

Interference Effects in Word-Meaning Priming

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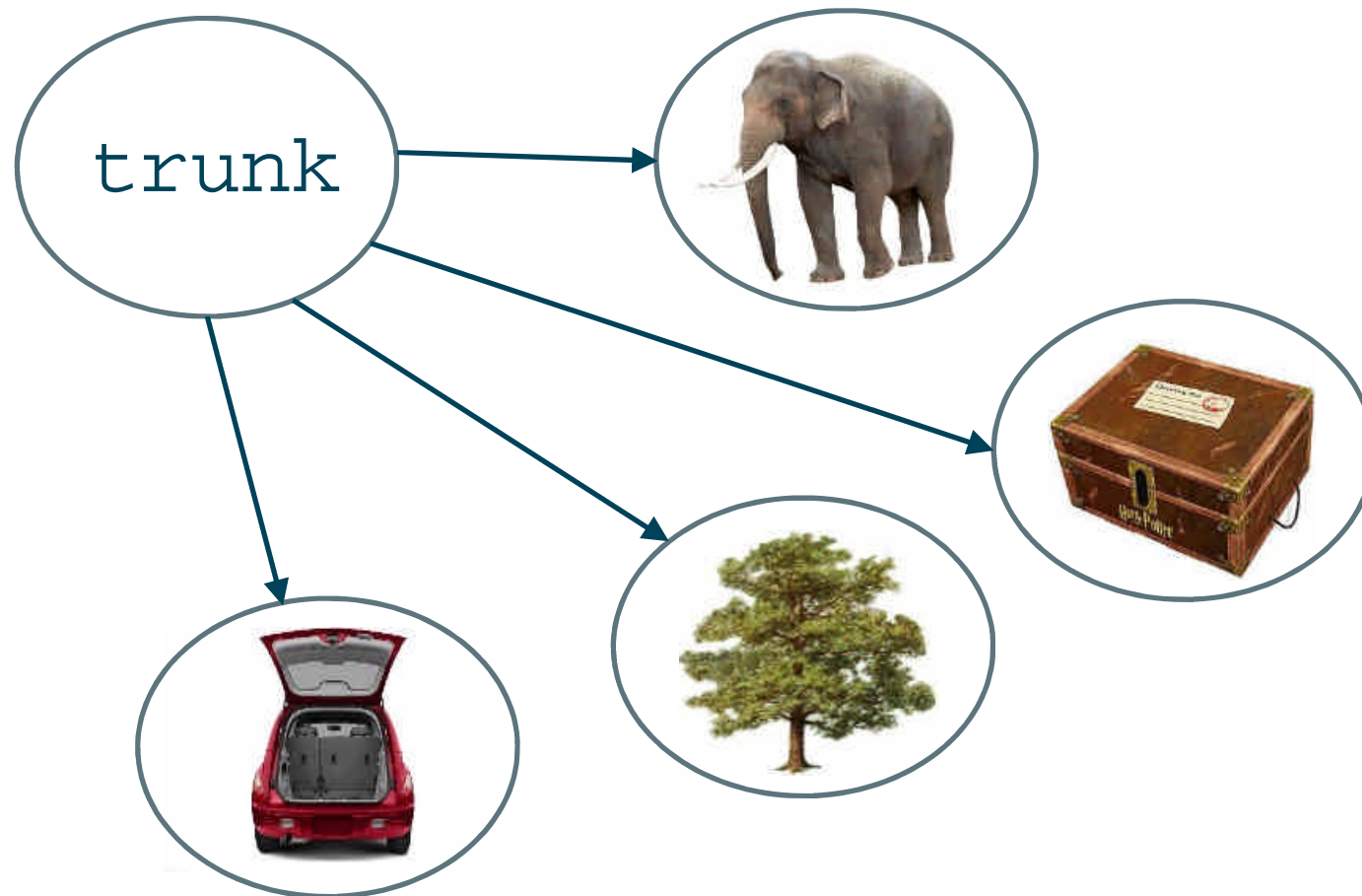
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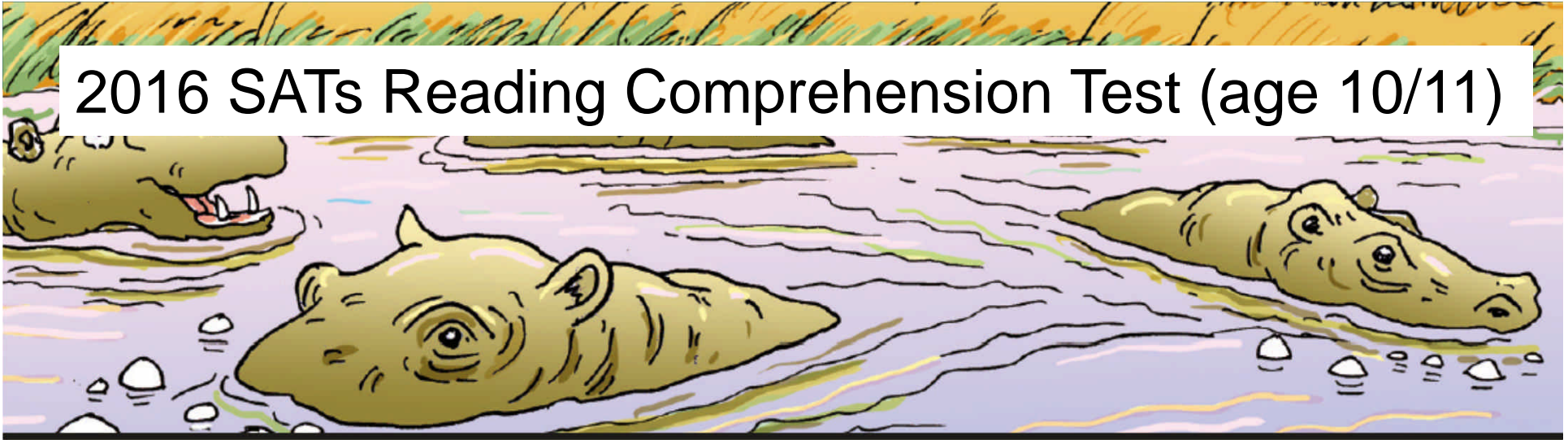
@BeckyAGilbert



