

Syntactic prediction without lexical activation: Evidence from *both (of the)...* and

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The role of prediction in language comprehension has been a topic of intense debate in psycholinguistic research (e.g., DeLong et al., 2005; Nieuwland et al., 2018). While much of this literature has focused on the prediction of a specific lexical item based on Cloze probability, evidence for prediction at the level of sentence structure has also been demonstrated. For example, Staub & Clifton (2006) show that the presence of *either* facilitates the reading of an upcoming disjunction *or*, and further that readers predict the size of the constituent following the disjunction (Clause or NP) based on the preceding sentence material. Blake et al. (CUNY, 2016) present some evidence, however, that the facilitation associated with *either* may not be entirely due to syntactic prediction. In their experiment, early eye movement measures showed that a disjunction preceded by a so-called non-participating *either* (in a partitive construction, e.g., *either of the landscapers...*) patterned with the condition in which *either* did syntactically predict *or*. This suggests that part of the facilitation of the disjunction could be simply due to an association between the word *either* and the disjunction.

Here, we examine a case in which facilitation of a coordination structure may be syntactically predicted, but is unlikely to be affected by mere association between two elements, namely *both* and *and*. These elements can be involved in the same coordination structure (e.g., *Both Amy and Marie went to the store*) but are less associated than *either* and *or*. In a search of the Corpus of Contemporary American English, for example, 3.1% of occurrences of *or* were preceded within 2-9 words by *either*, while 1.3% of occurrences of *and* were preceded by *both*.

Design. Four experimental conditions were tested (see 1a-d). In one condition (a), the coordination could be predicted syntactically via a preceding use of *both*. In another (b), *both* was present but in a partitive structure, and therefore did not participate in the coordination structure. Corresponding conditions without *both* were also tested as controls (c-d).

1. The children/ watched/...

a. ***both the clown/...***

b. ***both of the clowns/...***

c. ***the clown/...***

d. ***one of the clowns/...***

participating *both*

non-participating *both*

definite, no *both*

partitive, no *both*

... juggling/ colourful/ objects/ ***and the dancers/*** who were twirling/ shiny batons./

Method. We measured the eye movements of participants during the reading of sentences as shown in (1). Each trial consisted of one sentence followed by one comprehension question. Twenty-four items were presented and two were excluded due to programming error. Participants were native English-speaking members of the University of Toronto community.

Results (n=36). First fixation times (FFT) and first past times (FPT) for the critical region (e.g., ***and the dancers***) are shown in the table. Following the removal of outliers, a mixed-effects linear regression model with Helmert coded fixed effects revealed an FFT difference between conditions (a) and (b-d) ($t = -2.652, p = 0.013$), and between conditions (b) and (c-d) ($t = 2.137, p = 0.040$), indicating that participating *both* and non-participating *both* had a contrasting influence on initial processing. A difference in FPT was found between conditions (a) and (b-d) ($t = -2.096, p = 0.042$), suggesting that the early effect of the participating *both* was more robust than the effect of non-participating *both*. **Conclusions.** The results are consistent with the hypothesis that the presence of the participating *both* facilitates an expected conjunction later in the sentence, and non-participating *both* does not. Further, we did not find a late penalty for the non-participating *both* condition like that found by Blake et al. (2016) for *either*. Given both the corpus data and the reading times of the current study, we interpret the results as reflecting the weaker association between *both* and *and* as compared to *either* and *or*. Although we find some evidence that the presence of participating *both* leads readers to predict an upcoming *and*, the mere presence of the word *both* is not enough to facilitate a subsequent coordination.

Table: Mean first fixation times, first past times, and total times (SD), critical coordination region.

Structure	FFT	FPT	TT
<i>both the clown...</i>	238 (61)	477 (169)	711 (339)
<i>both of the clowns...</i>	277 (61)	530 (149)	707 (265)
<i>the clown...</i>	251 (44)	501 (135)	749 (290)
<i>one of the clowns...</i>	253 (53)	511 (164)	782 (316)

References:

DeLong, K. A., Urbach, T. P., & Kutas, M. (2005). Probabilistic word pre-activation during language comprehension inferred from electrical brain activity. *Nature neuroscience*, 8(8), 1117-1121.

Nieuwland, M. S., et al. (2018). Large-scale replication study reveals a limit on probabilistic prediction in language comprehension. *eLife*, 7, e33468.

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