Perception verbs with *that*-clauses

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Abstract

In this paper, I propose an analysis for the difference between inferential and reportative readings of perception verbs with finite *that*-clauses in contrast to perception verbs with bare infinitives. The analysis draws on the new observation that German perception predicates with *that*-clauses can be accompanied by prepositional *an*-phrases which are highly restricted within this use and are only compatible with inferential readings.

1 On two types of perception

Perception verbs with bare infinitives differ from constructions with finite *that*-clauses in several aspects that provide challenges to respective analyses.

1.1 Selectional restrictions

Perception verbs with bare infinitives allow only for events and Davidsonion states (Maienborn, 2005), but not for statives like in (1). Perception verbs with *that*-clauses underly no such restrictions, cf. (2).

(1) a. *I see her know Margaret.
b. *I see her have red hair.

(2) a. I see that she knows Margaret.
b. I see that she has red hair.

Furthermore, bare infinitves have to be co-temporal with the matrix event, cf. (3), while *that*-clauses can have any tense, cf. (4).

(3) a. *I see her have gone on vacation.
b. *I see her will go on vacation.

(4) a. I see that she has gone on vacation.
b. I see that she will go on vacation.

1.2 Epistemic load

Perception verbs with finite *that*-clauses carry a certain epistemic load, while perception verbs with bare infinitives are epistemically neutral (Bayer 1986, Maienborn 2011, Kratzer 2017/2007). This renders the inference in (5) invalid, whereas the inference in (4) is valid (examples taken from Kratzer 2017/2007).

(4) *First premise*:
Beryl saw Meryl sprinkle the white powder on Cheryl's dinner.
Second premise:
The white powder was the most deadly poison.
Conclusion (valid):
Beryl saw Meryl sprinkle the most deadly poison on Cheryl's dinner.

(5) *First premise*:
Beryl saw that Meryl sprinkled the white powder on Cheryl's dinner.
Second premise:
The white powder was the most deadly poison.
Conclusion (invalid):
Beryl saw that Meryl sprinkled the most deadly poison on Cheryl's dinner.

1.3 Types of evidence

Crosslinguistically, languages that employ markers for evidentiality can distinguish between direct evidence, in which case the speaker has directly perceived an event, and indirect evidence, which divides further into inference and report (Willett, 1988).
Perceptions verbs with bare infinitives refer to direct perception or evidence, cf. (6), while perception verbs with finite *that*-clauses can usually refer to indirect knowledge or evidence, cf. (7) and (8) (Aikhenvald 2007, Kratzer 2017/2007). In the contexts given in (7) and (8), Margaret has not witnessed the event of Mary killing the king directly. In (7) she draws an inference and in (8) she has been

told so. In both contexts the bare infinitive is not acceptable.

(6) *Direct perception context:*
Margaret and Mary were both present. Mary killed the king and Margaret saw/heard the event.
Margaret saw/heard Mary kill the king.
Margaret saw//heard that Mary killed the king.

(7) *Inference context:*
a. *Margaret knew that Mary wanted to kill the king and saw a bloody knife.*
Margaret saw that Mary killed the king.
#Margaret saw Mary kill the king.

b. *Margaret knew that Mary wanted to kill the king and a loud scream from a servant boy.*
Margaret heard that Mary killed the king.
#Margaret heard Mary kill the king.

(8) *Report context:*
Someone told Margaret that Mary killed the king.
Margaret heard that Mary killed the king.
#Margaret heard Mary kill the king.

1.4 Prepositional *an*-phrases

In German, perception verbs with finite clauses can be accompanied by a prepositional *an*-phrase that indicates the source of inference, cf. (9). While *hören* with a finite clause often receives a reportative interpretation, the presence of such an *an*-phrase forces an inferential reading, cf. (10).

(9) a. An dem blutigen Messer sah Margaret, dass Marie den König getötet hat.
'[On the bloody knife] Margaret saw that Mary killed the king.
b. An dem Geräusch hörte Margaret, dass Marie den König getötet hat.
'[On that sound] Margaret heard that Mary killed the king.'

(10) a. Es gab einen Schrei. Daran hörte Margaret, dass Marie den König getötet hat.
'There was a scream. [On that] Margaret heard that Mary killed the king.'
b. Margaret sprach mit Marion. #Daran hörte Margaret, dass Marie den König getötet hat.
'Margaret talked to Marion. [On that] Margaret heard that Mary killed the king.'

In this use, *an*-phrases are possible with all kinds of perception predicates with that-clauses in German, (e.g. *sicht-/hör-/spürbar*, *dass*), but neither with nouns or bare infinitives, cf. (11), nor with belief predicates, cf. (12). They are already attested as indicators of inference in Old High German (Axel-Tober & Müller 2017).

(11) a. *Daran sehe ich eine Katze.
'[On that] I see a cat.'
b. *Daran sehe ich dich kommen.
'[On that] I see you come.'