How do we know what words mean?



2016 SATs Reading Comprehension Test (age 10/11)



Dawn was casting spun-gold threads across a rosy sky over Sawubona Game Reserve as Martine Allen took a last look around to ensure there weren't any witnesses. She leaned forward like a jockey on the track, wound her fingers through a silver mane, and cried, 'Go, Jemmy, go.'

The white giraffe sprang forward so suddenly that she was almost unseated, but she recovered and, wrapping her arms around his neck, quickly adjusted to the familiar rhythm of Jemmy's rocking-horse stride. They swept past the dam and a herd of bubble-blowing hippos, past a flock of startled egrets lifting from the trees like white glitter, and out onto the open savannah plain. An early morning African chorus of doves, crickets and go-away birds provided a soundtrack.

Most words are ambiguous

Being able to select appropriate word meanings is vital for comprehension.



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Cognitive Mechanisms – an overview

Consensus that:

- Automatic retrieval of multiple meanings in parallel
- Rapid selection of single meaning
- Occasional need for subsequent reinterpretation

See Vitello & Rodd (2015) for review

Conventional view:

Two factors determine how readily available meanings are

- (i) Sentence context
- (ii) Dominance (relative frequency)

Reordered Access Model: Duffy & Colleagues

Cognitive Mechanisms – my view

Rapid, fluent access requires integration of many different statistical cues

1) SENTENCE CONTEXT

e.g., “The BARK of the TREE/DOG”



2) Recent experience with the word

3) Long-term experience with the word

4) Knowledge about the speaker/writer

(Cai et al., Cognitive Psychology, 2017)

Learning is key for ALL these mechanisms

Cue 2: Recent Experience

Word Meaning Priming: Method



1. Prime phase : Semantic relatedness task

The star had many **FANS**
who came to all his concerts

music?

