Testing the implicature approach to Sequence of Tense

Summary: In English, past tense stative clauses embedded under a past-marked attitude verb can receive two possible interpretations, differing on whether the state of the complement is understood to hold before, (1a), or at the matrix evaluation time, (1b).

(1)   Eric thought that Kalina was sick.   PAST-UNDER-PAST
   a.   Eric's thought: "Kalina was sick"   BACKWARD-SHIFTED
   b.   Eric's thought: "Kalina is sick"   SIMULTANEOUS

As is well known, the availability of the simultaneous reading in (1b) – also called 'Sequence of Tense' (SOT) – is subject to cross-linguistic variation (Ogihara & Sharvit 2012, a.o). Non-SOT-languages, like for instance Japanese or Polish, only allow for the backward-shifted interpretation (Bošković 2012, Sharvit 2014). The unavailability of the simultaneous reading has been recently analysed as arising from a 'cessation' implicature associated with Past tense (Altshuler 2016, Altshuler & Schwarzschild 2013). We tested the predictions of this implicature approach by investigating the Polish-equivalent of sentences like (1) in Upward Entailing (UE) and Downward Entailing (DE) contexts, comparing their potential cessation implicature to the exclusive implicature of disjunction. In our results, we found that the latter was endorsed more often in UE than in DE contexts, as expected, while the cessation implicature was endorsed overall very little, with no difference across contexts. The disanalogy between the disjunction and the temporal cases, and the insensitivity of the latter to monotonicity, is a challenge for the implicature approach. The results are instead in line with alternative structural approaches, which expect no similarity between SOT phenomena and implicatures (Ogihara 1995, 1996, Kusumoto 1999, 2005, a.o.)

Background: There are two main approaches to cross-linguistic variation of SOT phenomena. A structural approach which postulates an optional syntactic 'SOT rule,' deleting the past operator in the complement clause to derive the simultaneous reading in (1b) (Ogihara 1996 a.o.). Non-SOT-languages would simply lack this rule. Under the implicature approach, on the other hand, the sentence in (1) has one possible reading only, compatible with both interpretations. In non-SOT languages, (1) competes with the corresponding present sentence in (2a), giving rise to the implicature in (2b), which narrows the meaning to a back-shifted interpretation only.

(2)   a.   Eric thought that Kalina is sick.   PRESENT-UNDER-PAST
        b.   ⤳ *According to Eryk, Kalina was not sick anymore*   CESSATION IMPLICATURE

The cessation implicature is based on the following ingredients: **(i)** a specific temporal profile of statives: for every moment m at which a state s holds, there is a moment m' before m where s also holds, **(ii)** therefore, a present stative sentence asymmetrically entails its past alternative, **(iii)** PAST-UNDER-PAST, as in (1), and PRESENT-UNDER-PAST, as in (2a), compete to express simultaneous interpretations, **(iv)** PAST-UNDER-PAST gives rise to the scalar implicature that its (stronger) PRESENT-UNDER-PAST alternative is false, therefore excluding a simultaneous interpretation in languages like Polish. This cessation implicature is suspended in English because the present tense is indexical and gives rise to truth conditions for (2a) which are incompatible with purely simultaneous readings, thereby making it an unsuitable competitor to (1).

Predictions: The implicature approach attributes the unavailability of simultaneous readings in non-SOT-languages to the presence of an implicature. It therefore predicts that in DE contexts, where implicatures tend not to arise (Fox & Spector 2018 a.o.), such readings should re-emerge. The structural approach, on the other hand, doesn't expect any effect of monotonicity on the (un)availability of simultaneous readings in non-SOT-languages. We designed an experiment to test these predictions, by investigating PAST-UNDER-PAST sentences in UE and DE contexts and comparing them to disjunctive sentences like (3a) and their potential exclusive implicature in (3b).[1]

---

[1]In both the temporal and the disjunction cases, we consider the strongest of two possible versions of their in-

(3) a. Eric thinks that Kalina or Alexander are sick.
   b. ⤳ *According to Eric, it's not the case that both Kalina and Alexander are sick.*

