The interplay of verbal information and discourse structure: A crosslinguistic production study on implicit verb causality

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Implicit causality bias basics

- Implicit causality (IC) verbs: two animate arguments
- NP1 V-ed NP2 *because* . . .
- preference for pronominal reference

(1)  
   a. Peter frightened Mary *because* . . . he started yelling for no reason.
   b. John congratulated Sarah *because* . . . she won the race.

- bias: proportion of continuations mentioning NP1 or NP2 first
- *frighten*: NP1 bias
- *congratulate*: NP2 bias
- truly implicit: may be observed for non-marked explanations (Kehler et al. 2008)

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- incremental processing of discourse: incremental effects of pragmatics?
- puzzle: is it verb semantics? common denominator?
- explanation strategies
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What is implicit causality?

- hard to identify a single decisive semantic feature

**NP1 bias:**

*amuse*, apologize to, fascinate, bore, confess to, telephone, . . .

(5) Mary amused Jerry because she danced clumsily.

**NP2 bias:**

admire, pity, *congratulate*, thank, praise, hate, . . .

(6) John congratulated Sarah because she won the race.

(7) **Balanced bias:**

interrupt, hit, murder, . . .

- **linguistic factors:** *argument structure*, intentionality, Aktionsart

- **social psychology:** social hierarchies, gender stereotypes
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Does argument structure explain IC?

- stimulus-experiencer, experiencer-stimulus, agent-patient, ...
- stimulus arguments seem to be strong bias attractors
- **NP1**: amuse, fascinate, bore
  
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- congratulate, thank, praise
- neither agents nor patients are strong bias attractors
- Psychological verbs (**stim-exp**, **exp-stim**) only class with systematic bias patterns.
- “agent-evocator”: **congratulate**, **thank**
- **No explanation** of patterns, mere correlation between bias tendencies and classes of verbs defined by argument structure
- Why should argument classes and bias correlate, given that the bias is dependent on the discourse relation of explanation?
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- Stimulus-experiencer verbs (x CAUSE s):

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≈ “Mary’s clumsy dancing caused an attitudinal state of amusement in Jerry”.

- Why do non-causative thank, congratulate, praise display a strong NP2 bias?
- Why do predicates such as kill or murder display a balanced bias, given that they are causative predicates par excellence?
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IC bias reflects explanation preferences

Main claim
Implicit causality verbs trigger specific kinds of explanations associated with one of the two participants

- Implicit causality bias may be observed whenever a *because* clause can specify – or *elaborate* on – certain semantic entities which are associated with only one of the participants.
- The specific bias properties of a verb are dependent on features well-known from theoretical semantics.

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What determines the bias?

(11) John congratulated Mary because ... she won the race.

- Bias pattern dependent on
  - causal elaboration possibilities in $NP1 \ verb-ed \ NP2$
  - the semantic properties of $because$ (clauses):
    $because$ introduces factive causes, propositional in nature (Solstad 2010)
  - verb semantics + typology of explanations
because explanations: causes and reasons

Simple causes are causes of (attitudinal) states or events

(12) **Simple/direct cause:**
John disturbed Mary because he was making lots of noise.

Reasons are causes of attitudinal states involving intentionality

(13) **Externally anchored reason (‘Beweggrund’):**
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Elaboration possibilities I: stimuli

(15) \( \text{annoy} \sim \text{f CAUSE s}_{\text{att}} \)

Christian annoyed Hanna because he sang loudly.

- NP1 – “Christian” – is a ‘placeholder’ for a proposition, associated with NP1
- reinterpretation of NP1 as NP1 property
- simple cause: \( x \) singing loudly brings about the attitudinal state of \( y \) being annoyed
- evidence: the stimulus argument of a psych verb – stimulus–experiencer or experiencer–stimulus – may also be realized by a \( \text{dass} \) ‘that’ clause

(16)

a. It annoys Mary that Peter sings loudly.
b. Mary hates that Peter sings loudly.
c. It killed\(_{\text{psych}}\) Peter that Mary didn’t want him anymore.
d. #It killed\(_{\text{psych}}\) Peter that Mary stabbed him in the back.
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Ontological constraints

- *because* introduces factive causes, which are propositional in nature
- *because* cannot specify the causing event of all causative predicates (contra Hartshorne & Snedeker)

\[
\text{murder } \leadsto e \ \text{CAUSE} \ s
\]

(17)  #Tom ermordete Louisa, weil er sie in den Rücken stach.
      ‘Tom murdered Louisa because he stabbed her in the back’.