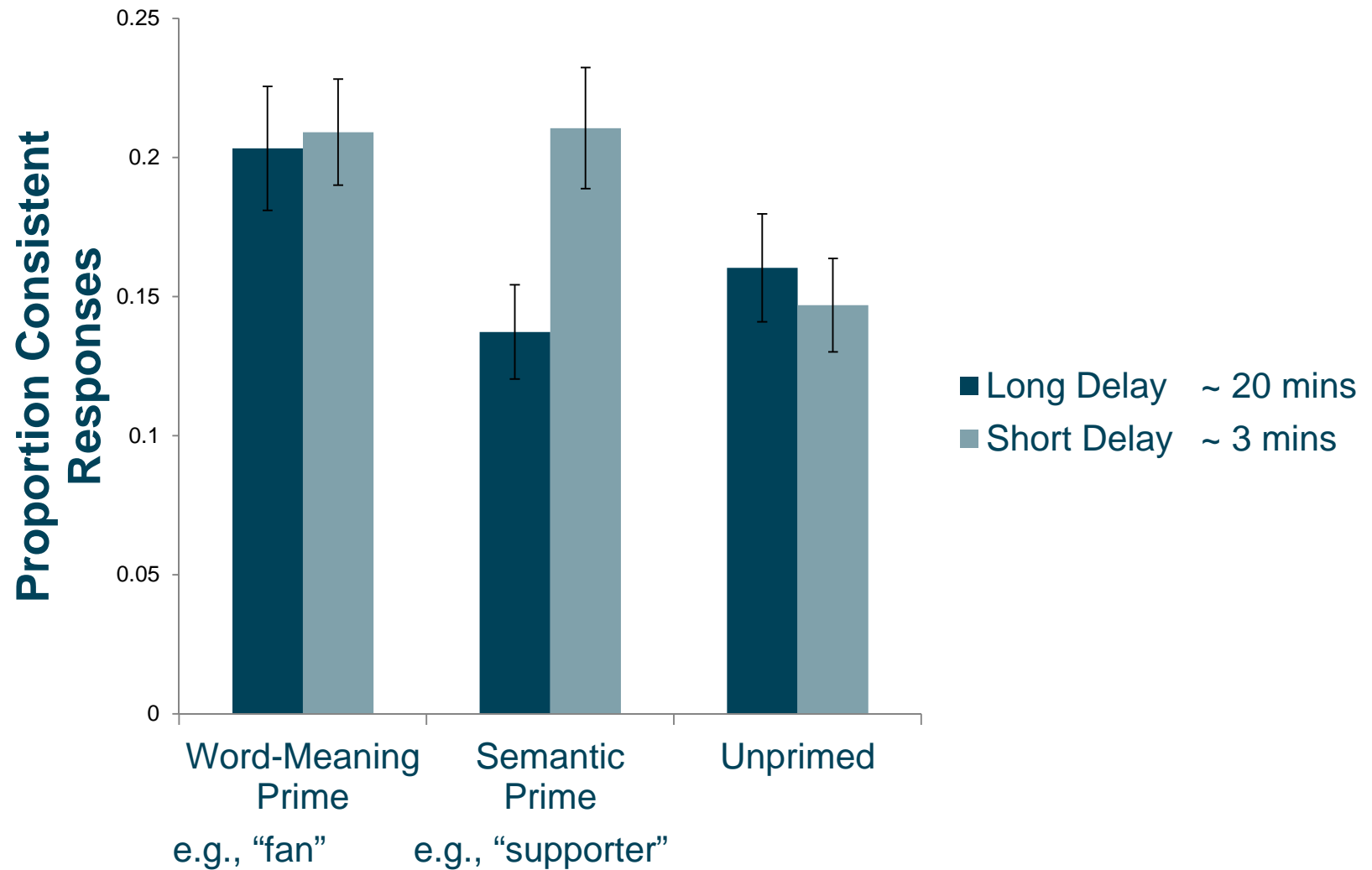
- (2. Filler task: Digit span)

3. Test phase: Word association task

FANS

Does Prime influence responses at Test?

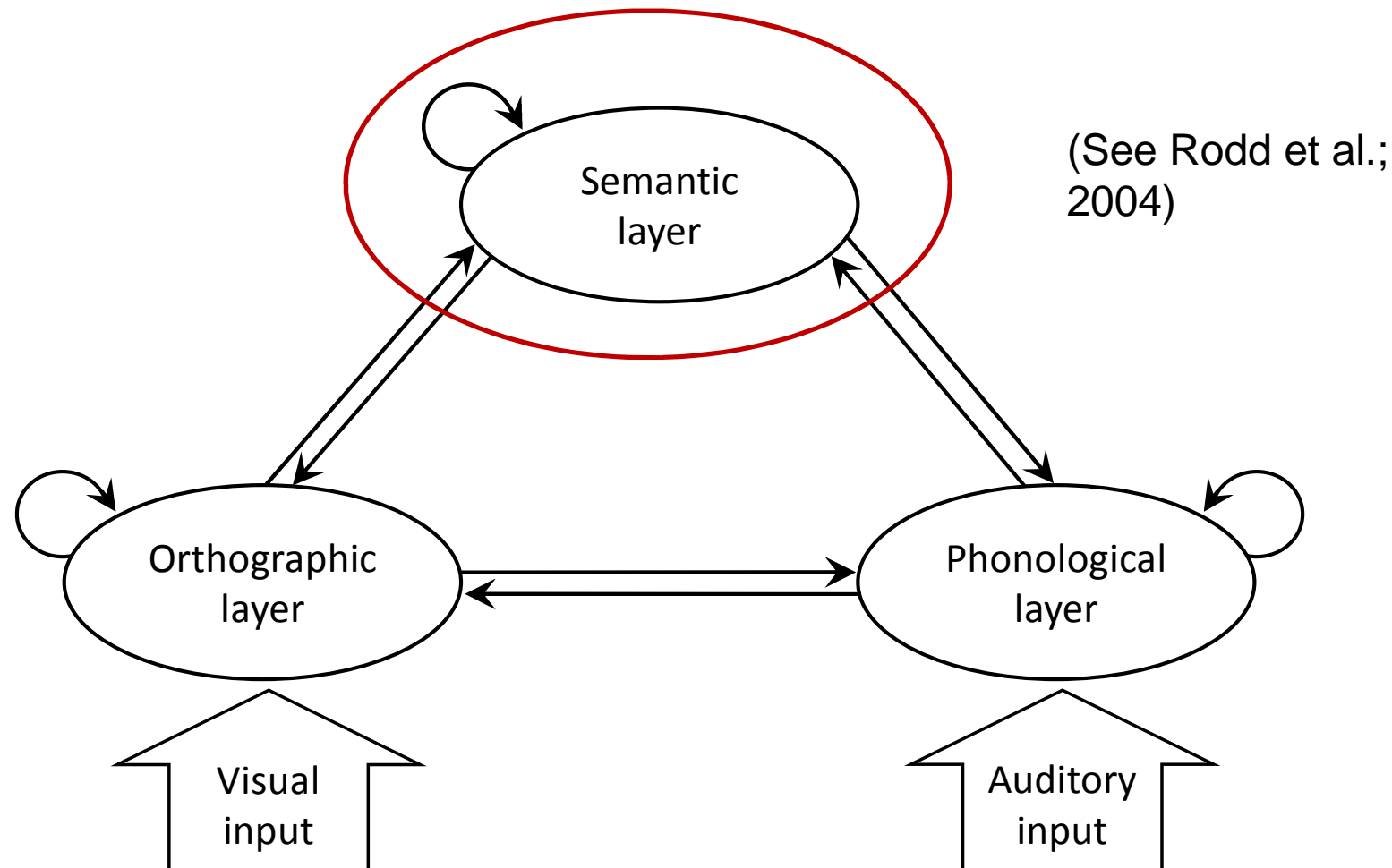
Word-Meaning Priming (Rodd et al., 2013; Expt 3)



