

Implicit Discourse Relations Beyond Connective Insertion: A Comprehension Study

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Background: Traditionally, discourse relations are associated with the presence of explicit connectives (e.g., “and” (additive), “because” (causal), “then” (temporal)). In recent years, theories of discourse have begun to recognise the importance of describing implicit as well as explicit discourse relations [1, 2]. In natural language, discourse relations are often underspecified, occurring without any specific explicit markers, which can make relation types difficult to determine [3]. Corpora such as Penn Discourse TreeBank (PDTB) insert explicit connectives into implicit relations to make them explicit (e.g., inserting “because” into “I was wet, it rained outside”) [4]. However, discourse relations can also occur with connectives that are not congruent with the underlying relation type [5, 6]. The third version of PDTB is the first to allow for the annotation of implicit discourse relations that do not appear to match the discourse connectives they are occurring with [3], raising questions about how informative connectives are for the classification of implicit discourse relations. **Method:** In the present study, we test how participants interpret variations of 72 sets of implicit discourse relations. The stimuli used (see (a)) manipulated the degree of causal relatedness (strongly / moderately / weakly causally related) between propositions. We also vary the order of propositions, i.e., whether discourse time aligns with event time (temporal order) or not (non-temporal order). The study uses self-paced reading, plausibility ratings, and comprehension questions asking participants to freely describe the meaning of the stimuli. **Analysis:** Responses in which participants inserted a connective are assigned top-level PDTB-style relation types (see (b)). Responses not using PDTB-recognised connectives were annotated based on more implicit grammatical signals or broader logical reasoning. We compare residual reading times, Likert-scale plausibility ratings, relation types, and temporal order. **Expected Results:** We expect more causally related relations to be read faster and perceived as more plausible. In a subset of participants ($N = 19$ of a planned $N = 120$), we observe causal relatedness to influence whether items are interpreted as causal or anti-causal (Contingency vs Comparison and Unrelated, see (c)). We further establish how to categorise responses in which the meaning of propositions is described without (PDTB-recognised) connectives, and how causality and temporal order affect shifts in the order in which they are described. **Discussion:** This study offers an open investigation into the diversity of relation types that can be contained in implicit relations, how they can be analysed using adapted PDTB-style guidelines, and how they relate to psycholinguistic measures such as reading times, plausibility, and syntactic order.

Figures and Tables

(a) Example Target Item Set (**HC**: Highly Causal, **MC**: Moderately Causal, **WC**: Weakly Causal; **TO**: Temporal Order, **NTP**: Non-Temporal Order)

- (1) **HC / TO**: The teenager had drunk too much last night. They had a hangover.
- (2) **HC / NTO**: The teenager had a hangover. They had drunk too much last night.
- (3) **MC / TO**: The teenager had drunk only little last night. They had a hangover.
- (4) **MC / NTO**: The teenager had a hangover. They had drunk only little last night.
- (5) **WC / TO**: The teenager had drunk almost nothing last night. They had a hangover.
- (6) **WC / NTO**: The teenager had a hangover. They had drunk almost nothing last night.

(b) Example Responses by Relation Type (apart from Unspecified all are based on PDTB)

- **Contingency**: “they had too much alcohol [so] **that** they made themselves sick the next day” (based on (1)) → alternative lexicalisation construction (AltLexC), TO retained
- **Comparison**: “the teenager had a hangover **but** hadn't had much to drink the previous night” (based on (5)) → explicit connective, order unexpectedly reversed to NTO (compare with “so”; cf. “the teenager hadn't had much to drink the previous night but had a hangover”)
- **Expansion**: “the teen had consumed alcohol **and** was a lightweight” (based on (3)) → explicit connective signalling conjunction, TO retained though propositions rephrased
- **Temporal**: “The adolescent was not feeling well **after** their night out drinking. When this young person was out, they did not cosume much alcohol” (based on (4)) → explicit connective, additional context strengthens temporal interpretation, NTO retained
- **Unrelated**: “The author [and the participant?] is **shocked that** the teenager can even have a hangover as they hardly drank anything the previous night.” (based on (6)) → participants tend to express surprise or shock when describing relations as incoherent, TO retained
- **Unspecified**: “someone got carried away and drank too much, they woke up feeling rough” (based on (1)) → a comma, full stop, or inserted “and” were considered non-informative, TO retained

(c) Some Early Findings (Ongoing Study!)

Table 1: Participants' Percentage Relation Type Rating Averaged Across Items, by Condition

	Contingency	Comparison	Expansion	Temporal	Unrelated	Unspecified
HC	50.74%	16.21%	13.06%	19.43%	7.16%	33.41%
MC	48.06%	25.20%	13.03%	20.89%	13.40%	32.38%
WC	33.77%	36.03%	17.81%	14.17%	12.14%	28.71%

Selecting multiple relation types was allowed. Percentages are based on multiple participants' relation types per item, which were then averaged across items for each category.

References

- [1] Zeldes, A., Aoyama, T., Liu, Y. J., Peng, S., Das, D., & Gessler, L. (2025). eRST: A signaled graph theory of discourse relations and organization. *Computational Linguistics*, 51(1), 23-72. [2] Webber, B., Prasad, R., Lee, A., & Joshi, A. (2019). The Penn Discourse Treebank 3.0 annotation manual. *Philadelphia, University of Pennsylvania*, 35, 108. [3] Zufferey, S. (2016). Discourse connectives across languages: Factors influencing their explicit or implicit translation. *Languages in Contrast. International Journal for Contrastive Linguistics*, 16(2), 264-279. [4] Prasad, R., Webber, B., & Joshi, A. (2017). The Penn Discourse Treebank: An annotated corpus of discourse relations. In *Handbook of linguistic annotation* (pp. 1197-1217). Dordrecht: Springer Netherlands. [5] Zufferey, S., & Degand, L. (2024). *Connectives and discourse relations*. Cambridge University Press. [6] Torabi Asr, F., & Demberg, V. (2020). Interpretation of discourse connectives is probabilistic: evidence from the study of but and although. *Discourse Processes*, 57(4), 376-399.