# Coercing events or inserting structure? Eye-tracking evidence for a distinction between semantic and syntactic enrichment

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## Background: semantic and syntactic enrichment

- **Semantic enrichment** (e.g. complement coercion):
  - *The boy **started** the puzzle* means something like "the boy started *doing* the puzzle"
- **Syntactic enrichment** (e.g. intensional transitives):
  - *The boy **wanted** the puzzle* means something like "the boy wanted *to have* the puzzle"

- Semantic enrichment involves changing the denotation of *puzzle* (Pustejovsky, 1991 [*Cognition*], among others), but syntactic enrichment involves inserting a silent verb (Harley, 2003 [*LI*]; Pylkkänen, 2008 [*Lang Ling Compass*]; among others)

- **Research question**: do syntactic and semantic enrichment have different consequences for online processing?

- Detecting *semantic* mismatch between a verb and its argument is known to engender processing cost (Traxler et al., 2002 [*JML*], among others), as evidenced by slower reading times for objects that require enrichment
  - Enrichment: "The boy started the puzzle"
  - No-enrichment: "The boy saw the puzzle"
- *Syntactic* enrichment also costly (Delogu et al., 2010 [*JML*])
- Are the patterns of processing costs qualitatively different?

## Design (based on Traxler et al., 2002)

- 48 sentences, manipulating Verb Type (3: aspectual, intensional, neutral) and Noun Type (2: event-denoting, entity-denoting),
  - Neutral verbs (which can take an event or entity complement) should never trigger enrichment
  - Aspectual verbs should trigger enrichment for entity-denoting nouns (as evidenced by slower reading after event verbs than after neutral verbs) but not event-denoting nouns
  - Intensional verbs might always trigger enrichment

*The young boy*
*{started$_{ASPECTUAL}$/wanted$_{INTENSIONAL}$/noticed$_{NEUTRAL}$} a {fight$_{EVENT}$/puzzle$_{ENTITY}$} and his mum found out.*

- Eye-tracking while reading (205 unrelated fillers, comprehension questions on all trials)
- Object surprisal estimated using Google Books trigrams; these values are included as covariates in the statistical models (see also Delogu, 2013 [*CUNY conference*])
- Reading times residualized using linear mixed-effects models

## Results: Object region (*N*=47 native English speakers)

*Violin plots of residual reading times for each measure. Shaded areas represent 95% confidence intervals (from mixed-effects model, normal bootstrap with 100 replicates) of the mean.*
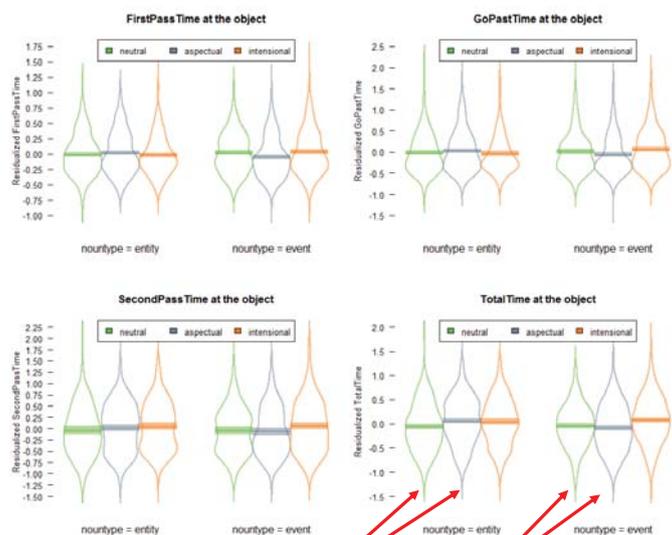


**Entity nouns read more slowly after *aspectual* verbs compared to *neutral* verbs**

**No such slowdown for event nouns**

**Intensional verbs lead to slowdowns for both noun types**
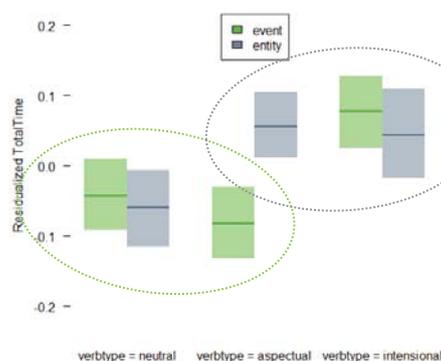
With *event* nouns, aspectual verbs pattern with neutral verbs (no enrichment).

With *entity* nouns, aspectual verbs pattern with intensional verbs (enrichment).

## Discussion

- Semantic and syntactic enrichment may apply differently: semantic enrichment (complement coercion) occurred in limited contexts but syntactic enrichment (covert verb insertion) may have applied across the board
- However, when enrichment did occur, there was not evidence that semantic and syntactic enrichment engendered qualitatively different eye movement patterns
- Future directions:
  - Probing for qualitative differences using ERPs and structural priming;
  - Examining other types of verbs (e.g. verbs that select for propositions)

## Results: Verb region

- No effects of semantic enrichment (aspectual vs. neutral verbs)
- Syntactic enrichment: late measures (regressions in, total reading time) suggest that event-denoting nouns in intensional verb contexts triggered more processing difficulty entity-denoting nouns in intensional verb contexts did