Mapping out the Parameter Space:

1. What is the time-course of these priming effects?
Single trial – up to 40 minutes. (Rodd et al., 2016)
2. Does the identify of the speaker matter?
No! (Rodd et al., 2013; 2016)
3. Does the age of the participants matter?
Yes! (Rodd et al., 2016)
4. Does priming accumulate across multiple trials?
Yes, but spacing matters. (Betts et al., JEP:LMC online)
5. Is there more priming within (than across) modalities?
No! (Gilbert et al., in press at JEP: LMC)
6. Does experience transfer across languages?
Yes, but effects may be weak
(Poort, Warren & Rodd, 2015; Poort & Rodd 2017)

General Framework for understanding results: Triangle model



Today's Questions:

What is the nature of the change to the lexical-semantic representations?

To what extent are representations of alternative meanings mutually dependent?

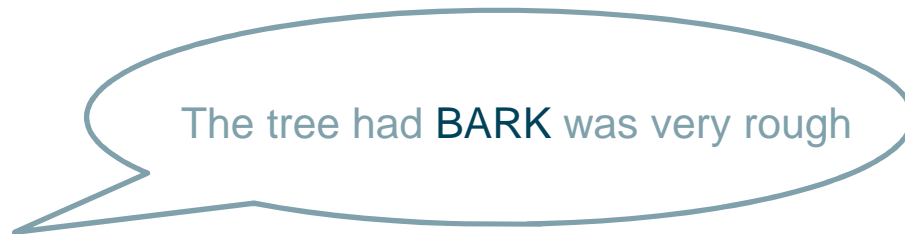
- Independent, c.f. Reordered Access Model
- Necessarily linked, as in distributed connectionist models
(Rodd et al., 2004)

What happens to the unprimed meaning?

Experiment 1: New Method

1. Prime phase :

Semantic relatedness task; Subordinate Meanings ($N_{\text{items}}=60$)



music?

(2. Filler task: Tower of Hanoi)

