

Processing metaphoric and non-metaphoric polysemous verbs

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- When we use a metaphoric sense of a verb, as in *the gossip **poisoned** his mind*, do we access the literal meaning of *poison*?
- When we use a **non**-metaphoric subordinate sense of a verb, as in *she **swears** when she drives*, do we access the central “vow” sense of *swear*?

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This talk will cover:

- Metaphor vs. inferencing
- Previous experimental work
- Methodology
- Results

Metaphor vs. inferencing

Different models of semantic change lead to different predictions about polysemies' synchronic behavior:

- Conceptual Metaphor Theory (cf. Lakoff and Johnson 1980, Sweetser 1990) asserts that metaphorically extended senses of polysemies continue to synchronically evoke their central senses via conceptual metaphors.
 - For example, *poison* in *the gossip poisoned his mind* is interpreted using THE MIND IS A BODY

Metaphor vs. inferencing

Different models of semantic change lead to different predictions about polysemies' synchronic behavior:

- Invited Inferencing (Traugott and Dasher 2002) and related models
 - For example, *swear* as in *she swears when she drives* developed via contexts in which the “vow” sense of *swear* generated inferences of taboo word use (as in *he swore a false oath*).
 - After a period of inference-generating ambiguous contexts, extended senses become fully established in the lexicon, and do not necessarily require access of their original meanings.

Metaphor vs. inferencing

- Certain semantic extensions, such as see “perceive visually” > “know/understand”, have been classified as metaphor by some researchers, and as inferencing by others:
 - KNOWING IS SEEING (Sweetser 1991, Haser 2003)
 - Inference of knowing/understanding an object/location/etc. when the object/location is seen; contexts such as *I see where it is* (Traugott & Dasher 2002)
- Metaphor theory would predict that these extended senses necessarily activate their central senses; an inference-based explanation would not.

Metaphor vs. inferencing

Experimental research should be able to determine:

- Whether metaphor theorists are right that metaphoric extensions activate their central senses
- Whether inference-based extensions activate their central senses
- Whether extensions such as see “know/understand” (henceforth **contested extensions**) behave more like metaphoric or inference-based extensions

Previous experimental work

Experimental research has focused on:

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Previous experimental work

Williams (1992):

- Lexical decision task
- Polysemous adjectives, all examples metaphoric
- Non-central senses of polysemous adjectives prime their central senses
- Priming effects for central polysemies and unrelated homonyms disappeared with delays of 200 msec (whereas non-central polysemies continued to have priming effects after much longer delays)

Previous experimental work

Brisard et al. (1997):

- Lexical decision task
- Polysemous adjectives, all metaphoric
- Non-central senses of polysemous adjectives prime their central senses (did not examine priming by central senses)
- Consistent 240 msec delay in target presentation
- No facilitation or even negative facilitation for homonyms
- Found similar effects for polysemous and for vague adjectives

Previous experimental work

The current study:

- Lexical decision task
- Polysemous verbs
- Compares the processing of metaphoric and inference-based (non-metaphoric) polysemies
- Also compares polysemies resulting from contested extensions such as *see* (visual “see” > “know/understand”)

Methodology

The study examined:

- 24 polysemous verbs
 - Eight verbs reflecting metaphoric extension with no historical ambiguous contexts that would permit inference-based extension (**metaphoric extensions**)
 - Eight verbs reflecting inference-based extension with no plausible metaphor-based explanation (**inference-based extensions**)
 - Eight verbs permitting both metaphor-based and inference-based explanations (**contested extensions**)

Methodology

For example:

- **metaphoric extension:** *explode* (“burst apart” > “demonstrate anger”)
 - ANGER IS A HOT FLUID IN A CONTAINER
- **inference-based extension:** *wear* (“be dressed in” > “damage by use”)
 - Inference that use can lead to damage
- **contested extension:** *fight* (“physically attack” > “argue”)
 - THE MIND IS A BODY; WORDS ARE WEAPONS
 - Inference that verbal arguing can accompany physical fighting

Methodology

- All verbs were “biased,” in that the central sense was more common than the extended sense (slightly under 2:1 for each category of verb).
- The central sense was always dominant, and the extended/non-central sense was always subordinate.

