

## Thinking ahead has its limits: Structural prediction with correlative and quantificational “both”

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**Background.** The sentence processor is thought to predict upcoming words in highly constraining contexts (Staub 2015, for overview). While much research addresses LEXICAL prediction, the processor may also predict upcoming STRUCTURAL information. Correlative adverbs (*either*, *neither*, *both*) provide ample testing ground for lexical and structural prediction, as they signal upcoming coordination (*or*, *nor*, *and*, respectively). Most studies concentrate on the *either-or* construction, finding (i) LEXICAL PREDICTION: a disjunction *or* is read faster after encountering *either*, and (ii) STRUCTURAL PREDICTION: an upcoming disjunctive structure is predicted from the position of *either*, facilitating processing temporarily ambiguous disjunctions in garden path sentences (Staub & Clifton, 2006; Staub, 2007). However, these adverbs do not necessarily co-occur with a coordinator – e.g., quantificational (*either sailor / both sailors*) and partitive (*either / both of the sailors*) uses, which do not participate in the disjunction (henceforth, *non-participating*). Nonetheless, Blake et al. (2016) found (i) faster reading times at the disjunction following a non-participating *either* (1a) over controls (1b), interpreted as lexical prediction facilitating the disjunction *or*, followed by (ii) a later reading penalty, interpreted as a canceled *structural* prediction. However, other correlative adverbs remain understudied. The present study extends the examination of correlatives to participating and non-participating *both*.

**Self-paced reading (N=48): Structural prediction from *both*.** The stimuli capitalized on a temporary, garden-path ambiguity of a conjunction between an NP and a CP analysis (Table 1). We manipulated the presence and position of *both* (High-Both, Low-Both, No-Both), along with early structural disambiguation. The correlative appeared High (at the first complementizer, signaling a CP conjunction), Low (above the temporarily ambiguous object noun), or was omitted (No-Both control). A complementizer *that* on the second conjunct disambiguated to a CP conjunction prior to the verb in the Unambiguous condition. We expected that High-Both would allow the parser to predict a CP conjunction, facilitating disambiguation to the structurally more complex structure (as in Staub, 2007). Indeed, High-Both sped reading at the coordinator ( $p < .001$ ), with an additional benefit for Unambiguous conditions ( $p = .06$ ). In contrast, Low-Both slowed reading at the disambiguating verb (*laughed*;  $p < .001$ ) and the spillover (main effect,  $p < .001$ ; interaction,  $p < .05$ ). The results support STRUCTURAL prediction: High-Both confirmed the prediction for a clausal conjunct, reducing the garden path effect, whereas the Low-Both generated a prediction for an NP conjunction, exacerbating the garden path effect.

**Eye-tracking (N=48): Lexical prediction from non-participating *both*.** The stimuli (Table 2) crossed the presence of non-participating *both* (Both, NoBoth) with the presence of a disambiguating comma between the two CP conjuncts. The NoBoth condition contained a control quantifier in place of *both* (e.g., *some*, *many*) that did not have a correlative function. We found evidence for LEXICAL prediction in early reading measures: non-participating *both* elicited marginally faster reading times at the conjunction (*and her sister*;  $p = .06$ ) and significantly faster reading times on the spillover ( $p < .05$ ). However, we failed to find evidence for STRUCTURAL prediction. There was no overall penalty as would be expected if non-participating uses generate structural predictions that must later be cancelled or inhibited (cf. Blake et al. 2016).

**Conclusion.** We demonstrate that participating correlative *both* triggers a STRUCTURAL prediction, just as *either* does, but that non-participating quantifier *both* only triggers a LEXICAL prediction, contrary to results from *either*. We propose that the processor may be sensitive to an array of factors when considering potential cues for upcoming structure, such as differences in frequency of use. Indeed, a follow up corpus study showed that *either* is used more often as a correlative than *both* (Table 3), perhaps resulting in a stronger association between *either* and its corresponding coordinative structure. In all, our results suggest that although correlatives appear to generate predictions about upcoming structure, the predictions are not equally strong.