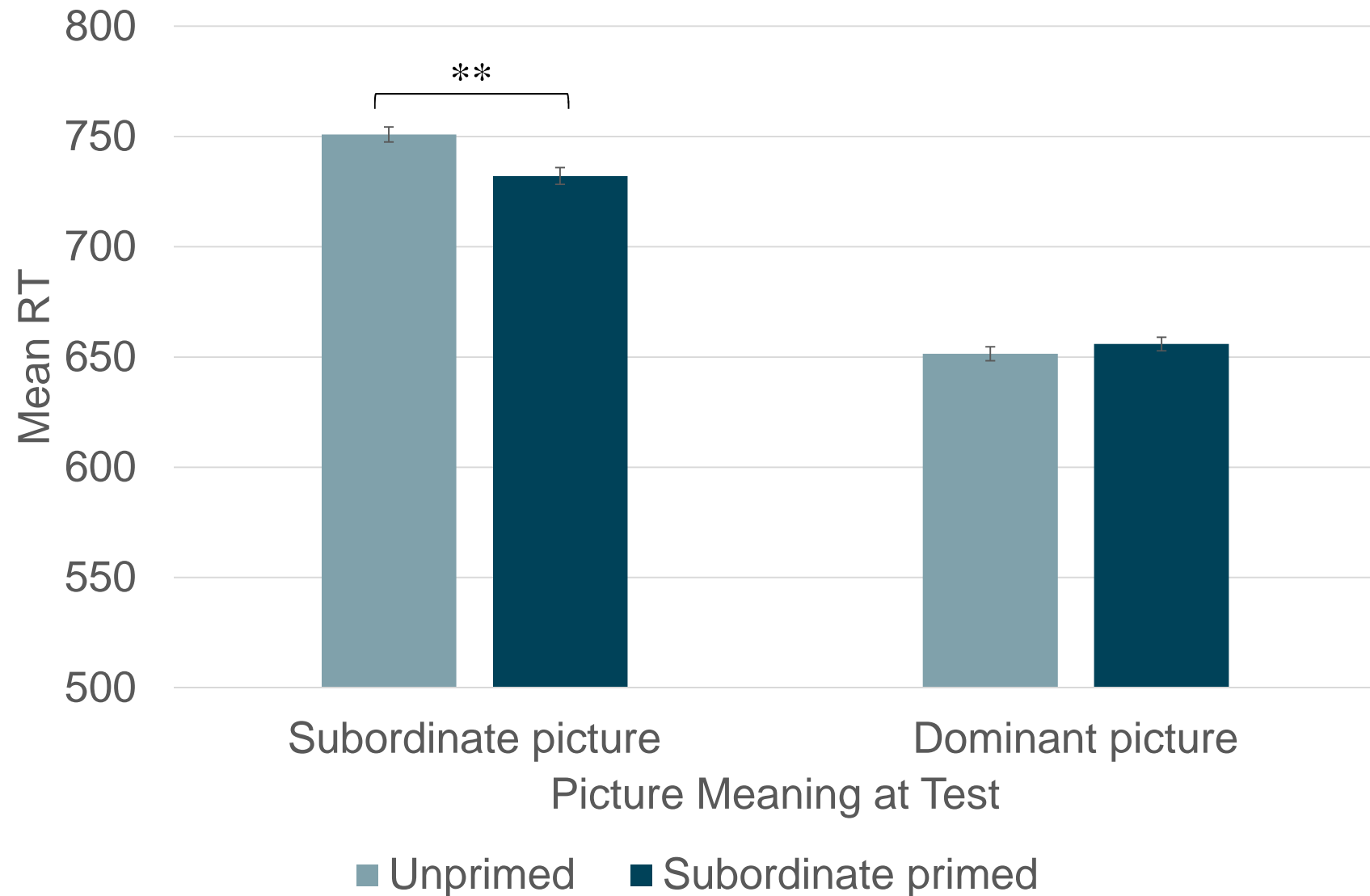
3. Test phase: Semantic Relatedness



Lots of fillers

Web-based, using Gorilla and Prolific Academic

Experiment 1: Results



Limitation of the design

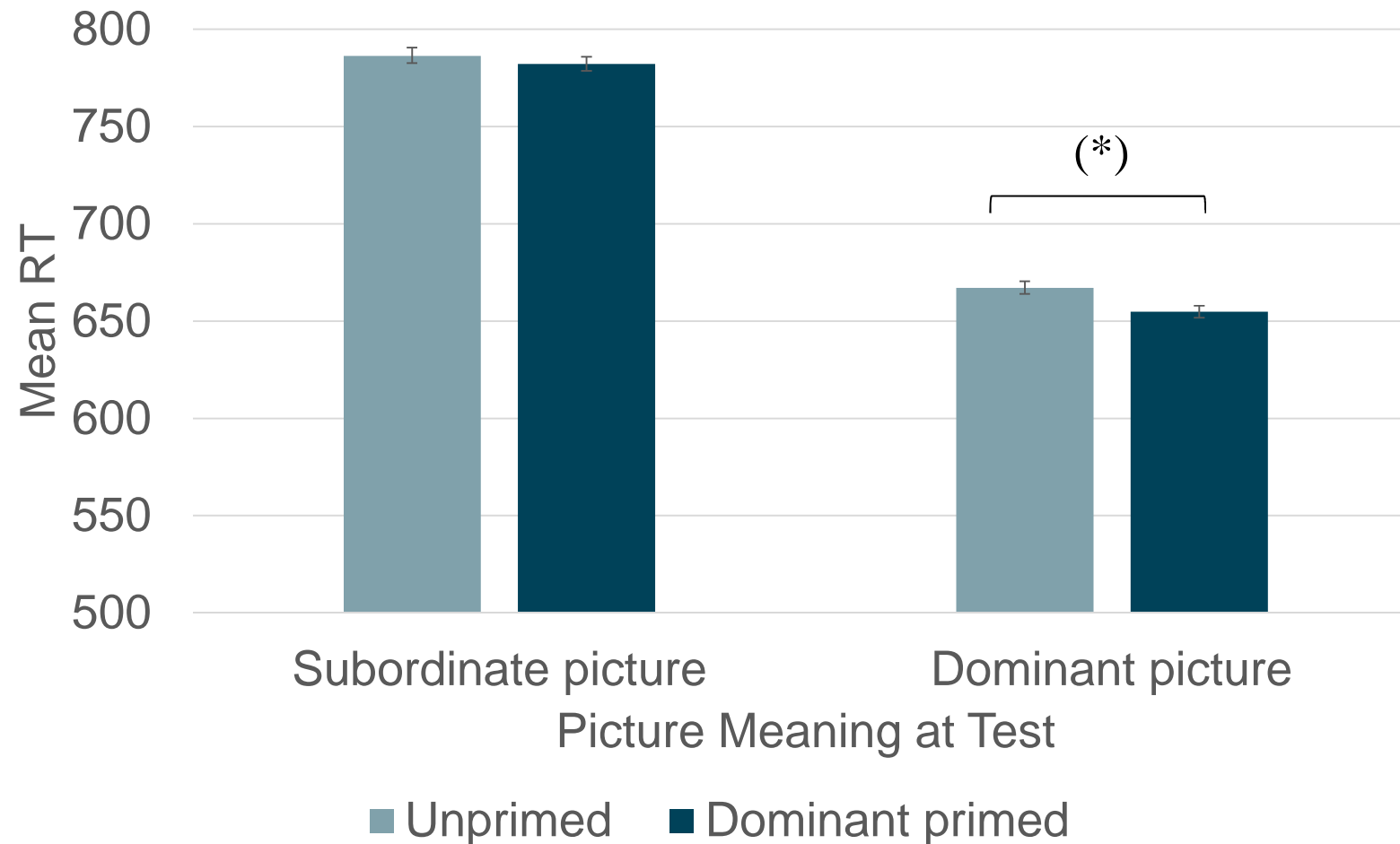
- Meanings (inevitably) classed as subordinate or dominant
- ALL primes are subordinate

Therefore confound with test dominance:

- Same meaning trials: test subordinate
 - Different meaning trials: test dominant
-
- Possible that dominant meanings more resistant to priming
(see Rodd et al., 2013)

