which NP1 was always definite, as in Table 1.

	Indefinite NP2	Definite NP2
Context favoring DEF NP2:	Target	Target
John, an actor, and Matt, a	TRUE/FALSE	TRUE/FALSE
director, were at the coffee shop.	sentence:	sentence:
They met Andy, a writer, who		
graciously thanked John for his	It is the actor [who a	It is the actor [who
incredible performance in the	writer graciously	the writer graciously
latest movie.	thanked for the	thanked for the
Context favoring INDEF NP2:	incredible	incredible
John, an actor, and Matt, a	performance].	performance].
writer, were at the coffee shop.		
They met Andy, another writer,		
who graciously thanked John for		
his incredible performance in the		
latest movie.		

 Table 1. Sample item set for Experiment 2

We created 16 sets items, presented in 4 lists according to Latin square. Participants (n=33, recruited on Murk) read the context (as a whole) and then the target TRUE/FALSE sentence, (region-by-region). At the verb, there were no main effects either of context type or of NP2 (i.e., distractor) type on RTs (ps > .25), but the interaction was significant (t= -2.5; p= .013), meaning that the

effect of definiteness of NP2 differed according to context type. Planned comparisons showed no effect of NP2 type in the contexts favoring **definites** (p = .4) but in the contexts favoring **indefinites**, the indefinite distractor condition was read significantly faster faster than the definite intervenor condition (431ms vs 523ms, *t*=-2.5, *p*=.007). We interpret this finding to indicate that the processing difficulty of definite distractors, which need to accommodate the presupposition, arises from the absence of a unique referent (as in indefinite-favored contexts). This effect disappears when contextual support provides an appropriate referent (as in definite-favored contexts).

General discussion

The overall findings show that NP types of distractors modulate the processing of filler-gap dependencies. However, neither (i) similarity nor (ii) givenness underlies the difficulty of processing definite distractor NPs. More fine-grained discourse of an intervenor, involving the accommodation of uniqueness presupposition, mediates filler-gap dependency formation of this type.

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