**Examples of participating and non-participating correlative adverbs.**

- (1) a. Either (of) the landscapers will borrow a rake or the manager will buy one at the store.
- b. One (of) the landscapers will borrow a rake or the manager will buy one at the store
- (2) John said (both) that a sailor kissed (both / the) women and (that) the girl laughed.
- (3) Both of the sailors kissed Marie and her sister laughed afterwards while the band played on.

**Experimental materials.**

Table 1. Self-paced reading sample item (from 30 sextets) with ‘/’ indicating regions.

	HighBoth	LowBoth	NoBoth
Ambig	John said <u>both</u> that / a sailor kissed / the women / and the girl ...	John said that / a sailor kissed / <u>both</u> women / and the girl ...	John said that / a sailor kissed / the women / and the girl ...
Unambig	John said <u>both</u> that / a sailor kissed / the women / and <b>that</b> the girl ...	John said that / a sailor kissed / <u>both</u> women / and <b>that</b> the girl ...	John said that / a sailor kissed / the women / and <b>that</b> the girl ...

... / cheerfully / laughed / while the band / played on.

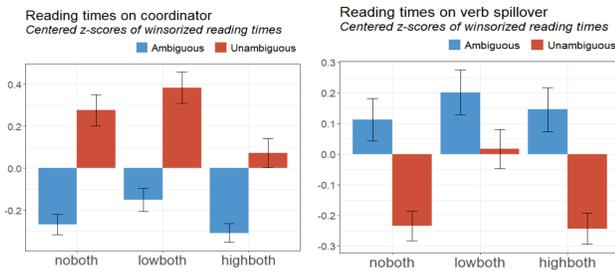
Table 2. Sample item (from 24 quartets) with ‘/’ indicating analysis regions.

It seems that / ...

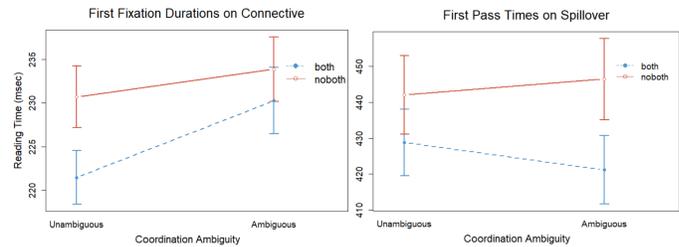
	Both	NoBoth
NoComma	both of the sailors / kissed Marie	some of the sailors / kissed Marie
Comma	both of the sailors / kissed Marie,	some of the sailors / kissed Marie,

... / and her sister / laughed afterwards / while the band / played on.

**Structural prediction for participating both. Lexical prediction for non-participating both.**



Experiment 1: Self-paced reading.



Experiment 2: Eye tracking while reading.

**Corpus results.** Table 3. Usage distribution of *either* and *both* from 400 examples for each adverb sampled from the Corpus of Contemporary American English.

Adverb	Type			
	Correlative	Quantifier	Partitive Quant.	Other
<i>either</i>	239 (60%)	38 (10%)	31 (8%)	92 (23%)
<i>both</i>	168 (42%)	103 (26%)	30 (8%)	99 (25%)

**References.** Blake, K., Gietz, F., & Grant, M. (2016). Prediction and inhibition of syntactic structure: Evidence from *either (of the) ... or*. CUNY 29. ♦ Staub, A. (2007). The return of the repressed: Abandoned parses facilitate syntactic reanalysis. *JML*, 57, 299-323. ♦ Staub, A. (2015). The effect of lexical predictability on eye movements in reading: Critical review and theoretical interpretation. *LLC*, 9, 311-327. ♦ Staub, A., & Clifton Jr, C. (2006). Syntactic prediction in language comprehension: Evidence from *either... or*. *JEP: LMC*, 32, 425-436.