

## Discourse Expectations Raised by Contrastive Connectives

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Markers of negative polarity discourse relations, such as *but*, *although* and *on the one hand... on the other hand* have been shown to induce more processing difficulty than additive or causal markers (e.g., Murray, 1995), and to facilitate the processing of upcoming content (e.g., Köhne & Demberg, 2013). These markers have been argued to shape comprehenders' discourse expectations in a way that differs from what comprehenders would expect in the absence of such markers (Murray, 1995; Köhne & Demberg, 2013; Xiang & Kuperberg, 2014). Here, we present two studies on the nature of the expectations elicited by negative polarity connectives, addressing three primary questions: (i) How specific are the expectations elicited by ambiguous connectors such as *but* and *although*? (ii) Do the discourse expectations raised by a connective like *on the one hand* target any contrast or specifically *on the other hand*? (iii) Are expectations sensitive to discourse structure?

To compare the ambiguous connectors *but* and *although*, we conducted an offline plausibility judgment study and an online eye-tracking-while-reading experiment. **Connective** and **consistency** were manipulated in a 3 (*but* vs. *although*-mid sentence vs. *although*-initial) × 2 (continuation consistent with contrast vs. concession) design (see Exp.1). Passages were normed to ensure that all versions up to the onset of the last sentence were equally acceptable. The last sentence varies in a way that is consistent with either a parallel contrast reading (3a) or a violation of expectation, namely, concession reading (3b) of the discourse relation in the second sentence. Using the Penn Discourse Treebank to assess the frequency with which *but* and *although* mark contrastive vs. concessive relations, we test whether sense frequency yields graded processing effects. Results from the offline plausibility study (n=48 Mturkers, 24 items) and the online eye-tracking study (n=32, same items) indicate that the distribution of a connective does indeed determine its effect on discourse relation inference, consistent with a fully distributional account of connective semantics (Asr & Demberg, 2012). The offline judgment study, which showed that discourse expectations are sensitive to segment order, leaves open the question of how sensitive discourse expectations are to the discourse structure, and whether the inferable discourse structure is used during real-time processing.

To address this question, we designed an eye-tracking experiment in which two clauses marked with *on the one hand* (OTIH) and *on the other hand* (OTOH) were separated by two intervening clauses. The first clause was always a reason relation marked with *because*; the second varied the resulting discourse structure of the passage using three variants: a **local contrast** marked with *but*, a **global contrast** marked with *but*, and an **additive relation** marked with *also* as a baseline (see Exp. 2). If comprehenders predict an upcoming contrast marked specifically with OTOH, the intervening *but* should not satisfy their predictions and therefore not yield difficulty at OTOH. If, however, comprehenders expect a contrast more generally, a slow-down on OTOH following both *but* conditions is possible. If contrast predictions are structure-sensitive, only the global-*but* condition should disrupt comprehension. This is exactly what we find: Reading times at OTOH for local-*but* are not significantly different from the *also* condition, but are significantly faster than in the global-*but* condition. Experiment 2 thus provides evidence that the expectation raised by OTIH for a contrastive relation can be satisfied with a clause marked with *but*, but only if its content constitutes a contrast at the expected level.

Taken together, the two studies support a model in which not only the identity of the connective, but also the order and distance of discourse segments in a passage, affect discourse expectations.

## Experiment 1 Stimulus:

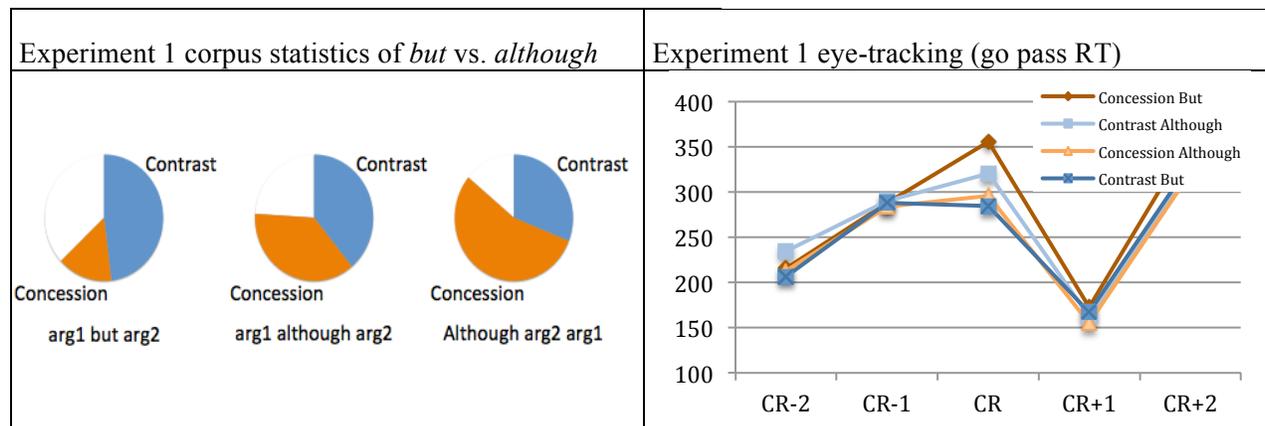
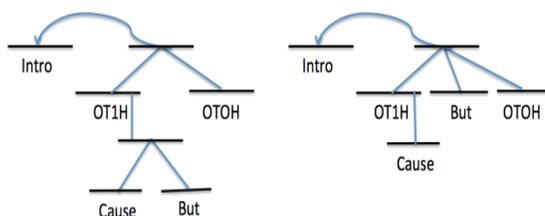
**Conditions: 3 (but vs. although vs. sentence-initial although) \* 2 (Consistency)**

