Using structural priming to test links between constructions:

Priming between caused-motion and resultative sentences

Tobias Ungerer, University of Edinburgh
s1773505@ed.ac.uk

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Research question

What can structural priming tell us about speakers' representations of **distinct but related** grammatical constructions?

A case study

- Goldberg (1995) argues that the **caused-motion construction** in (1) and the **resultative construction** in (2) are related via metaphorical extension

  (1) Bill rolled the ball down the hill. ('CAUSE TO MOVE')

  (2) Herman hammered the metal flat. ('CAUSE TO BECOME')

- Metaphorical extension links are part of Goldberg's **four-way classification of 'inheritance links'**, i.e. a model of the primary relations which interrelate grammatical constructions in speakers' mental networks

Outline of the talk

1 **Previous research on structural priming**

What is it and under which conditions does it occur?

2 **Two exploratory experiments**

Structural priming between the English caused-motion and resultative construction

3 **Conclusion**

Methodological potential and challenges; further research questions

Previous research on structural priming

Some basics

- “Priming effects occur when processing a stimulus with particular characteristics affects subsequent processing of another stimulus with the same or related characteristics” (Branigan & Pickering, 2017, p. 6)
- Primes can **facilitate** target processing or **hinder** it (e.g. Hilpert & Correia Saavedra, 2016)
- **Lexical priming** – since Meyer & Schvaneveldt (1971): Participants recognise *nurse* faster after having seen *doctor* than after seeing *butter*
- **Structural priming** – since Bock (1986): Participants are more likely to produce an active sentence after having read an active rather than a passive sentence, and vice versa

Previous research on structural priming

Under which conditions does structural priming occur?

- … an ongoing controversy
- Can be caused by **syntactic and/or semantic similarities** (e.g. Bock & Loebell, 1990; Hare & Goldberg, 1999; Ziegler et al., in press)
- Occurs both in **production and comprehension** (e.g. Segaert et al., 2013; Tooley & Bock, 2014)

  → even though effects in production might tend to be stronger (Branigan & Pickering, 2017)
- May be enhanced by repetition of the same verb between prime and target, a so-called **'lexical boost'** (Pickering & Branigan, 1998)

  → but some studies have found similar effects with and without lexical boost (Tooley & Bock, 2014)

Two exploratory experiments

Distinct but related **constructions**

Caused-motion (CM): *Bill rolled the ball down the hill.*

Resultative (RES): *Herman hammered the metal flat.*

Research questions specified

1. Can structural priming in comprehension be observed between the two constructions?
2. Does priming occur equally in both directions, or is there an asymmetric effect (e.g. from metaphorical source to target)?
3. Which role does lexical boost play ?
4. Which experimental methods and task designs are most effective to test speakers' representations of the two constructions?

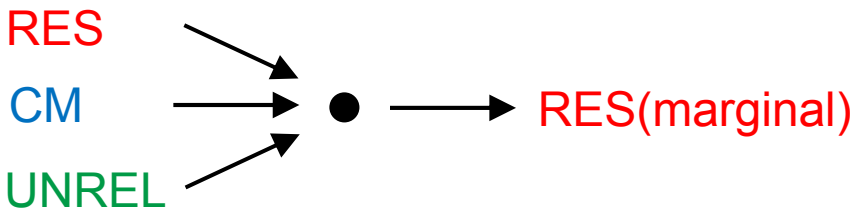
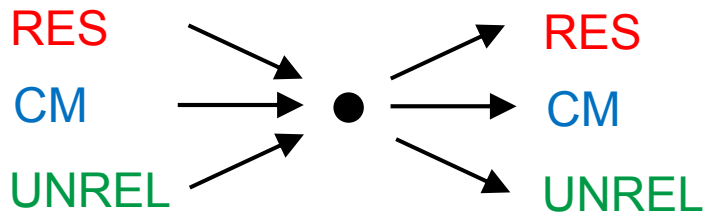
Experiment 1 & 2: Participants

Experiment 1	Experiment 2
159 participants	160 participants

Adult English native speakers (self-reported) living in the U.S.