- *e* is ‘associated with’ Tom, who is the agent of the causing event
- psych verbs: *f* CAUSE S\_att
  - simple causes with psych verbs, **not** with agent-patient verbs
Elaboration possibilities II: Presuppositions

- *because* may elaborate a presupposed preceding event

(18) NP2 bias:
Lars bestrafte Melanie, weil sie das Geld geklaut hatte.
‘Lars punished Melanie because she took the money.’

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e'z \\
e' <_t e \\
z: \text{AGENT}(e') \\
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\end{align*}
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▷ we expect strong bias effects: \text{AVOIDACCOMMODATION}
not all presuppositions associated with a referent lead to a pronounced bias
world knowledge important
consider forgive

(19) #Mary forgave John because he cheated on her.

cheating on someone does not explain forgiving
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Agent-patient verbs: external and internal reasons

- elaboration possibilities lead to specific explanation patterns
- agent–patient predicates without presuppositions don’t offer any elaboration possibilities ⇞ no obvious explanation strategy

(20)  *Judith verprügelte* (‘bashed’) *Richard*, weil (‘because’) . . .

  a.  **external reason:**
      *er ihren Bruder gequält hatte.* (‘he tormented her brother’)
  b.  **internal reason:**
      *sie sehr wütend war.* (‘she was very upset.’)

- any distribution of verb biases is possible
- **but: bias should follow from the ratio of external to internal reasons**
  - external reasons ⇞ NP2 bias
  - internal reasons ⇞ NP1 bias
Interim summary and predictions

- clear bias effects when *because* clause may elaborate on a semantic entity associated with an argument
- factors and their predictions
  1. ‘unspecified property’: presence of stimulus
     - causal explanation: simple causes
     - bias: stimulus
  2. presupposition
     - causal explanation: externally anchored reasons
     - bias: argument associated with presupposition
- we predict the bias of agent-patient verbs to follow from the ratio of external to internal reasons (no simple causes available)
The design of the study I

IC versus non-IC verbs

Some *NP1 verb NP2* configurations are explanatorily deficient and require causal elaboration. This provides us with a theoretically grounded classification of IC vs. non-IC verbs:

- Explanation should be the default coherence relation for verbs with missing content (*es-*-, *se-* or +psp-verbs)
- All other verbs should have a much more limited need for explanation

How measure the proportion of explanations?
- Count number of explanations after a full stop (cf. Kehler et al. 2008)
- Within-factor connective: *full stop* vs. *because*
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The design of the study II

Crosslinguistic generalizability

Our account only hinges on verbal semantics and possible explanations. We therefore expected IC bias and the underlying distribution of explanation types to be crosslinguistically stable.

- We chose German and Norwegian because...
  - verbs can be perfectly matched in meaning
  - the two languages differ in discourse segmentation
    (Fabricius-Hansen et al. 2005, Ramm 2011)
      - German: hypotactic sentences, explicit discourse marking
      - Norwegian: paratactic sentences, less explicit marking
Crosslinguistic generalizability

Our account only hinges on verbal semantics and possible explanations. We therefore expected IC bias and the underlying distribution of explanation types to be crosslinguistically stable.

- We chose German and Norwegian because...
  - verbs can be perfectly matched in meaning
  - the two languages differ in discourse segmentation
    - (Fabricius-Hansen et al. 2005, Ramm 2011)
      - German: hypotactic sentences, explicit discourse marking
      - Norwegian: paratactic sentences, less explicit marking
The design of the study II

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Crosslinguistic variation?

- After a full stop, there is no (simple) discourse marker for explanation relations
- Explanations thus have to be left implicit
- Given the difference in discourse structure: more explanations after a full stop in Norwegian than in German
52 Germans and 48 Norwegians participated in a discourse continuation study.

Instructions: “continue the discourse in the most natural way” (or skip it if you can’t come up with a continuation)

101 verbs: 16 se; 18 es; 10 ap/+psp; 57 ap/–psp

1. block full stop: NP1 verbed NP2. …
2. block because: NP1 verbed NP2, because …

Counterbalanced between NP1/2 = masc./fem.

