The mechanics of causal interpretation: Explaining implicit verb causality
Oliver Bott (University of Tübingen) & Torgrim Solstad (Norwegian University of Science and Technology & University of Stuttgart)
torgrim.solstad@ntnu.no

Implicit causality bias; Discourse processing; Production; German

Implicit Causality (IC) plays an important role in investigations of discourse expectations ([1]a.o.). Although there is good evidence as to when IC affects comprehension ([2,3]), its exact nature is still poorly understood. Recent research suggests that discourse coherence ([4]) and verb-class semantics ([5]) are important factors. Going beyond this, we show that IC can be better understood if we consider a typology of different kinds of verb-dependent explanations. Based on three continuation experiments, we present a detailed semantic analysis of IC. Participants continued simple sentences (4a-b). Continuations were annotated for (i) whether they were explanations, (ii)the kind of explanation, and (iii)IC-bias. Following [6], we distinguished simple/direct causes (SimpCause=(1)) from externally or internally anchored reasons (ExtReason=(2);IntReason=(3)). We show below that IC-bias is semantically determined by elaboration preferences for specific verb-dependent explanations and how this property allows us to manipulate IC-bias systematically (all contrasts:loglinear models, LRCS_{1/2;192}<.01).

**Experiment 1A-B** (N=52;12+12 verbs;(4)-(5)+(6)-(7)):Encountering strong IC-verbs raises the expectation that a specific explanation will follow. To test this assumption, we explicitly provided such explanations in the prompt. 1A:In stimulus-experiencer verbs (4a-b), NP1 is a placeholder for some property causing (=SimpCause) NP2’s experience. We predicted explanations to specify this property (NP1-association=NP1-bias). Crucially, in (5a-b) we stated this property explicitly using durch-phrases (‘by’/with’). This should impede the production of SimpCauses, shifting IC-bias towards NP2. As predicted, (i)after a full stop, explanations dropped from 58%=(4b) to 33%=(5b), (ii)in ‘full stop’ and because-explanations SimpCauses dropped from 52%=(4a-b) to 24%=(5a-b), (iii)altering the bias from 71% to 49% NP1. 1B: Causal elaboration may also reflect a strategy of avoiding presupposition accommodation ([7]). (6a-b) presupposes a fact associated with NP2 which constitutes an ExtReason for NP1 to act. Conditions (7a-b) specified this ExtReason. Accordingly, (i) explanations dropped from 67%=(6b) to 37%=(7b). In the explanations (ii)ExtReason-continuations were reduced from 53%=(6a-b) to 23%=(7a-b), and (iii)IC-bias shifted from 20%=(6a-b) to 60%=(7a-b) NP1.

**Experiment 2** (N=36;20 stimulus-experiencer+20 agent-patient verbs;(8)/(9)):Stimulus-experiencer and causative agent-patient verbs are semantically similar, allowing durch-phrases to specify SimpCauses (8a)/(9a). However, agent-patient verbs don’t allow because to do so ([10] – a fact overlooked by [5]). Consequently, the bias of agent-patient verbs should be more balanced. For both verb classes, durch-continuations were 99% SimpCauses. In because-continuations, stimulus-experiencer verbs (8b) triggered 83% SimpCauses (NP1-bias:92%). Agent-patient verbs (9b) prompted only 2% SimpCauses, 56% IntReasons and 42% ExtReasons (NP1-bias:50%).

**Experiment 3** (N=52;24 verbs;(11a-c)):Intentionally turns ambiguous agent-patient/stimulus-experiencer verbs into agent-patient verbs ([8]), disallowing SimpCauses (Exp. 2). By contrast, unintentionally produces stimulus-experiencer interpretations triggering SimpCauses (Exp. 1). As expected, manipulation by intentionally (11b) blocked SimpCauses (unmanipulated:39%→intentionally:3%), prompting IntReasons instead (40%→75%). Bias wasn’t affected (NP1-bias:67%→68%), since both SimpCauses and IntReasons are associated with NP1. Unintentionally (11c) led to a significant increase of SimpCauses (39%→66%) and NP1-bias (67%→85%).

**The results** show that IC-bias strongly depends on the availability of specific explanation types and that it can be manipulated by specifying those implicit explanations. In contrast to [5], our work shows that IC-bias depends on the semantics of the verb and of because. Moreover, we can account for focussing effects in processing([2,3]): if a verb triggers a specific kind of explanation, we may expect focusing of the associated referent.

1. John disturbed Mary because he was making lots of noise. (simple cause)
2. John disturbed Mary because she had damaged his bike. (externally anchored reason)
3. John disturbed Mary because he was angry at her. (internally anchored reason)
4. Maria (NP1) beeindruckte (‘impressed’) Peter (NP2), a) weil (‘because’) / b) ‘full stop’ [...] (intentionally)
5. Maria beeindruckte Peter durch ihr offensives Spiel (‘with her aggressive play’), a) weil (‘because’) / b) ‘full stop’ [...] (unintentionally)
6. Sara gratulierte (‘congratulated’) Martin, a) weil (‘because’) / b) [...] (intentionally)
7. Sara gratulierte Martin zum glänzenden Sieg (‘on the brilliant victory’), a) weil (‘because’) / b) [...] (unintentionally)
8. Emma bezauberte (‘charmed’) Paul, a) durch (‘by’/‘with’)[...] / b) weil (‘because’) [...] (intentionally)
9. Emma tötete (‘killed’) Paul, a) durch (‘by’/‘with’)[...] / b) weil (‘because’) [...] (unintentionally)
10. #Sue störte (‘disturbed’) Peter a) weil (‘because’) / b) absichtlich (‘intentionally’), weil / c) unabsichtlich (‘unintentionally’), weil [...]
11. Maria störte (‘disturbed’) Peter