Methodology

The study examined the priming effects of these 24 verbs on a lexical decision task involving:

- 48 target verbs, each semantically related to either the central or extended sense of the 24 polysemous verbs

For example, for the polysemous verb *explode*:

| Prime | Target |
|-------------------------------------|--------|
| The bomb was about to explode | RAGE |
| Their tempers were ready to explode | BURST |

Methodology

- The 48 target verbs also appeared following unrelated sentences:

| Prime | Target |
|---------------------------------|--------|
| The tide was about to turn | RAGE |
| Their phones were about to ring | BURST |

- Subjects were also presented with 96 sentence primes with non-word targets.

Methodology

- Experiment 1: 30 subjects were presented with polysemies involving metaphoric or inference-based extension (250 msec delay in target presentation)
- Experiment 2: 30 subjects were presented with the stimuli and targets in Experiment 1, and additionally with polysemous verbs such as see “perceive visually” vs. “know/understand” (250 msec delay in target presentation)
- Experiment 3: 30 subjects were presented with the stimuli and targets in Experiment 2, but with no delay in target presentation

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Results

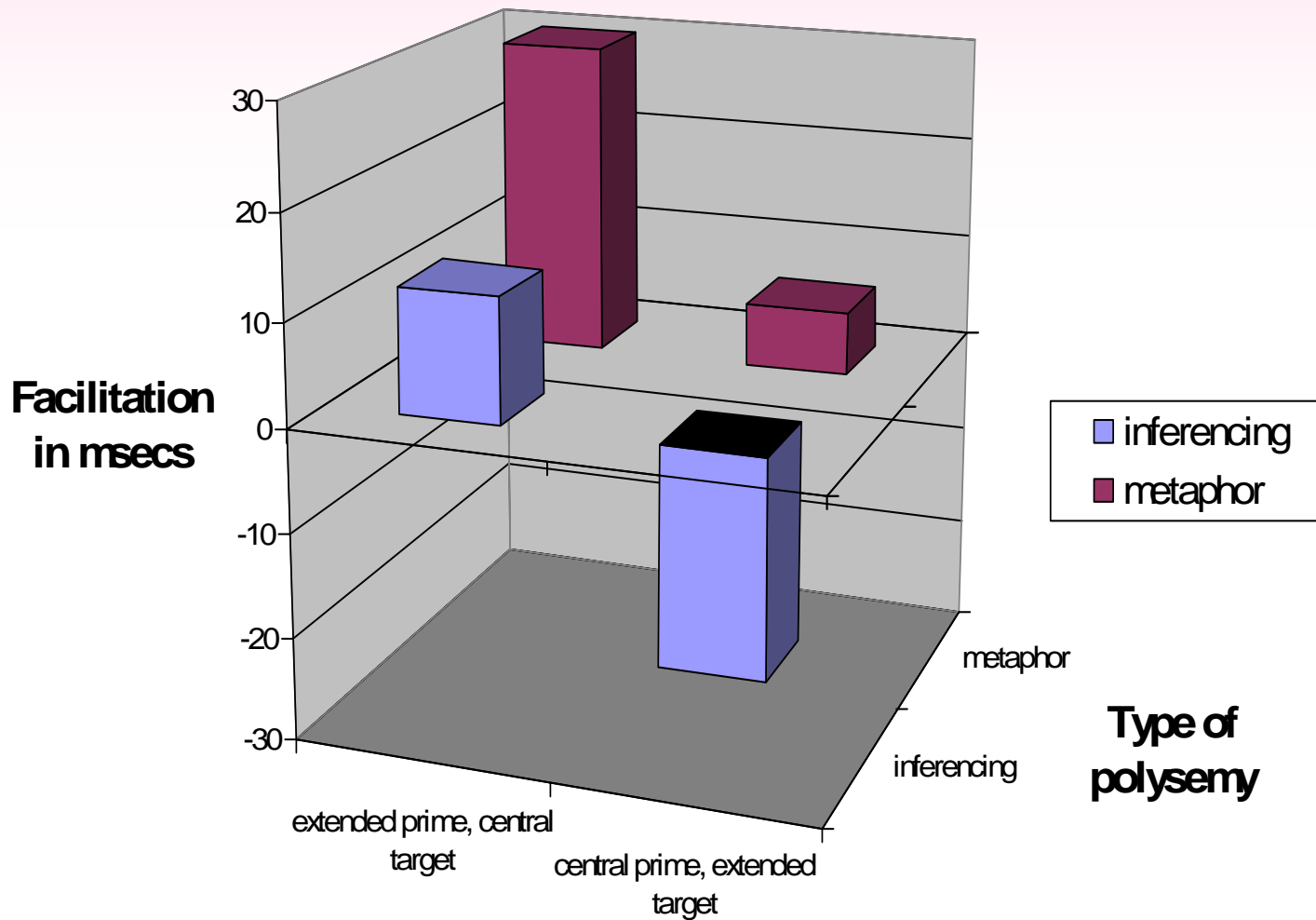
Results of Experiment 1 (250 msec delay)

