



An event-related potential study of the English resultative construction

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Introduction

- Comprehenders are able to use context to predict the syntactic properties and semantic features of upcoming words. This prediction is probabilistic in nature such that higher constraint contexts lead to higher certainty predictions, leading to more facilitation of bottom-up inputs that are consistent with these predictions (DeLong, Urbach, & Kutas, 2005; Smith & Levy, 2013).
- An unusual word combination can strongly constrain a context, cuing us to generate high certainty predictions of certain fixed expressions (Jurafsky, 1996; Cacciari & Tabossi, 1988).
- Can comprehenders use such informative cues to facilitate access to the resultative construction (Goldberg & Jackendoff, 2004) during online neural processing?

Design

Real Object Resultative construction: direct object consistent with verb's selection restriction

Bill wiped the table...*clean*
...down
...thoroughly
...with

resultative is one of many possible continuations

False Object Resultative construction: direct object inconsistent with verb's selection restrictions

The team ran their shoes*...*thin*
...???

resultative is the only possible continuation

Fully-crossed design also included incoherent real object and false object resultatives.

	Coherent	Incoherent
Real Object	Bill wiped the <u>table</u> <i>clean</i> ...	Bill wiped the <u>table</u> <i>thin</i> ...
False Object	The team ran their <u>shoes</u> <i>thin</i> ...	The team ran their <u>shoes</u> <i>clean</i> ...

Hypothesis

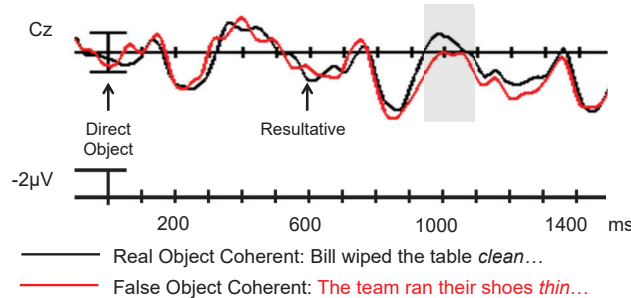
False objects that provide strong cues for a resultative construction will lead to facilitated retrieval of the construction. Thus, the N400 should be smaller to resultatives following false objects than real objects.

Methods

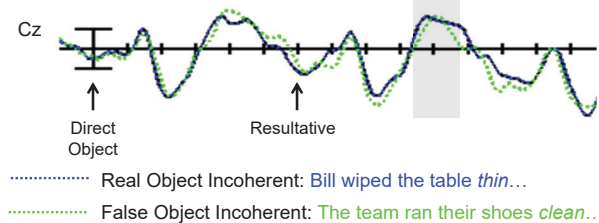
- 28 right-handed subjects
- Plausibility judgment task
- Participants read 60 critical sentences (15 per condition) and 120 filler sentences
- Presented word-by-word (400 ms, 200 ms ISI)
- ERPs measured with 29 active tin electrodes, continuously sampled at 200 Hz with a bandpass filter of 0.01-40 Hz.

Results

A. Smaller N400 evoked to coherent resultatives following false objects than real objects.

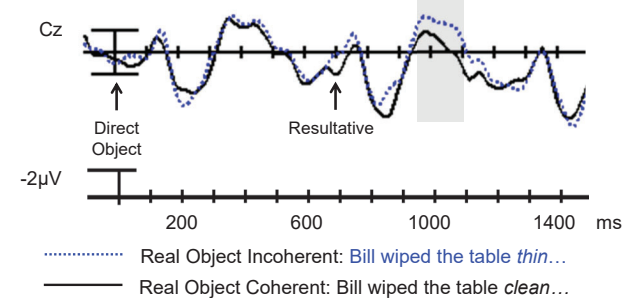


B. No difference between N400 evoked to incoherent resultatives following false objects vs. real objects.

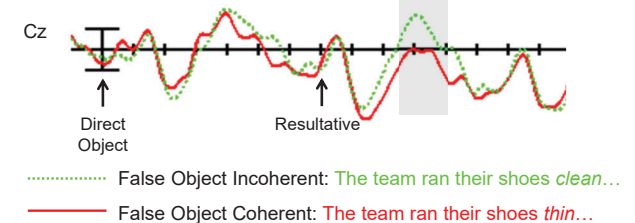


N.B. No N400 effect on direct objects that violate (vs. do not violate) preceding verb.

C. N400 coherence effect comparing incoherent and coherent real object resultatives.

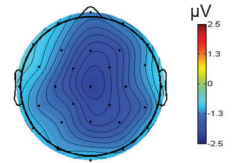


D. N400 coherence effect comparing incoherent and coherent false object resultatives.



Centrally distributed N400 effect to Incoherent vs. Coherent resultatives (collapsed across object type)

N400
350-500ms
post resultative



Conclusions

- Comprehenders can use surprising information as a cue to constrain their probabilistic predictions for particular upcoming constructions, leading to facilitated retrieval of these constructions during online neural processing.
- More generally, these data support the idea that the resultative construction is stored (and retrieved) 'as a whole' (Goldberg & Jackendoff, 2004).

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References

- DeLong, K.A., Urbach, T.P., & Kutas, M. (2005). Probabilistic word pre-activation during language comprehension inferred from electrical brain activity. *Nature Neuroscience*, 8(8), 1117-21.
- Smith, N. J., & Levy, R. (2013). The effect of word predictability on reading time is logarithmic. *Cognition*, 128(3), 302-319.
- Jurafsky, D. (1996). A probabilistic model of lexical and syntactic access and disambiguation. *Cognitive Science*, 20(2), 137-194.
- Cacciari, C., & Tabossi, P. (1988). The comprehension of idioms. *Journal of Memory and Language*, 27(6), 668-683.
- Goldberg, A.E. & Jackendoff, R. (2004). The English resultative as a family of constructions. *Language*, 80(3), 532-568.