The Distribution of a Discourse Connective Determines its Interpretation

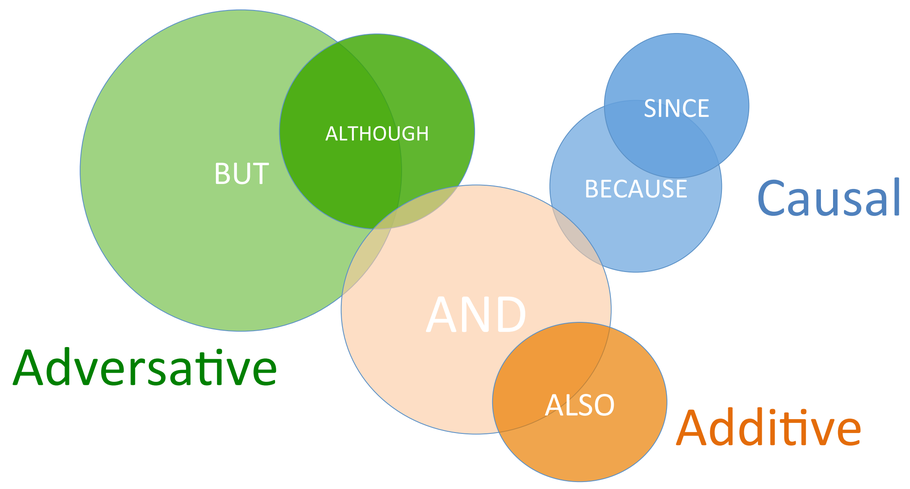
Fatemeh Torabi Asr and Vera Demberg
Saarland University, Germany

Questions:
- Does the usage of a connective in natural text predict its effect on discourse coherence?
- Do other differences such as a connective's position matter?

Hypothesis: a sentence connective biases interpretations towards its most frequent relation sense and this should affect the coherence of the global context.

Background:
Previous work largely limited to comparison of relations / markers that are more different from one another (e.g., Murray 1995, Millis *et al.* 1995, Drenhaus *et al.* 2014).

Different accounts of connectives' semantics:
- A core-meaning approach (Fraser 1999)
- A relevance-based approach (Blakemore 2004)
- A distributional approach (Asr & Demberg 2012, 2013)



Classic categorization of connectives (Halliday & Hassan 1976) by color.
Patterns of overlap indicate the distribution across finer discourse relation senses.

Discourse Relations: Contrast vs. Concession

Contrast encodes a *parallel contrastive comparison*: neither argument describes a situation that is asserted on the basis of the other one.

Concession encodes *violation of causality*: second argument denotes a fact that triggers a set of potential consequences that the first argument denies.

Experimental Material

Design:
3 (*but* vs. *although* vs. *sentence-initial although*) * 2 (*Context*) * 2 (*Continuation*)

(1) After a busy day at the university and attending a lot of courses, Jane came home, made some tea, and started looking for something to eat.
(2) (a) She took some pizza from the fridge that was left from the day before, **but** she desired to have something sweet with her drink.
(b) She took some pizza from the fridge that was left from the day before, **although** she desired to have something sweet with her drink.
(c) **Although** she desired to have something sweet with her drink, she took some pizza from the fridge that was left from the day before.
(3) (a) She had a piece of **cake** and slept early to recharge for another busy day.
Consistent with a *contrast* reading of 2
(b) 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", which is the factor *Context*.
Note: Critical region in sentence 3 (for the eye-tracking study) is bold.

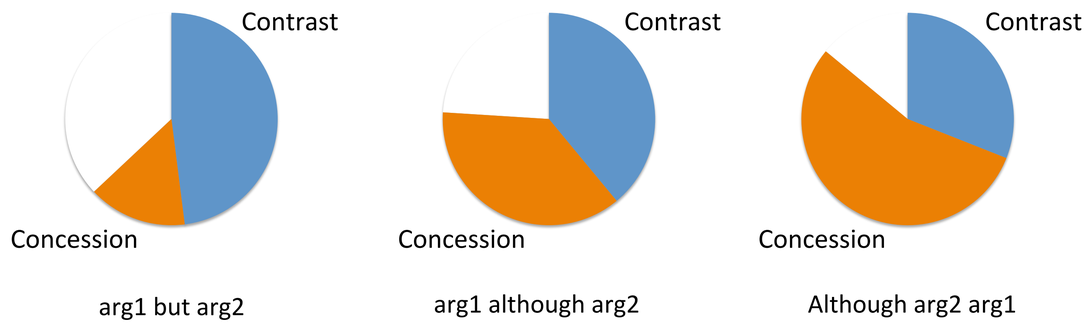
Procedure

Offline coherence judgment task on Amazon Mechanical Turk:
- 48 native English speakers (US American), 24 items
- Likert scale scoring between 1 and 7
- Stories excluding last sentence were matched for coherence (pretested on n=48)