| | Experimental | Control | Facilitation |
|--|--------------|---------|---------------|
| Metaphor (extended prime, central target) | 553 | 583 | 30 ** |
| Metaphor (central prime, extended target) | 559 | 564 | 6 |
| Inferencing (extended prime, central target) | 555 | 567 | 12 |
| Inferencing (central prime, extended target) | 566 | 544 | - 21 * |

| | | | |
|-------------|-----------|----------|---------|
| p<0.001 *** | p<0.01 ** | p<0.05 * | p<0.1 ‘ |
|-------------|-----------|----------|---------|

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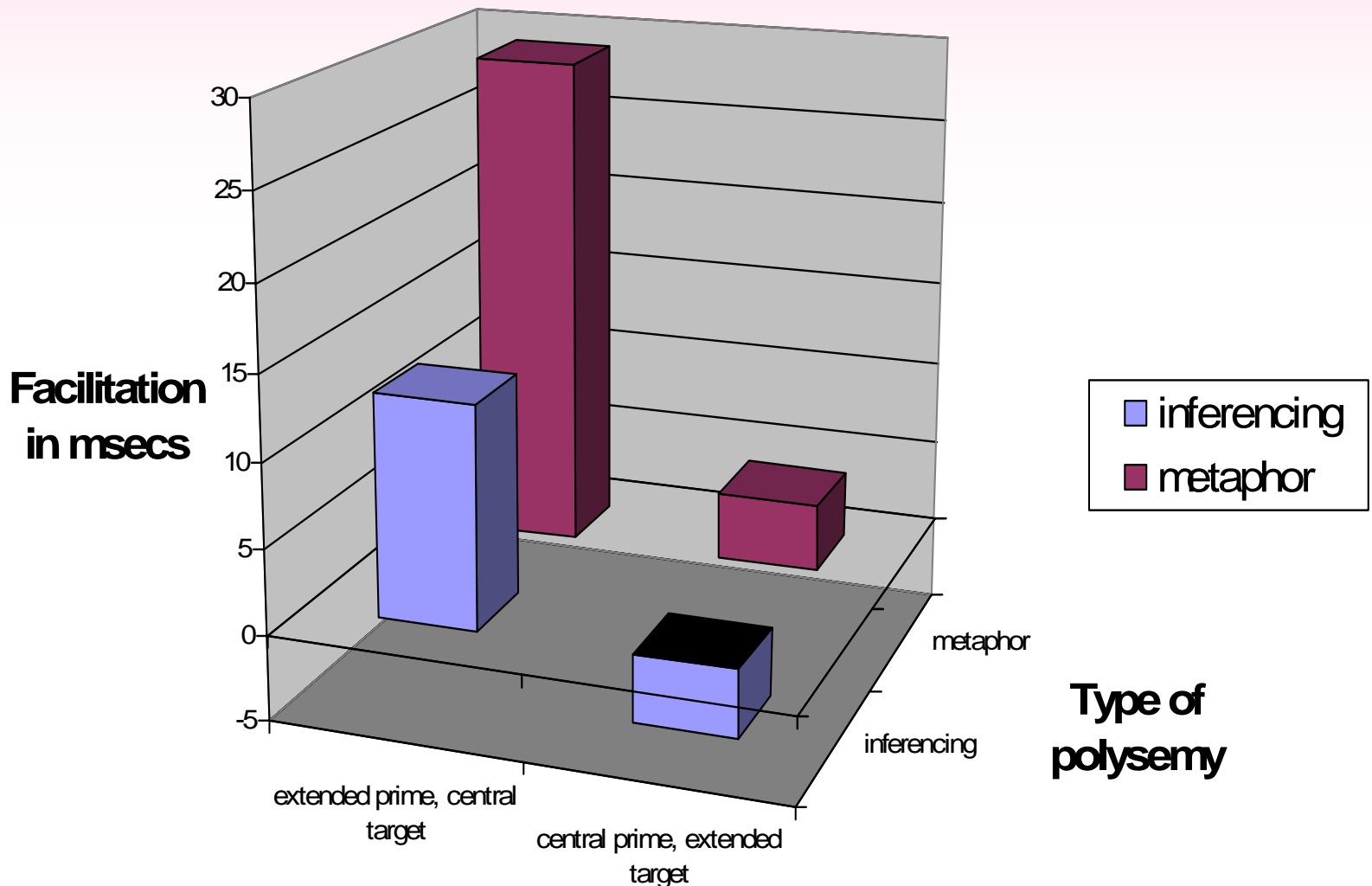
Facilitation in Experiments 1-2 (250 msec delay)