Experiment: We tested 52 native speakers of Polish (12 females, mean age: 26). Participants were asked to imagine they were meeting with a friend, Anna, who would tell them news about their common friends. In the target items, Anna's statements were either PAST-UNDER-PAST sentences, as in (4), or disjunctions, as in (5), distributed across positive (UE) or negative (DE) contexts. Participants received pairs of a statement and a candidate inference and their task was to judge to which extent the former suggested the latter on a scale from 1–7. Each participant saw a total of 24 target items and 36 fillers. All items had unique lexicalisations distributed in a Latin square design across four lists. An example of the four conditions is presented below:

(4) PAST-UNDER-PAST
   a. Rozmawiałam ostatnio z Erykiem. Uważał, że Kalina była chora.   UE
      '*I talked to Eryk recently. He thought that Kalina was sick.*'
      ⤳ Według Eryka, Kalina nie była już wtedy chora.
      '*According to Eryk then, Kalina was not sick anymore.*'
   b. Rozmawiałam ostatnio z Erykiem. Nie uważał, że Kalina była chora.   DE
      '*I talked to Eryk recently. He didn't think that Kalina was sick.*'
      ⤳Według Eryka, Kalina była wtedy nadal chora.
      '*According to Kalina then, Eryk was still sick.*'

(5) DISJUNCTION
   a. Rozmawiałam ostatnio z Erykiem. Uważa, że Kalina lub Alek są chorzy.   UE
      '*I talked to Eryk recently. He thinks that Kalina or Alek are sick.*'
      ⤳ Według Eryka, to nieprawda, że Kalina i Alek są obydwoje chorzy.
      '*According to Eryk, it's not the case that both Kalina and Alek are sick.*'
   b. Rozmawiałam ostatnio z Erykiem. Nie uważa, że Kalina lub Alek są chorzy.   DE
      '*I talked to Eryk recently. He doesn't think that Kalina or Alek are sick.*'
      ⤳ Według Eryka, Kalina i Alek są obydwoje chorzy.
      '*According to Eryk, both Kalina and Alek are sick.*'

Results: Endorsement of the inference in the target conditions is shown in Fig. 1. Overall, participants computed the implicature of disjunction more than the cessation inference and only the former exhibited sensitivity to monotonicity. An ordered logit model fitted to the data revealed a significant effect of *type-of-inference* ($p < .05$), *monotonicity* ($p < .001$), and a significant interaction between them ($p < .001$).

Figure 1: Inference endorsement across conditions

Discussion: We tested the predictions of different approaches to SOT, by investigating PAST-UNDER-PAST Polish sentences in UE and DE contexts. Our results do not show any effect of monotonicity on the unavailability of SOT interpretations: in particular, the simultaneous reading didn't re-emerge in DE contexts. Moreover, we found an interaction between *type-of-inference* and *monotonicity*. The results are therefore challenging for the implicature approach and instead more in line with structural approaches, which expect no effect of monotonicity on the (un)availability of simultaneous readings.

Selected references: Altshuler (2016). Events, States and Times: An Essay on Narrative Discourse in English. Altshuler & Schwarzschild (2013). Moment of change, cessation implicatures and simultaneous readings. SuB 17, 45–62. Ogihara (1996). Tense, Attitudes, and Scope. Ogihara & Sharvit (2012). Embedded Tenses. Oxford Handbook of Tense and Aspect, 638–668. Sharvit (2014). On the universal principles of tense embedding: The lesson from *before*. JoS 31, 263–313.
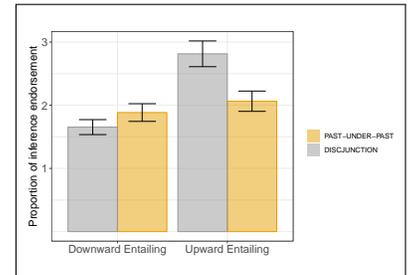
---

ferences. For instance, (3a) can also have a weaker inference that it's not true that according to Eric, Kalina and Alexander are sick; see Chierchia 2004, Geurts 2008, a.o. for discussion.