Adults demonstrate implicit causality and consequentiality biases for novel verbs

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Background

In causally-dependent clauses [1-3, 5-6]:

***Implicit Causality*: pronouns tend to refer to the cause**

1. Josh feared Paul because he…[he=Paul]
2. Josh frightened Paul because he…[he=Josh]

***Implicit Consequentiality*: pronouns tend to refer to the affected entity**

3. Because Josh feared Paul, he…[he=Josh]
4. Because Josh frightened Paul, he…[he=Paul]

These **IC biases** are linked to verb argument structure [1-2] (mapping between semantic roles and syntactic positions)

- Verb argument structure is a function of verb meaning [4,8]

Do IC biases emerge:

H1: by tracking probabilistic patterns of reference in the language input [7], or

H2: "for free" from representations of verb meaning and discourse structure [1-2]?

KEY TEST of (b):

- **Do adults extend IC biases to novel transitive emotion verbs?**
  - A positive correlation between argument structure and pronoun interpretation = **generalization**
  - No correlation = **item-based learning**

Method

Participants:

- Experiment 1a: 688 native English speakers
  - 6 verbs (trials)
  - Implicit Causality
- Experiment 1b: 97 native English speakers
  - 12 verbs (trials)
  - Implicit Consequentiality

Stimuli:

- 28 novel definitions for transitive emotion verbs (e.g., *dax* = the love of all things good)
- Normed to ensure no obvious English translations

Task:

Question 1: Argument structure

Suppose Albert felt *dax* in relation to Bernie. Which of the following sentences is the best way to describe that?

(a) Albert daxed Bernie. → experiencer-subject
(b) Bernie daxed Albert. → experiencer-object

Question 2: Pronoun interpretation

Choose the next work in the following sentence:
Experiment 1a: John daxed Sarah because…
Experiment 1b: Because John daxed Sarah,…

(a) he
(b) she

Results

Argument structure judgments (Q#1) varied systematically by verb definition

Crucially:
Argument structure predicted pronoun interpretation (Q#2)

- Experiment 1a: $p = .04$
- Experiment 1b: $p < .001$

Experiment 1a:

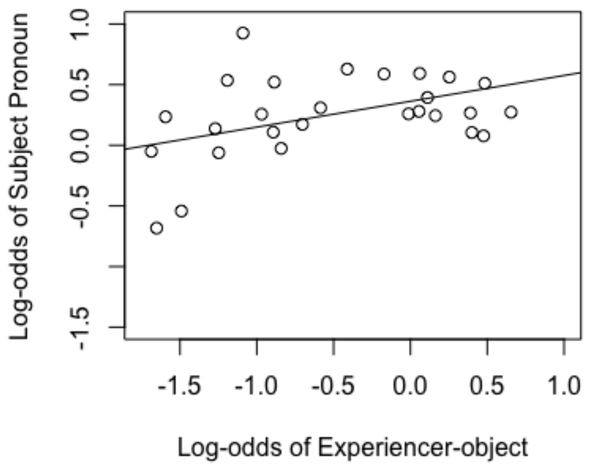

Figure 1. Correlation between argument structure judgments and subject pronoun resolution in implicit causality sentences.

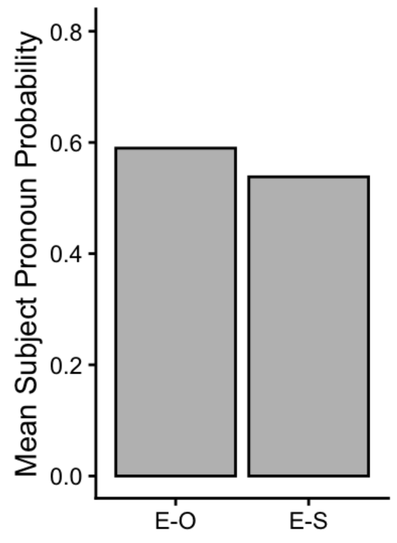

Figure 2. Average probability of subject pronoun by verb argument structure in implicit causality sentences.

Experiment 1b:

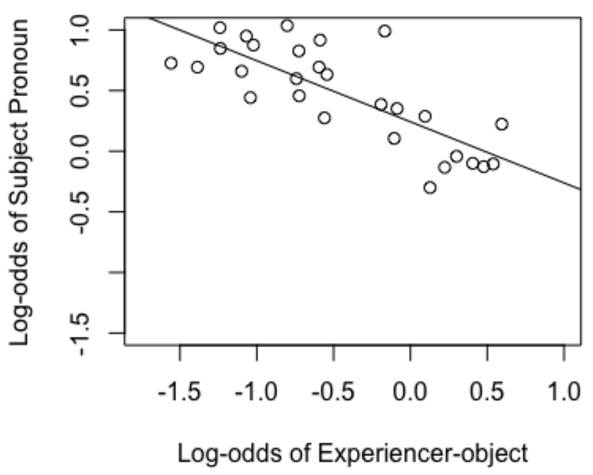

Figure 3. Correlation between argument structure judgments and subject pronoun resolution in implicit consequentiality sentences.

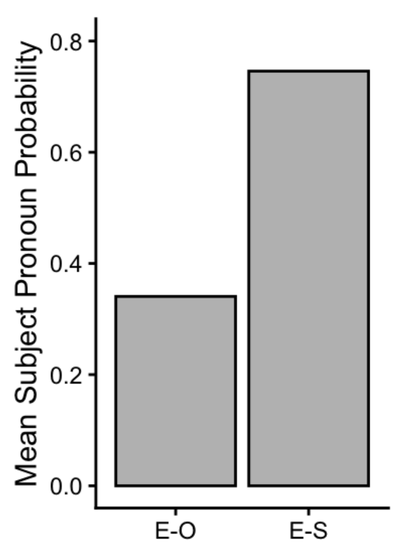

Figure 4. Average probability of subject pronoun by verb argument structure in implicit consequentiality sentences.

Conclusions

IC biases:

- are **not learned solely from exposure to specific verbs**
- reflect **abstract, systematic generalizations**
- likely emerge "for free" from representations of verb meaning and discourse structure (**H2**)

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