| | Experiment 1 | Experiment 2 | Combined |
|--|----------------|--------------|---------------|
| Metaphor (extended prime, central target) | 30 ** | 27 ** | 29 *** |
| Metaphor (central prime, extended target) | 6 | 3 | 4 |
| Inferencing (extended prime, central target) | 12 | 13 ' | 13 ' |
| Inferencing (central prime, extended target) | - 21 * | 13 | - 4 |

| | | | |
|-------------|-----------|----------|---------|
| p<0.001 *** | p<0.01 ** | p<0.05 * | p<0.1 ' |
|-------------|-----------|----------|---------|

Results

Combined results of Experiments 1 & 2 (250 msec delay)



Methodology

- Experiment 1: 30 subjects were presented with polysemies involving metaphoric or inference-based extension (250 msec delay in target presentation)
- Experiment 2: 30 subjects were presented with the stimuli and targets in Experiment 1, and additionally with polysemous verbs such as see “perceive visually” vs. “know/understand” (250 msec delay in target presentation)
- Experiment 3: 30 subjects were presented with the stimuli and targets in Experiment 2, but with no delay in target presentation.

Results

Results of Experiment 2 (250 msec delay)

| | Experimental | Control | Facilitation |
|--|--------------|---------|--------------|
| Metaphor (extended prime, central target) | 552 | 579 | 27 ** |
| Metaphor (central prime, extended target) | 560 | 563 | 3 |
| Inferencing (extended prime, central target) | 546 | 559 | 13 ' |
| Inferencing (central prime, extended target) | 544 | 556 | 13 |
| Contested (extended prime, central target) | 524 | 528 | 4 |
| Contested (central prime, extended target) | 536 | 523 | - 13 |