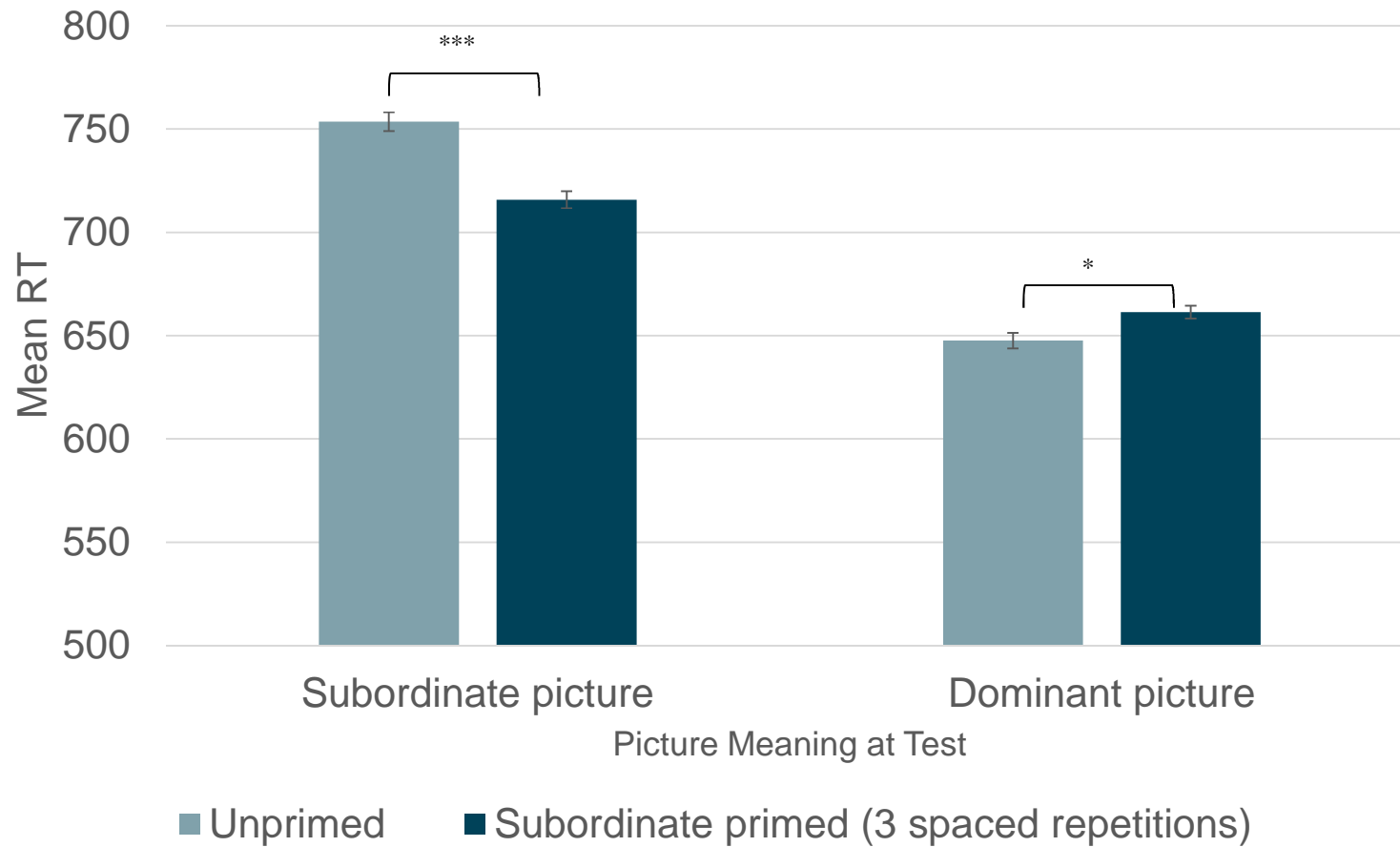
Experiment 2: All primes are dominant

Experiment 2: Results

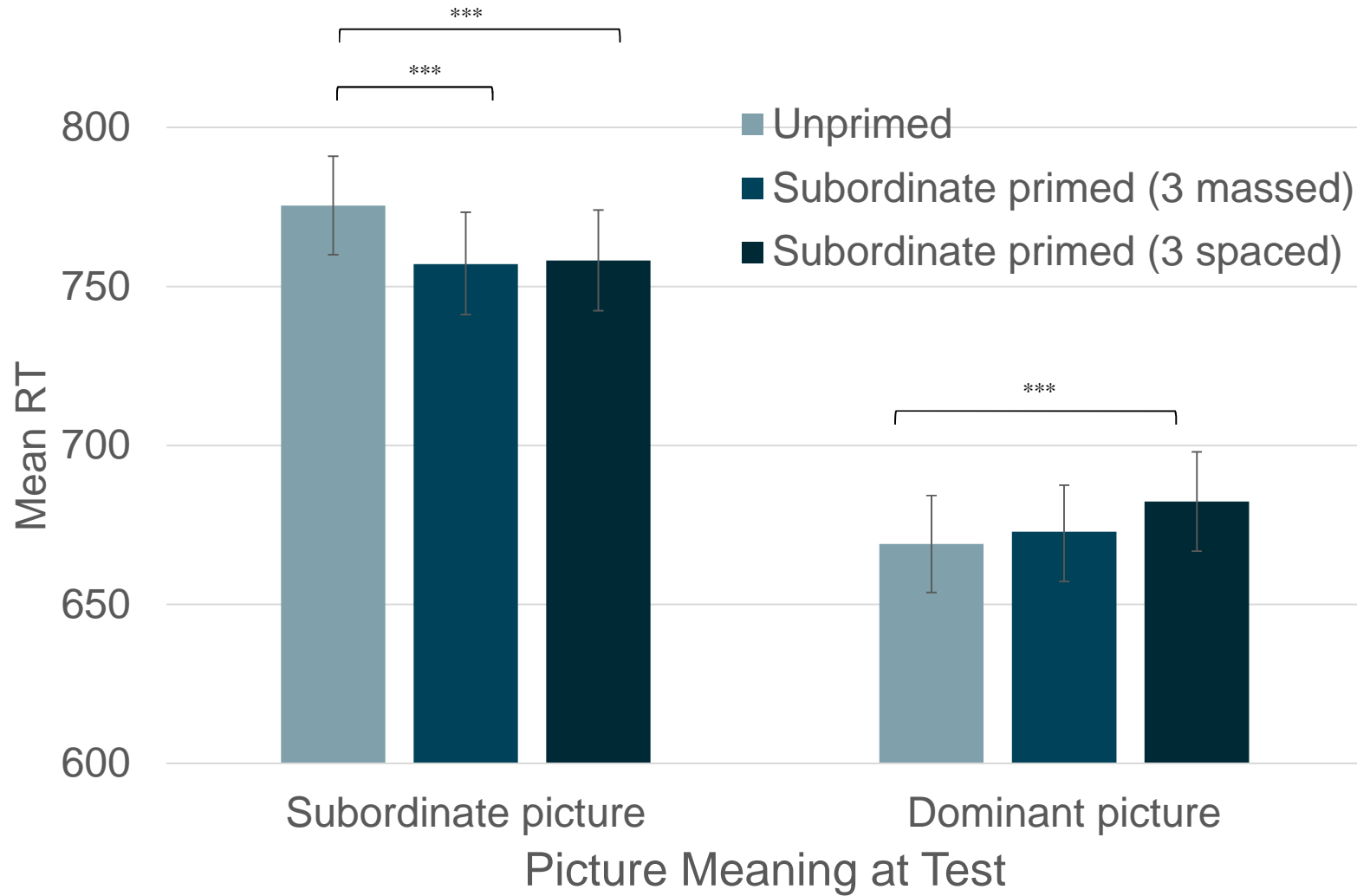


Expt	Primed Meaning	Picture at Test	Nsubjects	Number Prime Repetitions	Interference?
1	Sub	Dom & Sub	112	1	X
2	Dom	Dom & Sub	117	1	X
3	Sub	Dom & Sub	116	3 (Spaced)	
4	Sub	Dom & Sub	180	3 (Spaced & Massed)	

Experiment 3: Results



Experiment 4: Results



Summary of Results: Expts 1-4

Another example of high quality data from web-based method

Gorilla: <https://gorilla.sc/>; @GorillaPsyc

Prolific Academic: <https://www.prolific.ac/>; @prolificac

Primed Meaning:

4 additional replications of word-meaning priming

New word-picture relatedness paradigm

Puzzling effects of spacing

Unprimed Meaning:

Null effects after 1 prime (Expt 1, 2)

Weak effects after 3 primes (Expts 3, 4)