1. After a busy day at the university, Jane came home, made some tea, and started looking for something to eat.
  - 2a. She took some pizza from the fridge that was left from the day before, **but** she desired to have something sweet with her drink.
  - 2b. She took some pizza from the fridge that was left from the day before, **although** she desired to have something sweet with her drink.
  - 2c. **Although** she desired to have something sweet with her drink, she took some pizza from the fridge that was left from the day before.
  - 3a. She had a piece of **cake** and slept early to recharge for another busy day. **Consistent with a contrast reading of 2**
  - 3b. She had a piece of **pizza** and slept early to recharge for another busy day. **Consistent with a concession reading of 2**
- Note: Counter-balancing is applied by replacing “pizza” and “sweet” in sentence 2 with “cake” and “salty”. The Critical Region (CR) in sentence 3 (for the eye-tracking study) marked bold. Conditions with 2c were present **only in the offline study**.

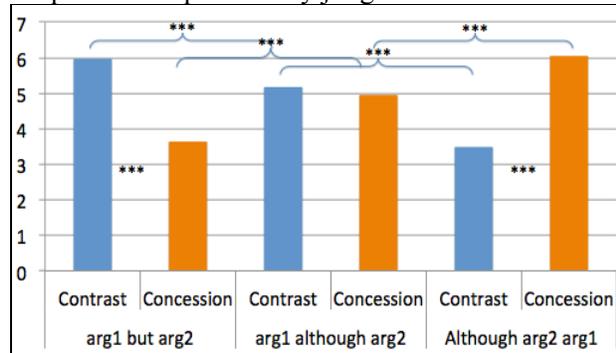
## Experiment 2 Stimulus:

**Conditions: 3 (local but vs. global but vs. also)**

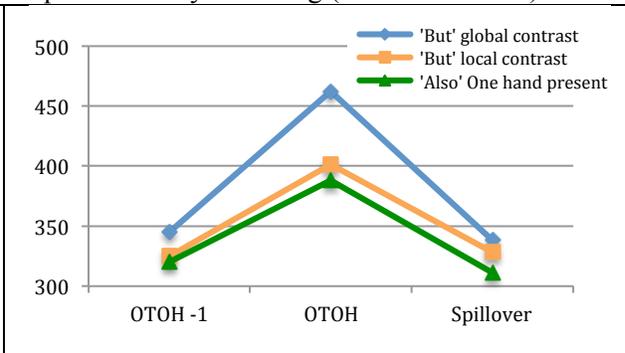
1. John is from Spain and is considering going to a Scottish ceilidh, to dance and listen to music.
2. On the one hand, he thinks it might be a lot of fun, because he’s heard great stories about these parties from his brother.
- 3a. But he does not have the same taste in music as his brother.
- 3b. But he doesn’t know anybody else who will be there.
- 3c. Also, he would like to learn more about Scottish culture.
4. **On the other hand**, he’s really worried about other people seeing his underwear when dancing with a kilt.



## Experiment 1 plausibility judgment scores



## Experiment 2 eye-tracking (first fixation RT)



## References:

- [1] F. T. Asr and V. Demberg (2012) “Measuring the strength of linguistic cues for discourse relations.” ADACA.
- [2] J. Köhne and V. Demberg (2011) “The Time-course of Processing Discourse Connectives.” CogSci.
- [3] J. Murray (1995) “Logical connectives and local coherence.” *Sources of Coherence in Reading*.
- [4] Xiang, Ming, and Gina Kuperberg. "Reversing expectations during discourse comprehension." LCN (2014): 1-25.