Recruited online via Amazon Mechanical Turk

Experiment 1 & 2: Materials

	Experiment 1	Experiment 2
Primes	3 prime types: RES: e.g. *Allan wiped the table dry.* [adjectival] CM: e.g. *Steve pushed the chair into the kitchen.* UNREL: e.g. *Jenny managed to escape.*	
Targets	Marginally acceptable RES: e.g. *Robert kissed Sandra unconscious.* *Leslie frightened Fred awake.* 	Same as prime constructions, i.e. all 3 constructions appear as prime and target 
Verbs	All sentences use a different verb (no lexical boost)	Each verb occurs in 2 RES + 2 CM items, i.e. prime-target pairs can occur with and without lexical boost

Experiment 1 & 2: Methods

	Experiment 1	Experiment 2
Web tool	Experiment hosted on Ibex Farm (Drummond, n. y.)	
Task	Self-paced reading (word by word) + speeded acceptability judgments (1-5 Likert scale)	

Joe

pushed

Bob

into

the

kitchen.

Judge!

(Totally UNacceptable) 1 2 3 4 5 *(Totally acceptable)*

Press the number button on your keyboard.

Experiment 1 & 2: Methods

	Experiment 1	Experiment 2
Web tool	Experiment hosted on Ibex Farm (Drummond, n. y.)	
Task	Self-paced reading (word by word) + speeded acceptability judgments (1-5 Likert scale)	Self-paced reading (word by word) with maze task (Forster et al., 2009; experiment code from Boyce et al., 2019)

Words so far: 0

Vivian

x-x-x

e

i

Words so far: 1

plates

e

pulled

i

Words so far: 2

the

e

die

i

Words so far: 3

seeing

e

window

i

Words so far: 4

shut.

e

adds.