p<0.001 ***

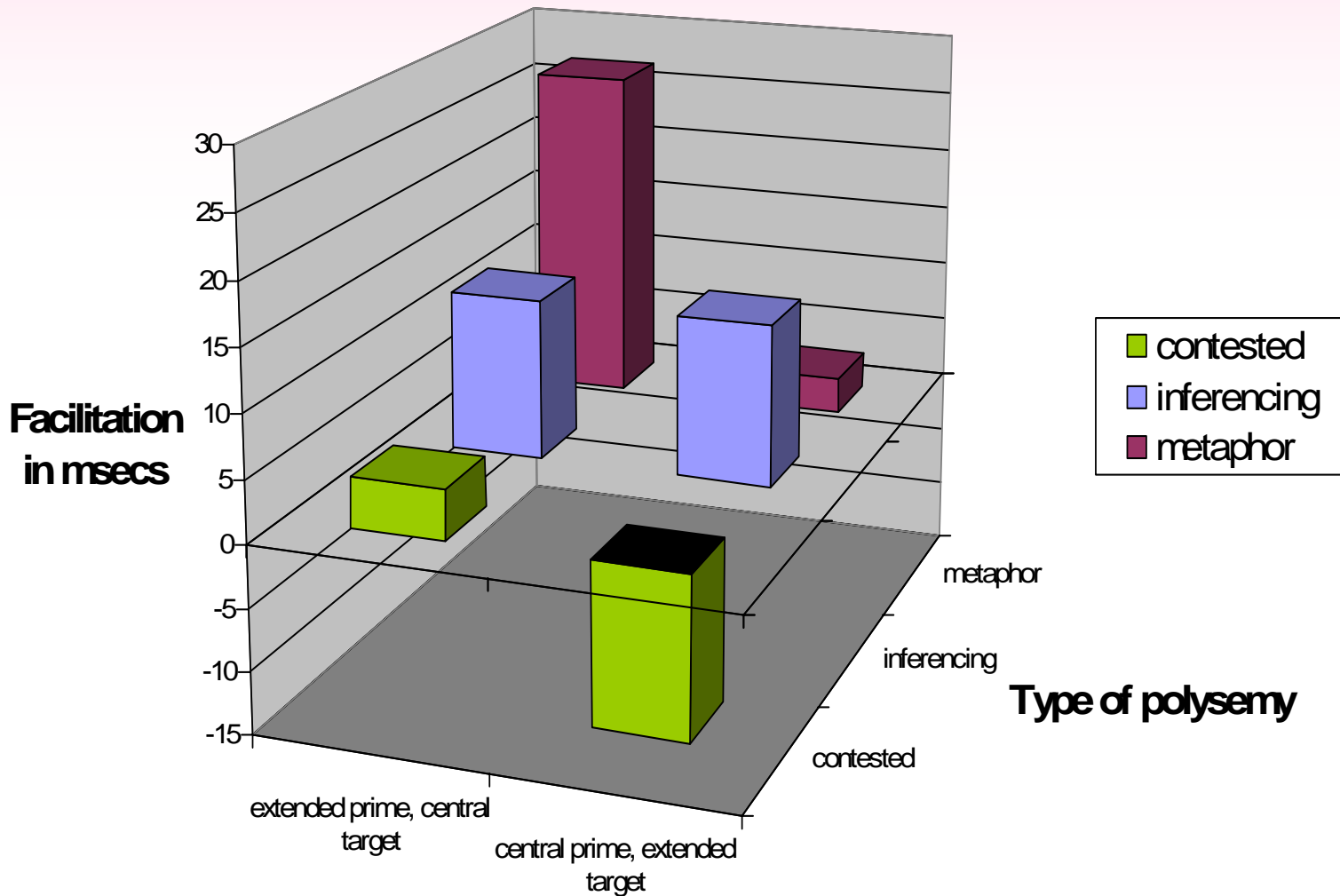
p<0.01 **

p<0.05 *

p<0.1 '

Results

Facilitation in Experiment 2 (250 msec delay)



Results

Facilitation in Experiments 1-3 (250 and 0 msec delay)

| | Experiment 1 (250 msec SOA) | Experiment 2 (250 msec SOA) | Experiment 3 (0 msec SOA) |
|---|--------------------------------|--------------------------------|------------------------------|
| Metaphor (extended prime, central target) | 30 ** | 27 ** | 10 |
| Metaphor (central prime, extended target) | 6 | 3 | 3 |
| Inferencing (extended prime, central target) | 12 | 13 ' | 6 |
| Inferencing (central prime, extended target) | - 21 * | 13 | 11 |
| Contested (extended prime, central target) | NA | 4 | 7 |
| Contested (central prime, extended target) | NA | - 13 | - 16 * |