Latin square design, four lists
The resulting corpus of a total of 10,100 continuations was annotated wrt. the following categories:

- **Bias annotation** (agreement: Cohen’s $\kappa = .93$)
  - NP1 vs. NP2 vs. no anaphor
  - unequivocal vs. ambiguous (*he loved her*)
  - continuation contains subordinated sentence (bias of embedded sentence)
  - kind of anaphor (pronoun, DP, proper name)

- **Discourse relation** (agreement: Cohen’s $\kappa = .72$)
  - sensible continuation (skips and nonsense $\triangleright$ mis. values)
  - temporal order (event continuation after event prompt?)
  - explanation? (*weil*/*fordi* test)
  - elaboration? (*indem*/*ved å* test)

- **Causal annotation**: *simple cause vs. externally anchored reason* vs. *internally anchored reason* (agreement: Cohen’s $\kappa = .80$)
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Proportions of Explanations
Proportion of explanations after a full stop

Verbs that require causal elaboration triggered 64.5% explanations

Ordinary ap verbs received only 39.5% explanations

No differences between German and Norwegian

Effects didn’t differ across languages
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Effects didn’t differ across languages
A closer look at the verb classes

- All three types of verbs that require further causal elaboration predominantly received explanations.
- Effects were crosslinguistically stable.
Explanation Profiles
Psych verbs trigger simple causes

(21)  

a. Mary fascinated John because she was so talented.  
b. Mary feared John because he was very aggressive.

Psych verbs overwhelmingly prompted simple causes  
Agent-patient verbs don’t allow for simple causes
(22) Mary thanked John because he had repaired her bike.

Verbs with a presupposition prompted explanations about the presupposed content

Participants avoided accommodation
Implicit Causality Bias
IC-bias was the same across languages

(23) NP1 verbed NP2 because he/she...

German and Norwegian verbs closely corresponded in bias

\( r = .92; p < .01 \)
Simple causes of psych verbs specify a property of the stimulus causing the experience

- stimulus-experiencer verbs: NP1 bias
- experiencer-stimulus verbs: NP2 bias
IC-bias of psych verbs

- experiencer-stimulus: NP2-bias
- stimulus-experiencer: NP1-bias
- Bias due to simple causes
Linking causal typology to anaphor resolution II

Agent-patient verbs

- +PSP verbs: bias towards the argument associated with the presupposition (= ext. reason)
- −PSP verbs: bias is determined by the ratio of internally to externally anchored reasons
Nine out of ten +PSP verbs had presuppositions associated with NP2 (exception: *apologize to*)

NP2 bias

- PSP: int. reasons (rise NP1) = ext. reasons (rise NP2)
Nine out of ten +PSP verbs had presuppositions associated with NP2 (exception: *apologize to*).

**NP2 bias**

- PSP: int. reasons (↗ NP1) = ext. reasons (↗ NP2)
The ratio of int. to ext. reasons is a good predictor for IC-bias

(accounted variance: $R^2 = .75$)
Comparison with alternative approaches
Verb classes？ *apologize* vs. *forgive* vs. other PSP verbs

- *apologize to*: presupposition associated with **NP1**
- *forgive* (VerbNet class 33 *judgment*): no presupposition can be targeted by *because*
- *criticize* (VerbNet class 33 *judgment*): presupposition associated with **NP2**

(24)  

a. **Mary** apologized to John because **she** had forgotten about his birthday.

b. #**Mary forgave John** because **he** had betrayed her with some other girl.

c. Mary criticized **John** because **he** had told a lie.
Verb classes? *apologize vs. forgive vs. other PSP verbs*

The different behavior is unexpected given the VerbNet entries.

Once we take PSPs into account, the pattern is fully expected.
Causative verbs: *kill* and *murder*

(25) #John killed Mary because he shot her in the back
≠ ’John caused Mary to die by shooting her in the back’

---

Not a single simple cause! no clear NP1 bias!
We have demonstrated that...

- IC-bias follows from specific explanatory elaboration strategies
- the phenomenon is crosslinguistically stable
- IC-bias is fully predictable even at the level of individual verbs
Our account allows us to...

- predict preferred discourse continuations for individual verbs
- explain focussing effects (eg. Koornneef & van Berkum 2006, Pyykkönen & Järvikivi 2010)
- predict which kinds of verbs should elicit particularly strong focussing effects
  - ie. earlier bias effects in se-verbs than in NP1-bias ap-verbs without a PSP
We thank you because ... you attended this talk!
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