i

Correct! Press any key to continue

Experiment 1 & 2: Methods

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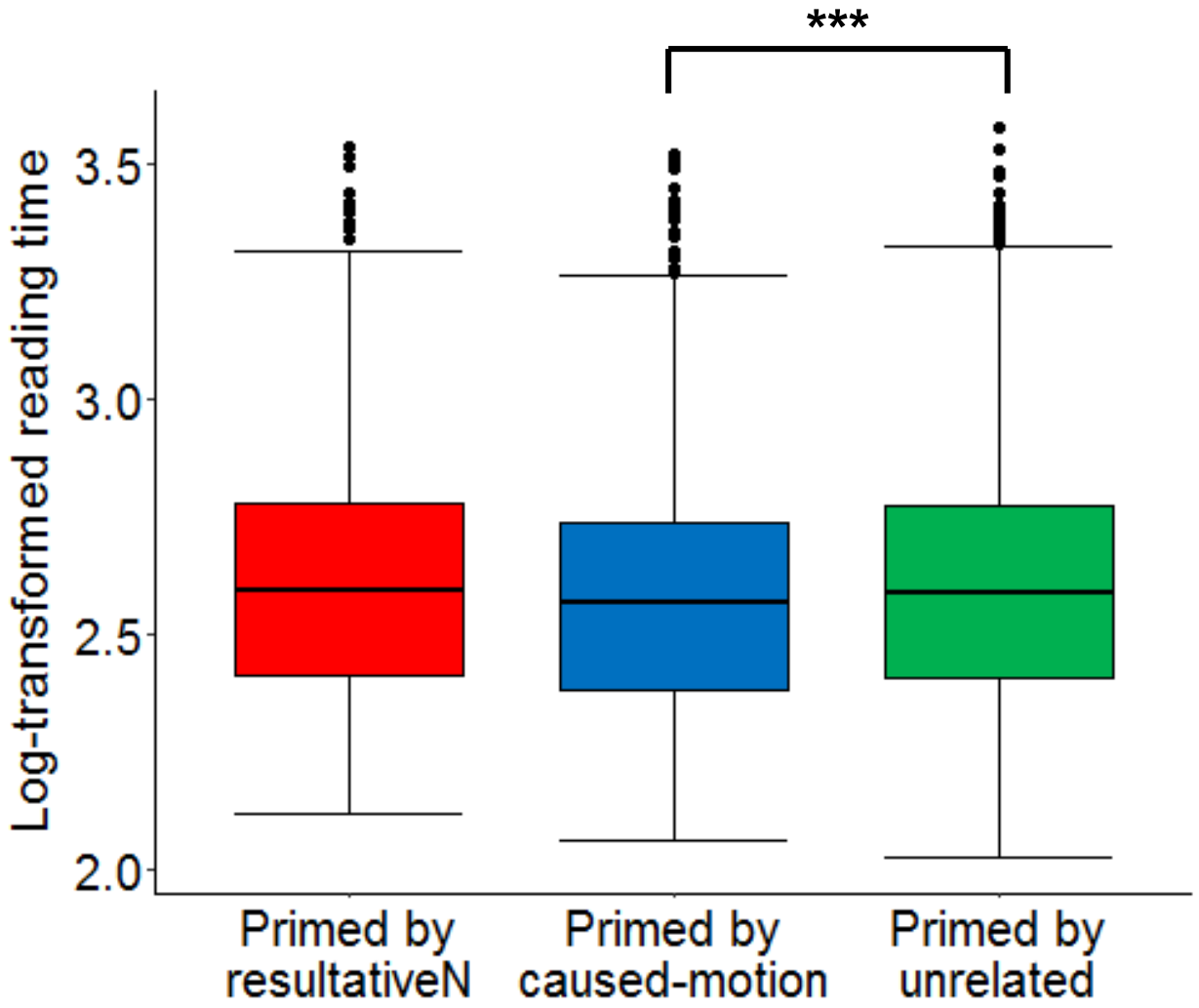
Web tool	Experiment hosted on Ibex Farm (Drummond, n. y.)	
Task	Self-paced reading (word by word) + speeded acceptability judgments (1-5 Likert scale)	Self-paced reading (word by word) with maze task (Forster et al., 2009; experiment code from Boyce et al., 2019)
Why?	Task engages participants' deep processing Several outcome measures	No spill-over effects Potentially more sensitive than pure self-paced reading (Boyce et al., 2019)
Outcome measures	Reading time, judgment score, judgment time	Reading time, (Correctness of maze choices)

