Tracking the activation of scalar alternatives with semantic priming

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EXPERIMENTS IN LINGUISTIC MEANING 2
Scalar implicature (SI)

Mary ate some of the deep dish.

- **Literal content**: Mary ate some, and *possibly all*, of the deep dish.
- **Scalar implicature**: Mary ate some, but *not all*, of the deep dish.

Comprehenders reason about **stronger unsaid alternatives**: *all*

(Grice, 1967; Horn, 1972)
Alternatives in processing

Alternatives: psychologically real, or just a useful theoretical tool?

• Operationalization: Are alternatives activated in processing?
Semantic priming with lexical decision

**Goal:** Track the retrieval and activation of alternatives

Do we activate the meaning of *all* when we access *some*?

Mary ate some of the deep dish.  

The movie is good.
Alternatives in processing: previous work

Alternative activation in the processing of...

• **Focus** (i.a., Fraundorf et al., 2010, 2013; Gotzner & Spalek, 2017, 2019; Braun & Tagliapietra, 2010; Yan & Calhoun, 2019; Husband & Ferreira, 2016; Spalek et al., 2014; Kim et al., 2015)

• **Negation** (i.a., Kaup & Zwaan, 2003; Kaup et al., 2006; Tian et al., 2016)

• **Counterfactuals** (i.a., Ferguson et al., 2008; de Vega & Urrutia, 2012)
Previous priming studies on SI

Lexical priming (Schwarz et al., 2016; de Carvalho et al., 2016)

Priming the mechanism of SI calculation (i.a., Bott & Chemla, 2016; Rees & Bott, 2018; Bott & Frisson, 2022)
Experiment 1: Sentential semantic priming

**PRIME** → 650 ms → **TARGET**

- **Task**: decide whether *excellent* is a word or non-word
- **Dependent measure**: reaction time (RT)
- **Items**: 60 different lexical scales

The movie is good.

excellent

F: non-word  J: word

Item N=60
Participant N=46
(recruited online)
### Sentential semantic priming: conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Prime</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Related (scalar)</td>
<td>The movie is good.</td>
<td>excellent</td>
</tr>
<tr>
<td>Unrelated</td>
<td>The movie is foreign.</td>
<td>excellent</td>
</tr>
<tr>
<td>Filler (non-word)</td>
<td>Susan decorated the cookies.</td>
<td>kleens</td>
</tr>
</tbody>
</table>
Experiment 2: Priming with only

- Previous work has found alternative activation

The movie is only good.  

\[ \text{PRIME} \rightarrow 650 \text{ ms} \rightarrow \text{TARGET} \]

excellent

F: non-word  J: word

Item N=60  
Participant N=43  
(recruited online)
Experiment 3: Lexical semantic priming

• What if the priming effect is not due to SI?
• Ruling out effect of meaning similarity

Item N=60
Participant N=44
(recruited online)

PRIME → 650 ms → TARGET

good

excellent

F: non-word
J: word
Results

No effect in lexical experiment

Linear mixed effects regression model:

Estimate=11.46
SE= 9.94
t=1.15
p=0.26

n.s.
Results

Facilitated RT to alternatives in sentential experiment

Linear mixed effects regression model:

Estimate=21.62
SE= 8.65
$\bar{t}=2.5$
$p<0.05$
Results

only: similar facilitation

Linear mixed effects regression model:

Estimate=24.47
SE= 8.01
t=3.06
p<0.01

n.s.

* p<0.05
** p<0.01
Results

SI and *only*: no difference

Linear mixed effects regression model:

Estimate=9.51
SE= 22.53
t=0.422
p=0.67
Upshot of findings

Alternatives are retrieved and activated in real-time processing of scalar implicature-triggering sentences
A puzzle

Alternatives like *excellent*:

similar activation with *The movie is good* or *The movie is only good*

does **not track the rate of inference** from the corresponding sentences
Thank you!
References


Bott, Lewis, and Steven Frisson. 2022. Salient alternatives facilitate implicatures. PLOS ONE 17:1–10


de Carvalho, Alex, Anne C. Reboul, Jean-Baptiste Van der Henst, Anne Cheylus, and Tatjana Nazir. 2016. Scalar implicatures: The psychological reality of scales. Frontiers in Psychology 7

References


References


References


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Schwarz, Florian, Zehr Jeremy, Grodner Daniel, and Hezekiah Akiva Bacovcin. 2016. Subliminal priming of alternatives does not increase implicature responses. Poster presented at the Logic and Language in Conversation Workshop, University of Utrecht

Spalek, Katharina, Nicole Gotzner, and Isabell Wartenburger. 2014. Not only the apples: Focus sensitive particles improve memory for information-structural alternatives. Journal of Memory and Language 70:68–84

List of scales

| Adjective       | <allowed, obligatory>; <attractive, stunning>; <big, enormous>; <cool, cold>; <dark, black>; <difficult, impossible>; <dirty, filthy>; <funny, hilarious>; <good, excellent>; <happy, ecstatic>; <hard, unsolvable>; <harmful, deadly>; <hungry, starving>; <intelligent, brilliant>; <intimidating, terrifying>; <old, ancient>; <overweight, obese>; <palatable, delicious>; <polished, impeccable>; <possible, certain>; <pretty, beautiful>; <scared, petrified>; <serious, life-threatening>; <similar, identical>; <small, tiny>; <snug, tight>; <tired, exhausted>; <ugly, hideous>; <understandable, articulate>; <unpleasant, disgusting>; <warm, hot>; <willing, eager> |
| Verb            | <begin, complete>; <believe, know>; <damage, destroy>; <dislike, loathe>; <double, triple>; <like, love>; <match, exceed>; <permit, require>; <reduce, eliminate>; <slow, stop>; <start, finish>; <survive, thrive>; <tolerate, encourage>; <try, succeed>; <want, need> |
| Adverb          | <equally, more>; <here, everywhere>; <largely, totally>; <mostly, entirely>; <once, twice>; <overwhelmingly, unanimously>; <partially, completely>; <primarily, exclusively>; <probably, necessarily>; <usually, always>; <well, superbly> |
| Quantifier      | <or, and> |
| Connective      | <some, all> |
Experimental details

Before each sentence, a fixation cross was displayed for 350 ms, followed by 400 ms of an empty screen.

Each word in the sentence was displayed for 350 ms (Experiments 1-2). Prime sentences were presented word-by-word.

In Experiment 3, the prime word was displayed for 150 ms.

The time (SOA) between the offset of the final prime word (good/foreign) and the onset of the target word (excellent) was 650 ms.
Another puzzle

**No by-item correlation** between SI rates and priming effect

allowed $\rightarrow$ *not obligatory* more robust SI than dirty $\rightarrow$ *not filthy*

this doesn’t correspond to a difference in priming

*Possible reason:* we measure priming effect by **comparing to the unrelated condition**

*(The movie is foreign.)*