(12) *An dem Messer glaube ich, dass…
'[On that knife] I believe that …'

In the translations above, the most literal counterpart *on* is used for glossing the *an*-phrase, which would not be used in English. Instead, the preposition *from* is accepted by at least some speakers with perception predicates.[1] In contrast to German, however, it is also compatible with pure predicates of inference like *conclude* or *infer*, cf. (13). In German, (*da*)*raus* has to be used. So, while English *from* seems to generally indicate a source of knowledge with any knowledge predicate, German *an* is restricted specifically to perception predicates.

(13) a. From that I conclude / infer that…
b. *Daran(/√Daraus) schließe / inferiere ich…

For French, a reviewer suggested the preposition *à* with the example in (14a). If *à* can be used in French systematically the way *an* is used in German, then (14b) is supposed to correlate to the German example (9a).

(14) a. J'ai vu à son air qu'il était faché.
b. J'ai vu au couteau sanglant que Marie avait tué le roi.

[1] A reviewer and a native speaker suggested this, however, another native speaker did not agree.

2 Previous Accounts

Previous accounts have focused on and provided analyses for the combination of perceptions verbs with bare infinitives, which have been widely discussed in event and situation semantics (e.g. Barwise, 1981; Higginbotham, 1983; Vlach, 1983; Maienborn, 2005, 2011). Accounts that rely on a relation between events for both constructions (e.g. Rau, 2011) cannot account for either of the illustrated challenges. Since in such an account the internal argument would be the witnessed event for both cases, it cannot explain the selectional restrictions, especially in cases where an event argument does not seem to be present. Also, it is unclear where different interpretations with respect to evidence type would come from. In an extensional, Davidsonian account epistemic load as described in section 1.2 is not expected and the conclusion in (4) seems straightforward, while its failure in (5) is surprising.

Presupposing a Davidsonian account in which perception verbs with a bare infinitive take an event as argument and express an extensional relation of direct perception between two individual arguments, cf. (16) and (17) in the next section, a standard possible worlds account in the spirit of Hintikka (1969a, 1969b) could be used for the combination with *that*-clauses, cf. (15), in order to account for evidential types and *an*-phrases.

(15) a. Margaret saw/heard that Mary killed the king.
b. For every w' such that w' is compatible with what Margaret saw/heard, Mary killed the king in w'.

Since this analysis has been deemed inadequate for the bare infinitive constructions by most authors, the question arises whether there is any link between *see* with a nominal argument or a bare infinitive and *see* with a finite *that*-clause. In the case of *hear*/*hören*, a general analysis describing a set of worlds which is compatible with what someone has heard is compatible with both inferential and reportative readings. However, it is not clear how these readings would be distinguished. Moreover, it is not explained how these readings relate systematically to the availability of an *an*-phrase and to the presence or absence of factive presuppositions which is described in section 3.3.

The following sections aim to keep a unified core for all analyses, only adding what is necessary to derive the differences illustrated in section 1.

3 Analyses

3.1 Inferential readings

I argue that the prepositional phrase from section 1.4 is the overt realization of the actual internal argument of the perception predicate and acts as an implicit argument that restricts an inferential relation between the subject and the content of the subordinate clause. Since it expected to differ from world to world, which conclusion can be drawn by whom from which piece of evidence, the inferential relation is tied to a certain world of evaluation. This relation is defined in (16) as a function from an attitude holder, a piece of evidence, and a world of evaluation to a set of worlds.

(16) $I_{Inference}(y)(x)(w)$ = {w' ∈ W: w' is compatible with the conclusions x draws (wrt. to x's knowledge in w) from y in w}

I use a non-epistemic event semantics for *see*/*sehen* with nouns/bare infinitives in (17)/(18) expressing direct perception.[2] This explains the restrictions from section 1.1: In order to witness something, you have to be within the same temporal and spatial boundaries as the witnessed event. Furthermore, Kimian states (Maienborn, 2005; cf. Kim, 1969, 1976) do not introduce an eventuality argument which could serve as the internal argument of the perception predicate.

The same perception predicate is then carried over to the inferential sentences. In (19) and (20), the regular object of direct perception is still implicitly present and the inferential relation given in (16) is introduced on top of that. Both relations share their arguments: y is the perceived object and the evidence,

[2] As a reviewer correctly points out, there can also be inferential readings with abstract nominals like *sincerity*. Whether a particular case falls under the proposed analysis or whether the noun treated as a visible entity because it is a trope (cf. Moltmann 2007) depends on its compatibility with the *an*-phrase in German. I acknowledge this issue, but will ignore it at this point.

Margaret is the perceiving subject and the attitude holder.
The inferential relation also introduces the epistemic effect from 1.2, since it ties the subclause of the first premise to the epistemic worlds of the perceiver, w', while the second premise is linked to the world in which the sentence is uttered, w, and the perceiver does not necessarily know about it.