p<0.001 ***

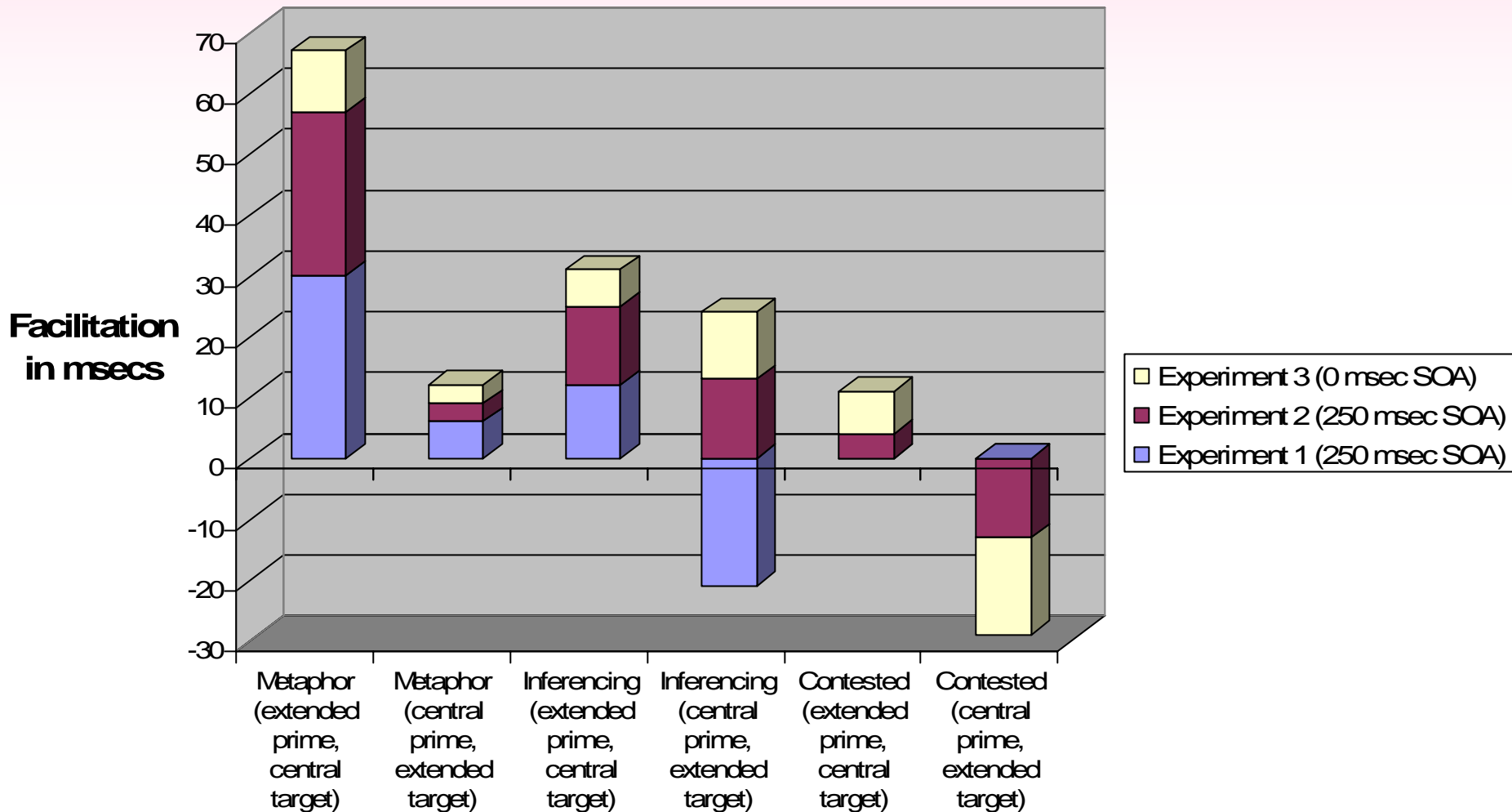
p<0.01 **

p<0.05 *

p<0.1 '

Results

Facilitation in Experiments 1-3 (250 and 0 msec delay)