Experiment 1: Results



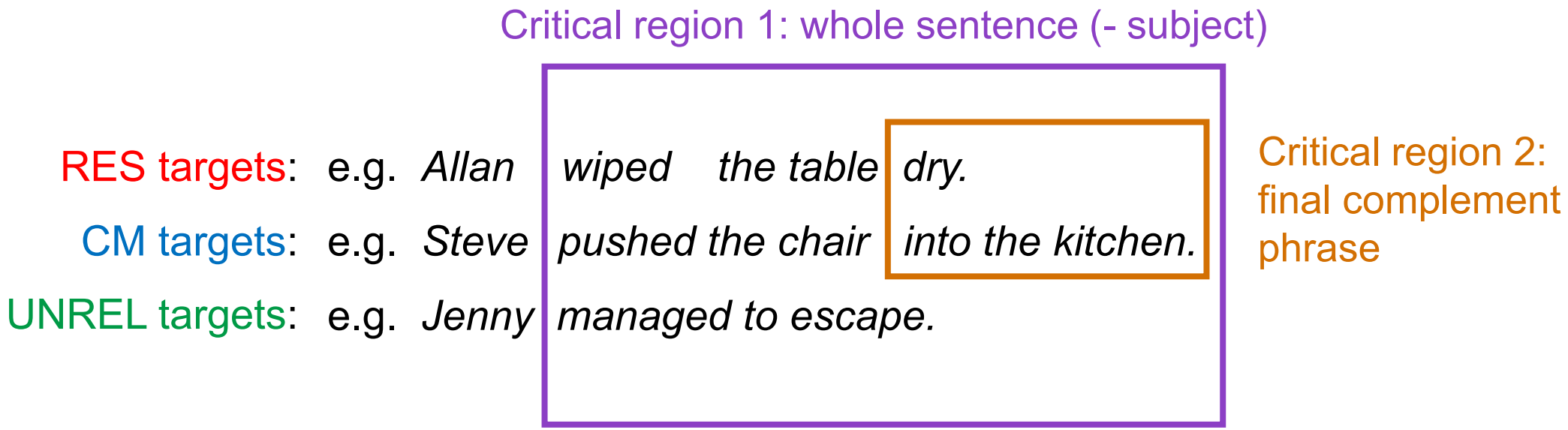
RES targets

e.g. *Allan wiped the table* *dry.*

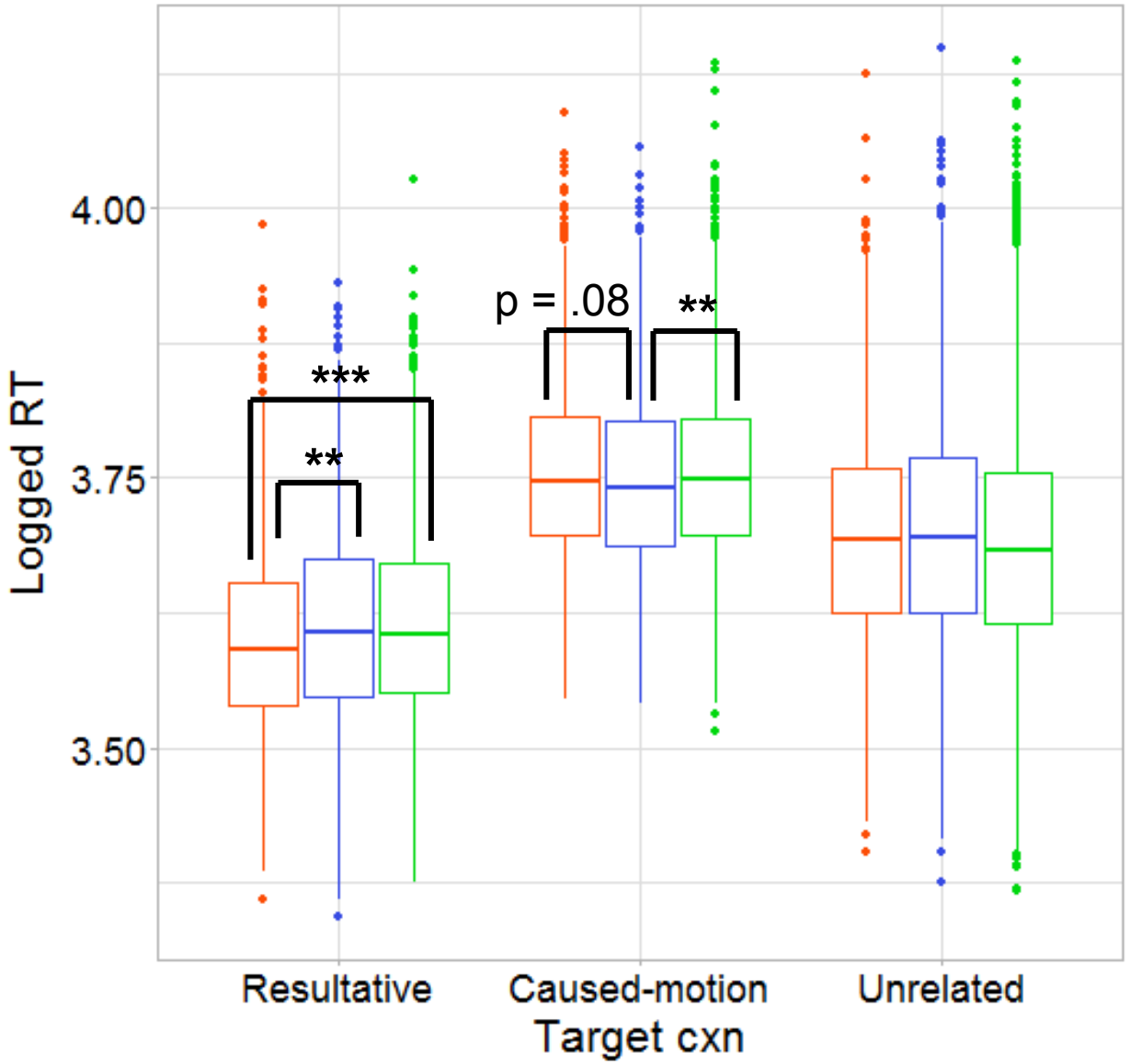
Critical region

- Significant effect of priming condition on reading time:
  RES were read approx.19 ms faster after CM primes than after UNREL primes (p = .001)
- Surprisingly: no decrease in reading time of RES targets after RES primes
- No effect of priming on judgment score or judgment time

