The processing of tense in attitude reports: Evidence from self-paced reading

Introduction: In English, past-tensed stative verbs embedded under past-tensed attitude verbs are ambiguous between a simultaneous interpretation (SIM) and a backward-shifted interpretation (BACK). The occurrence of a semantically vacuous past for the former, commonly referred to as Sequence of Tense (SoT), has been motivated in terms of morpho-syntactic agreement between a matrix and an embedded tense. We test in a series of studies the predictions of these structurally-based theories, comparing data from native and non-native speakers of English, thus discussing broader implications to semantic theory.

Theoretical Background and Processing Hypotheses: Sentences such as (1) are generally ambiguous between two readings, depending on whether the embedded eventuality is located at a time overlapping with (SIM) or preceding (BACK) the time of the matrix’s statement.

(1) Jerry said that Elaine was upset.

(2) a. Jerry: ‘Elaine is upset’. (SIM)
    b. Jerry: ‘Elaine is upset’. (BACK)

The interpretation in (2-a) challenges standard semantic views of past tense, in that no past reference with respect to the attitude time (of speaking) is introduced. Instances of vacuous past in attitude reports are usually dealt with in the literature assuming an SoT rule optionally deleting an embedded semantic past operator (Ogihara 1995), or instatiating an agreement relation between tense morphemes and a covert PAST (Kusumoto 2005; Stowell 2007).

(3) \[TP \text{ PAST } [VP \text{ Jerry say that } [TP \text{ PAST } [VP \text{ Elaine be-upset }]]]]\] (tense deletion)

(4) \[TP \text{ PAST } [TP 2 \text{ [T' past } 2 [VP J-say [TP 3 \text{ [T' past } 3 [VP E-be-upset ]]]]]]]\] (tense agreement)

While the literature has focused on the proper semantical treatment of tense in attitude contexts, very little attention has been paid to the online processing of tense in intensional environments (but see Dickey 2001).

Following (3) and (4), our hypotheses were formulated as follows:

(5) Simple Structure Hypothesis (SSH)
    The processing of past-tensed statives under past-tensed attitude verbs is facilitated in contexts biasing for SIM-readings over Back-readings, due to structural simplicity.

(6) What you see is what you get (WYSIWYG)
    The processing of past-tensed statives under past-tensed attitude verbs proceeds as to favor BACK-readings over SIM-readings, the latter being associated with restructuring.

Empirical Studies: In two twin self-paced reading studies, we tested whether past-under-past constructions induce distinct processing patterns in contexts forcing a SIM- or a BACK-interpretation. The two studies tested respectively native (n=48) and non-native (n=35) speakers of British English, students at the University of Manchester. We adopted a 2x2 design, with factors SoT (BACK vs SIM) and Evaluation Time (EvalT: past vs future). Participants saw 88 trials, consisting of 48 experimental items embedded within 40 fillers. Each experimental trial started with a context picture setting the time of the statement (EvalT = yesterday/tomorrow) and the intended reading (BACK or SIM), followed by a target sentence, read word-by-word in a self-paced manner. Sample trials for each condition are given below (with pipes delimiting segments of presentation):

(7) EvalT=past, SoT=sim
    a. Context: Oliver (Yesterday): ‘Amber is sick’
    b. Target: Oliver | said | that | Amber | was | sick.

(8) EvalT=past, SoT=BACK
    a. Context: Oliver (Yesterday): ‘Amber was sick’
b. **Target**: Oliver | said | that | Amber | was | sick.

(9) EvalT=future, SoT=sim
   a. **Context**: Oliver (Tomorrow): ‘Amber is sick’
   b. **Target**: Oliver | will say | that | Amber | was | sick.

(10) EvalT=future, SoT=back
   a. **Context**: Oliver (Tomorrow): ‘Amber was sick’
   b. **Target**: Oliver | will say | that | Amber | was | sick.

Note that (9) denotes a mismatch between a BACK-context and a SIM-context.

**Predictions**: Our regions of interests are the embedded auxiliary and the adjective, in that at the embedded auxiliary a temporal relation between the embedded clause and the embedding predicate can be constructed. We expect the mismatch in (9) to be reflected by higher reading times (RTs) at was and spillover.

Following SSH, we expect an interaction of SoT and EvalT, being the simultaneous reading the favored one in past contexts, but disfavored in future ones. On the other hand, WYSIWYG suggests that an effect of SoT should be expected, in that the processor should take longer to read SIM-biased targets compared to BACK-biased ones.

**Results**: In the L1 study, we found a marginal effect at the spillover region, while no contrast between SIM and BACK emerges at the embedded auxiliary. Zooming in on the SoT ambiguity (EvalT=past), the difference in RTs between BACK and SIM only approaches significance. L2 study’s data shows a robust effect of SoT in the whole VP region. The effect weakens however in a by-items analysis. Analogous effects hold for EvalT=past, in that SIM evoked higher RTs than BACK at the critical word, thus providing evidence for a WYSIWYG strategy in online processing.

**Discussion and Conclusion**: The two empirical studies show that the processor is sensitive to the ambiguity of past-under-past constructions, in that reading times for distinct interpretations diverge in the critical area. More specifically, studies’ results point to a transparent processing strategy from L2 speakers, who exhibit higher RTs in contexts forcing a simultaneous interpretation. This speaks in favor of a processing model in which each tense morpheme is assigned temporal meaning, resorting to revision in case an inconsistent interpretation is derived. This model sides with a deletion-based account of SoT facts. Nevertheless, no conclusive evidence was found for L1 speakers, suggesting that further investigation is needed for a better assessment of the phenomenon.

**References**