Results

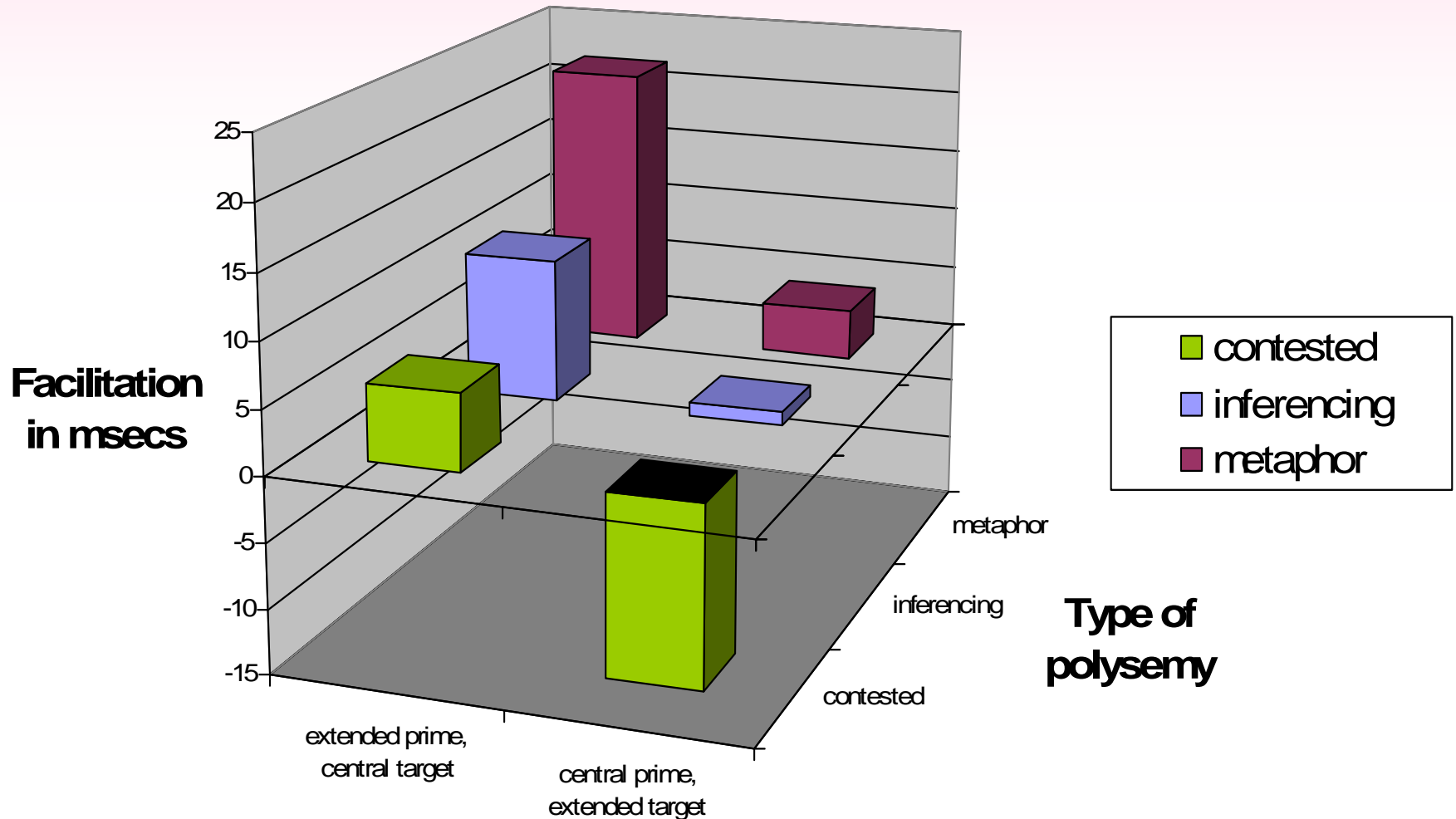
Combined results of Experiments 1-3 (250 and 0 msec delay)