Experiment 2: Results



Experiment 2: Results

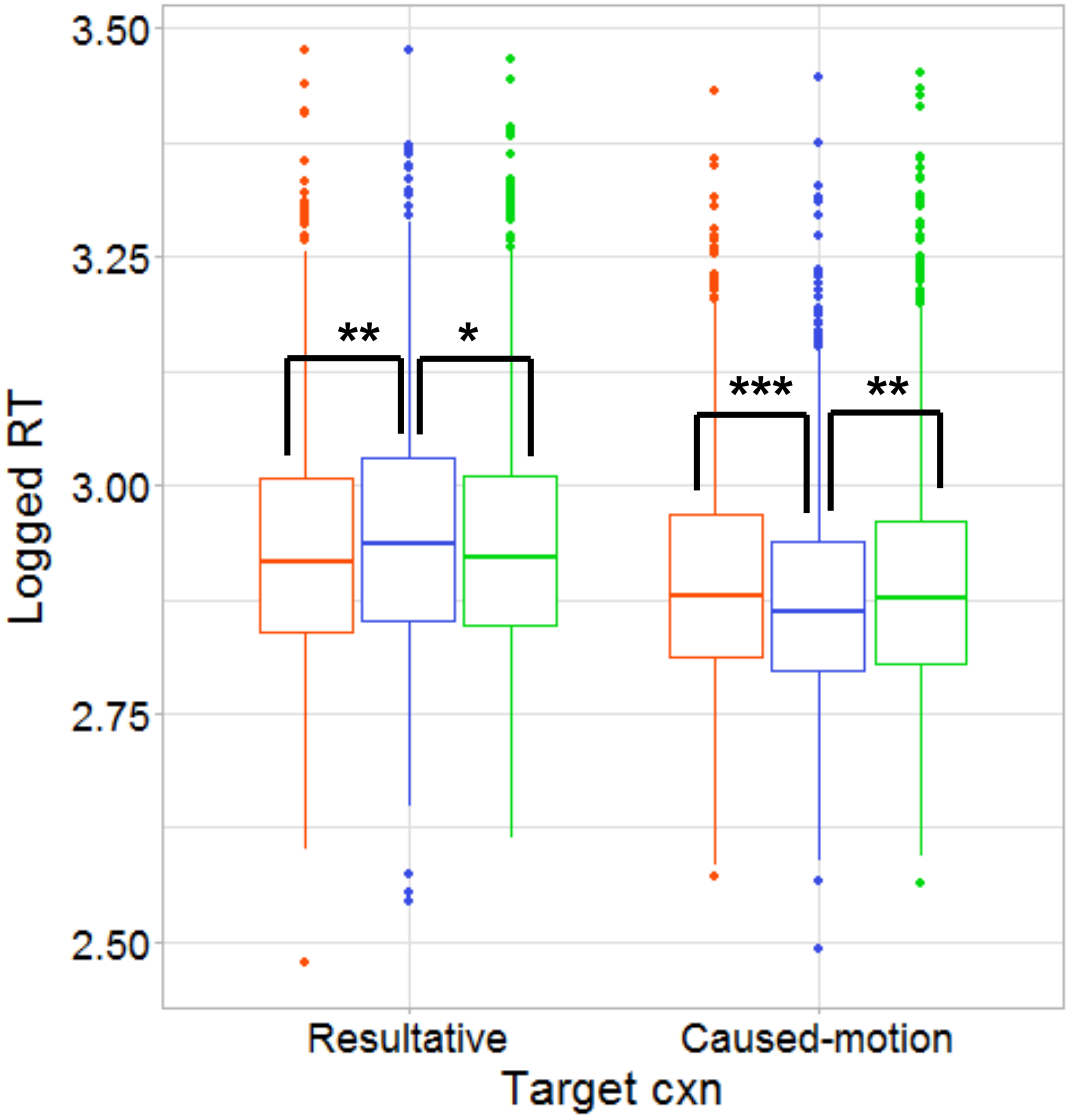


Reading times for overall sentence (without subject)

- RES targets are read faster after RES primes than after UNREL and CM
- CM targets are read faster after CM primes than after UNREL (and RES?)
- UNREL targets are not affected by prime construction

Prime cxn
Resultative
Caused-motion
Unrelated

Experiment 2: Results



Reading times for first word of final complement phrase

- RES targets are read more slowly after CM primes than after RES and UNREL (by approx. 39 ms and 25 ms respectively)
- CM targets are read faster after CM primes than after RES and UNREL (by approx. 67 ms and 48 ms respectively)

Prime cxn
- Resultative
- Caused-motion
- Unrelated

Experiment 1 & 2: Summary & discussion

Priming *within* the two target constructions, i.e. RES → RES and CM → CM, compared to unrelated controls

- Facilitation of target processing
- But not under all conditions where it would be expected (e.g. Exp. 1)

Priming *between* the two target constructions, but only in the direction CM → RES

- Potential asymmetry from metaphorical source to target
- Facilitatory effect (Exp. 1) vs. inhibitory effect (Exp. 2) – why these differences?

No effect of lexical boost on priming

- There might even be a tendency towards inhibition (!)

Conclusion: Methodological potential & challenges

Priming in comprehension

- Seems to work
- Affords a lot of flexibility over production priming
- Effects are small to medium-sized → use sufficiently large sample sizes

Methods

- Reading time measures seem promising
- Participants' deep processing needs to be ensured by combining self-paced reading with additional task requirements (e.g. maze task)

Materials

- Controlling for lexical artifacts (animacy, verb class, collocations etc.) is challenging
- Lexical boost does not seem to be a necessary requirement for observing inter-constructional priming (and its possible inhibitory effect deserves further investigation)

Conclusion: Further research questions

Experimental design

- Which materials, tasks and procedures can maximise our chances of detecting structural priming effects between distinct but related constructions?
- What benefits could alternative methods contribute (e.g. eye-tracking, brain measures)?

Facilitatory vs. inhibitory priming effects

- Under which conditions do they arise? What do they tell us about linguistic representations and processing?

Types of constructional links

- Can priming contribute direct evidence about the *type* of link that relates two constructions (e.g. metaphor, taxonomy, meronymy, etc.)?
- Can differences in effect size be used as indicators of differences in linking type?

And extending the paradigm to other constructions, other languages, etc. …

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