(Some additional stats needed)

Conclusions

To what extent are representations of alternative meanings mutually dependent?

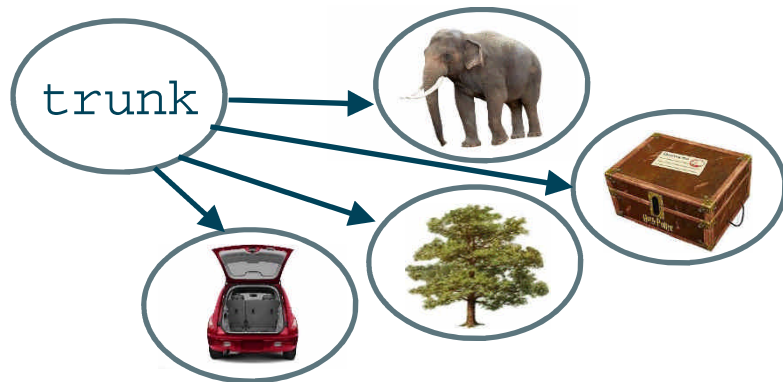
Ruled out 2 extreme accounts:

- Independent, e.g., Reordered Access Model
- Strongest version of 'reciprocal relationship' account

Need computational simulations to explore specific claims about nature of representations

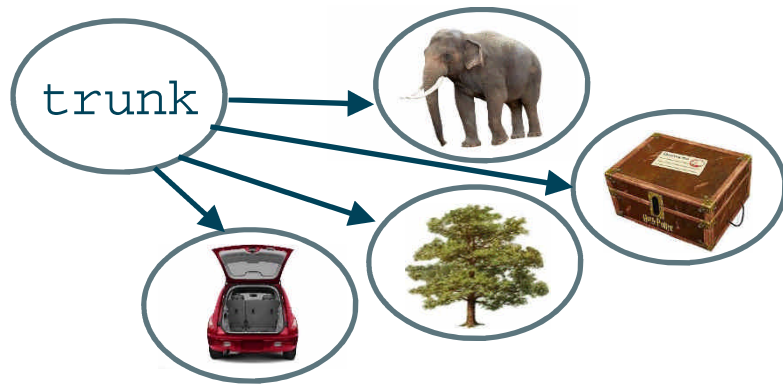
Avoid 'armchair connectionism'

Do effects arise at time of learning or at test?



Conclusions

- Fluent comprehension requires sophisticated lexical knowledge
 - Which meanings are more likely?
 - When are specific meanings more likely?
- Good 'lexical quality' requires constant learning/updating
- Learning about words continues throughout adulthood



Thank You!