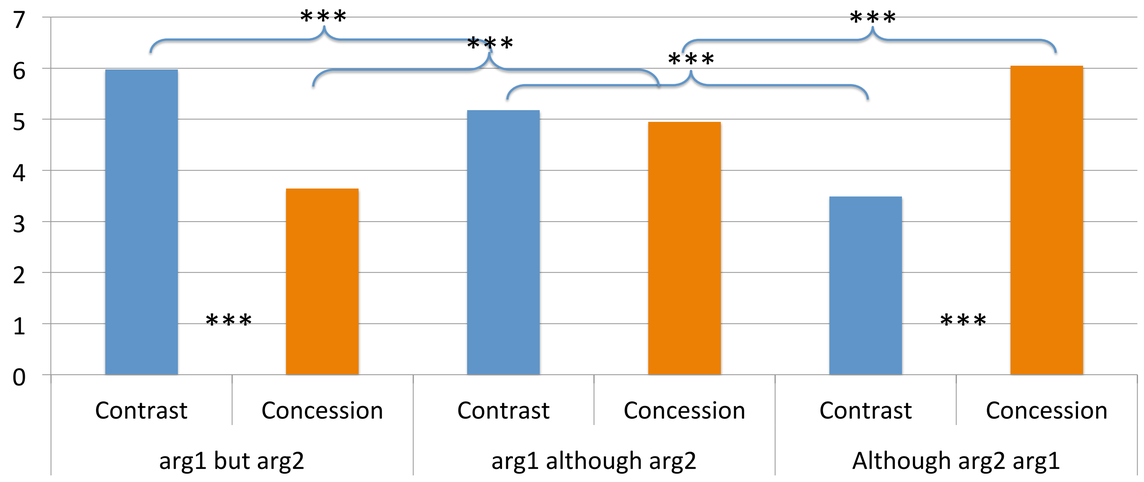
Online reading with Eye-tracking:
- 32 native English speakers in Edinburgh, 24 items
- Stimuli same as above excluding the Although-initial conditions
- Every item: story screen -> key press -> comprehension question -> answer key press
- Eye-link 2000 desktop mount/ 500 sampling rate/ dominant eye

Production, Coherence Judgment, Comprehension

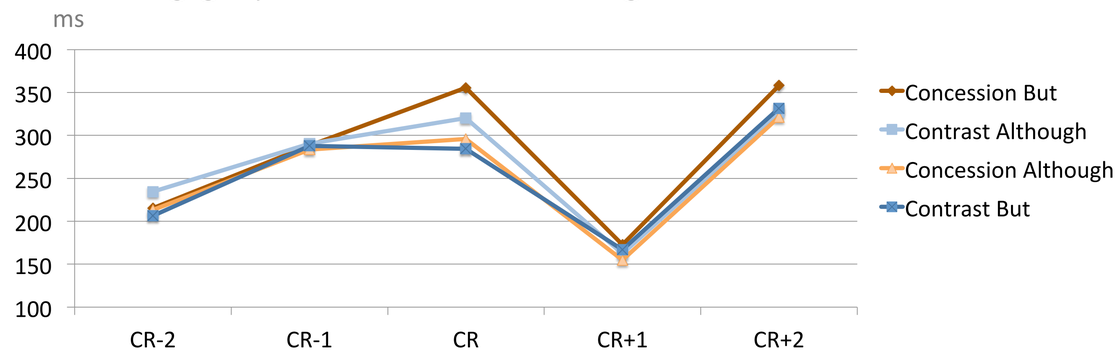
Statistics extracted from corpus data (PDTB)



Coherence scores by AMTurk participants



Reading go pass time: Critical region of the last sentence



- Residual analysis after fitting a LRM to interest area length and subject average reading pace
- Interaction of Connective & Continuation ($p < 0.001$)
- Contrast But < Concession But ($p < 0.01$)
- Contrast Although vs. Concession Although (not significant)

Summary and Conclusions

Evidence from offline coherence judgment & online reading:
- ✓ Fine-grained discourse relations that co-occur with a connective, as well as its syntactic arrangement (sentence initial vs. mid args) affect its meaning.
- ✓ This information can be collected from natural text corpora.

This finding suggests that similar connectives **can have very different effects** on interpretations, perhaps by:
- having different influences on the information structure, e.g. the focus or the Question Under Discussion (Roberts 1996)
- manipulating the truth-conditional state of the unsaid but implied meaning (Grice 1975)

F. T. Asr and V. Demberg (2012) "Measuring the strength of linguistic cues for discourse relations." Proceedings of the Workshop on Advances in Discourse Analysis and its Computational Aspects (ADACA):33.
F. T. Asr and V. Demberg (2013) "On the information conveyed by discourse markers." Proceedings of the Workshop on Cognitive Modeling and Computational Linguistics (CMCL): 84.
D. Blakemore (2004) "Relevance and linguistic meaning: The semantics and pragmatics of discourse markers." Cambridge University Press.
H. Drenhaus,V. Demberg, J. Köhne, and F. Delogu (2014) "Incremental and predictive discourse processing based on causal and concessive discourse markers: ERP studies on German and English". Proceedings of CogSci.
B. Fraser (1999) "What are discourse markers?." Journal of Pragmatics 31.7: 931-952.
H. P. Grice (1975) "Logic and conversation".
M. Halliday and R. Hasan (1976). *Cohesion in English*. *Longman,* London.
K. Millis, J. Golding, and G. Barker (1995). Causal connectives increase inference generation. *Discourse Processes*, 20(1):29–49.
J. Murray (1995). Logical connectives and local coherence. *Sources of Coherence in Reading*, pages 107–125.
C. Roberts (1996) "Information structure in discourse: Towards an integrated formal theory of pragmatics." Working Papers in Linguistics-Ohio State University Department of Linguistics: 91-136.