| | Experimental | Control | Facilitation |
|--|--------------|---------|---------------|
| Metaphor (extended prime, central target) | 585 | 607 | 22 *** |
| Metaphor (central prime, extended target) | 586 | 590 | 4 |
| Inferencing (extended prime, central target) | 584 | 595 | 11 ' |
| Inferencing (central prime, extended target) | 583 | 584 | 1 |
| Contested (extended prime, central target) | 570 | 576 | 6 |
| Contested (central prime, extended target) | 587 | 572 | - 14 * |

| | | | |
|-------------|-----------|----------|---------|
| p<0.001 *** | p<0.01 ** | p<0.05 * | p<0.1 ' |
|-------------|-----------|----------|---------|

Results

Combined results of Experiments 1-3 (250 and 0 msec delay)



Summary (the good...)

- The extended sense of a metaphorically polysemous verb primes its central meaning, as predicted by a conceptual theory of metaphor
- The extended sense of an inferentially extended polysemous verb appears to prime its central meaning sense to a smaller, less significant extent

This suggests that:

- Metaphorically extended senses of verbs are synchronically different from inference-based extended senses
- Metaphoric verbs are similar to metaphoric adjectives

Summary (...the bad and the ugly)

- Polysemies based on contested extensions do not behave much like either type of polysemy
 - They appear especially unlike metaphor in that their extended senses produce such insignificant priming effects
 - On average, these extensions occurred earlier than the others
 - These verbs are more common than those in the other classes
- There is a weird anti-priming effect from the central senses of the contested polysemies (and from the central senses of the inference-based polysemies in Experiment 1)
 - Well-established dominant senses/meanings may hinder access to subordinate senses/meanings, especially early in processing
 - This may be related to the negative facilitation for homonyms noted by Brisard et al. (1997)

Thank you!

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References

- Bartsch, R. 2003: "Generating polysemy: Metaphor and metonymy", in Dirven, R.; R. Pörings (eds.) 2003: *Metaphor and Metonymy in Comparison and Contrast*, Berlin/New York, Mouton de Gruyter. 48-74.
- Brisard, Frank, Gert van Rillaer and Dominiek Sandra 1997. "Processing Polysemous, Homonymous, and Vague Adjectives". In: Cuyckens, Hubert and Britta E. Zawada, eds., *Polysemy in Cognitive Linguistics*. Amsterdam, Philadelphia: John Benjamins, 261-284.
- Gibbs, Raymond W. Jr. & Teenie Matlock. 2001. "Psycholinguistic perspectives on polysemy". In: Cuyckens, Hubert & Britta Zawada, eds., *Polysemy in Cognitive Linguistics*. Amsterdam, Philadelphia: John Benjamins, 213-39.
- Haser, V. 2003: "Metaphor in semantic change", in Barcelona, A. (ed.) (2003): *Metaphor and Metonymy at the Crossroads*, Berlin/New York, Mouton de Gruyter. 171-194.
- Lakoff, G.; M. Johnson 1999: *Philosophy in the Flesh*, New York, Basic Books.
- Pickering, Martin J. and Steven Frisson 2001. "Processing Ambiguous Verbs: Evidence From Eye Movements". *Journal of Experimental Psychology: Learning, Memory and Cognition* 27:2, 556-573.
- Sullivan, Karen 2007. "Metaphoric Extension and Invited Inferencing in Semantic Change". In *Culture, Language and Representation*. Castellón, Spain: Universitat Jaume I.
- Sullivan, Karen 2007. "Grammar in Metaphor: A Construction Grammar Account of Metaphoric Language." Dissertation. University of California, Berkeley.
- Sweetser, E. 1990: *From Etymology to Pragmatics: Metaphorical and Cultural Aspects of Semantic Structure*, Cambridge, UK, University of Cambridge Press.
- Traugott, E. C.; R. B. Dasher 2002: *Regularity in Semantic Change*, Cambridge, UK, University of Cambridge Press.
- Williams, John N. 1992. "Processing polysemous words in context: Evidence for interrelated meanings". *Journal of Psycholinguistic Research* 21:193-218.