(17) a. Margaret saw a marten.
b. λw ∃e∃y [see(y)(Mrgt)(e) & e ≤ w & marten(y)]

(18) a. Margaret saw Mary kill the king.
b. λw ∃e∃e'∃y [see(e')(Mrgt)(e) & e ≤ w & e' ≤ w & kill-theking(Mary)(e')]

(19) a. Margaret saw that Mary killed the king.
b. λw ∃e∃y [see(y)(Mrgt)(e) & e ≤ w & ∀w' [w' ∈ $I_{nference}$(y)(Mrgt)(w) → killed-theking(Mary)(w')]]

(20) a. An einem blutigen Messer sah Margaret, dass Marie den König getötet hat.
b. λw ∃e∃y [see(y)(Mrgt)(e) & e ≤ w & bloody(y) & knife(y) & ∀w' [w' ∈ $I_{nference}$(y)(Mrgt)(w) → killed-theking(Mary)(w')]]

The fact that *see(y)(x)(e)* is used in both analyses has two benefits of unification. First, there is only one basic perception predicate that is present in both analyses. Second, there is only one inferential relation for all perception predicates, which does not differ whether someone saw, heard, feeled, or smelled something. It can be introduced via a unified function that applies to perception predicates, binds its internal argument and yields an inferential predicate with an argument slot for the proposition expressed by the finite *that*-clause.

(21) λQλpλxλeλw . ∃y [Q(y)(x)(e) & ∀w' [w' ∈ $I_{nference}$(y)(x)(w) → p(w')]]

3.2 Reportative readings

Verbs of hearing with finite clauses, however, are generally ambiguous between inferential and reportative interpretations. I argue that reportative interpretations arise, if the internal argument is satisfied by an informational object with which the *that*-clause is associated. Such informational objects may be modeled by taking an individual argument as a modal anchor (Hacquard, 2006) for a content-related domain projection function with defeasible normalcy conditions which is introduced by the *that*-clause via relativization (Kratzer, 2016), cf. (22).

(22) C_{ontent}(x) = {w' ∈ W: the set of worlds that are compatible with the content of x.
Undefined if x doesn't have intensional content.

Kratzer (2016) proposes the analysis in (23) for speech act verbs like *say*. In (23), the speech event produces an argument which acts as a modal anchor for the content function in (22) relating it to the speech content.
In (24), this analysis is carried over. The product of a speech act is received, i.e. heard, by Margaret and related to the worlds in which Mary killed the king via a content function.

(23) a. Margaret [says that Mary killed the king].
b. λeλw ∃x [say(x)(e) & e ≤ w & ∀w'(w' ∈ Content(x) → killed-theking(Mary)(w'))]

(24) a. Margaret [heard that Mary killed the king].
b. λeλw∃x[hear(x)(e) & e ≤ w & ∀w'(w' ∈ Content(x) → killed-theking(Mary)(w'))]

In (24) above, the modal anchor is not overtly realized. The overt realization of the internal argument of *hear* by *daran* in (9b) prevents a reportative interpretation. In this case, the *that*-clause does not express the content of a report but a conclusion along the lines of (16).

3.3 Presuppositions

One component has been ignored so far. As (25) shows, *see* with a *that*-clause yields factive presuppositions, as it is also commonly assumed for *know*.

(25) *Context: Heidi saw a wet street. It didn't rain.*
#Heidi saw that it rained.

The same is true for other perception predicates, but only in their inferential readings. Thus, the two readings of *hear* with a *that*-clause do not only differ with respect to the type of information source they rely on, i.e. inference or report, but also with respect to whether the information expressed by the that-clause is regarded factual or not, cf. (26).

(26) a. *Context: Heidi heard the door open downstairs and thought it was her father. But it was her mother.*
#Heidi heard her father come home.
b. *Context: Someone told Heidi that her friend Peter was a spy. But he wasn't.*
Heidi heard that Peter was a spy.

While reportative readings may involve a factive presupposition in some contexts, inferential readings always yield a factive presupposition.
Hence, we have to update the general template given in (21) to a partial function which presupposes the proposition p expressed by the *that*-clause such that p is true in w and in w'.

(27) $\lambda Q \lambda p \lambda x \lambda e \lambda w$: p(w) . $\exists y$ [Q(y)(x)(e) & $\forall w'$ [w' $\in$ $I_{inference}$(y)(x)(w) $\rightarrow$ p(w')]]

4 Open issues in syntax and composition

For her analysis, Kratzer (2016) draws on the assumption that *that*-clauses are actually relative clauses (Kayne, 2008; for the diachronic development out of relative clauses in German Axel-Tober, 2009) and assumes that mood provides a relative modal anchor with a free variable ranging over domain projection functions. This assumption would also hold for the reportative analysis in section 3.2 and make its compositional derivation the same as for other cases like speech act verbs, belief predicates or noun phrases like *the rumour that*….
However, this is not possible for the inferential readings, since the inferential function is designed to not only take the perceived object as an argument, but also the perceiving subject. Even if this were to be neglected, and the difference with respect to the factive presupposition attributed to different domain projection functions, e.g. $f_{act}(x)$ vs. $c_{content}(x)$ (Kratzer, 2016), the presence of the *an*-phrase and its relation to the difference between inferential and reportative readings would still have to be explained. The main problem is the way the template in (27) is introduced into composition. One way of dealing with this would be to assume a productive derivation process built on a silent suffix with the meaning of the template in (27). Other possibilities, which may be more elegant, will have to be explored with respect to the available options in different frameworks.

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