

Perception verbs and finite complement clauses

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

Keywords perception verb · clausal complement · epistemicity · evidentiality

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1 Introduction

In many languages, perception verbs (henceforth PVs) can take various kinds of complements resulting in often nuanced semantic differences. In (1), this is illustrated for German with a bare infinitive (henceforth BI) and a finite complement clause (henceforth FC).

- (1) a. *Margarete sah / hörte Marie den König töten.*
 ‘Margaret saw / heard Mary kill the king.’
 b. *Margarete sah, dass Marie den König tötete.*
 ‘Margaret saw that Mary killed the king.’
 c. *Margarete hörte, dass Marie den König tötete.*
 ‘Margaret heard that Mary killed the king.’

If the sentences in (1) are interpreted differently, how do the different kinds of perception relate to each other? Do FCs trigger a different kind of perception, one where the PV is interpreted in a metaphorical manner, as in the English phrase *I see*, which is used to convey *I understand*, the phrase *I hear you*, or Goethe’s famous dictum *Die Botschaft hör ich wohl* ‘’Tis true, I hear the message’?

While sentences like (1a) have sparked much interested in event and situation semantics where they have played an important role, this paper

focuses on the intricacies of sentences like (1b) and (1c): even though both are syntactically similar, (1c) with *hören* in German or *hear* in English can receive a slightly different reading, one where Margaret has heard a rumor.

The paper draws upon the observation illustrated in (2): in German, PVs with a FC can be accompanied by *an*-PPs.

- (2) *Margarete sieht an dem blutigen Messer, dass Maria
Margaret sees at the-DAT bloody-DAT knife-DAT that Mary
den König umgebracht hat.
the-ACC king-ACC killed has*
'Margaret sees from the bloody knife that Mary killed the king.'

The main questions of this paper are: How can the different readings in (1a) and (1b) be captured in formal semantic analyses? And how do these relate to PVs with a nominal complement as in *I see a cat* or with a bare infinitive as in (1a) above, both of which receive a purely visual reading, but would not be compatible with an *an*-PP in German?

There are basically two options. In the first option, perception is the same for (1a) and (1b), but the latter expresses additional meaning beyond perception. In the second, the act of seeing in (1a) is different from the act of seeing in (1b) because perception differs for objects of different ontological types and seeing a cat is different from seeing a proposition or fact.

The aims of this paper are to argue for the first option for (1b) as well as for the necessity of assuming a different one which is closer to the second option for the most prominent interpretation of (1c), which is one based on hearsay. Furthermore, the present paper aims at presenting further data that analyses of these phenomena need to deal with and to present an analysis for each option on the basis of the data discussed.

This paper is organized in two main sections, together with this introduction and a conclusion. In the first main section, §2, I will lay out the differences between sentences like (1a) and (1b) and the challenges that these different semantic and syntactic restrictions pose to any analysis. They encompass selectional restrictions for predicate type and tense, epistemicity, evidentiality, the abovementioned *an*-PPs, and presupposi-

tions. In the second main section, §3, I will use this data to discuss the problems for previous semantic analyses and propose two separate analyses for the inferential and hearsay interpretations of (1b) and (1c), respectively. They are then compared to each other and discussed with respect to their differences. I will use English examples to illustrate more general points that apply to English and German alike and German examples if the point made might only apply to German.

2 Differences

2.1 Selectional restrictions

Perception verbs with bare infinitives allow only for events and Davidsonian states (Maienborn 2005), but not for statives like in (3).

- (3) a. I see her come.
 b. *I see her know Margaret.
 c. *I see her have red hair.

Perception verbs with *that*-clauses underly no such restrictions, as can be seen in (4).

- (4) a. I see that she is coming.
 b. I see that she knows Margaret.
 c. I see that she has red hair.

Furthermore, bare infinitives have to be co-temporal with the matrix event, which is illustrated in (5), while *that*-clauses can have any tense, as in (6).

- (5) a. I see her go on vacation.
 b. *I see her have gone on vacation.
 c. *I see her will go on vacation.
- (6) a. I see that she goes on vacation.
 b. I see that she has gone on vacation.
 c. I see that she will go on vacation.

2.2 Epistemic load

Perception verbs with finite *that*-clauses carry a certain epistemic load, while perception verbs with bare infinitives are epistemically neutral (Bayer

1986; Hintikka 1969b; Kratzer 2017; Maienborn 2011). In the following example adapted from Maienborn (2011), it is conceivable for (7a) and (7b) that Anna perceived the event of rose cutting and the speaker knows the rose cutting agent to be Heidi, but Anna did not recognize her or maybe does not even know her. However, the sentence in (7c) is only felicitous if Anna recognized Heidi, which is why the part in parentheses cannot be added.

- (7) a. Anna saw Heidi cut the roses.
 b. Anna saw Heidi cut the roses, but she didn't recognize it was Heidi who cut the roses.
 c. Anna saw that Heidi was cutting the roses (#but she didn't recognize that it was Heidi who was cutting the roses).

(Adapted from Maienborn 2011: 808, (11))

This epistemic effect, which requires the subject of the PV to fully recognize the content of the FC, also renders the inference in (9) invalid, whereas the inference in (8) is valid (Kratzer 2017).

- (8) *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.

- (9) *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.

(Taken from Kratzer 2017: (3) and (4))

Only in the case of FCs does the perceiver necessarily know what he is perceiving and the descriptions attributed to the event and to the individual participants in the *that*-clause match the perceiver's epistemic state. In the case of BIs, however, they do not necessarily match the perceiver's

epistemic state.

Hence, the conclusion in (8) is valid because it does not make a statement about whether Beryl knew the white powder to be the most deadly poison. In contrast, the invalid conclusion in (9) entails that Beryl knew about the poison, which is not given by the premises.

2.3 Types of evidence

Crosslinguistically, many languages around the world employ grammatical markers for the category *evidentiality*, marking the evidential grounds the speaker has for asserting a main proposition. Regarding the types of evidential grounds, a central distinction can be made 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).

PVs with a BI refer to direct perception or evidence, as in (10), while PVs with a FC can usually refer to indirect knowledge or evidence, as in (11) and (12) (Aikhenvald 2007; Kratzer 2017), but they can also be based on a direct perception context. In the contexts given in (11) and (12), Margaret has not witnessed the event of Mary killing the king directly. In (11) she draws an inference and in (12) she has been told so.¹ In both contexts the BI is not acceptable.

(10) *Direct perception context*

Margaret, Mary, and a king were present. Mary killed the king and Margaret saw / heard the event.

- a. Margaret saw / heard Mary kill the king.
- b. Margaret saw / heard that Mary killed the king.

(11) *Inference context*

- a. Margaret knew that Mary wanted to kill the king and saw a bloody knife.

¹As indicated above, the reportative interpretation is much more prominent for *hear* as well as for German *hören*. As a reviewer emphasizes, the inferential is very rare and would have to be forced by context. It is important at this point, however, to acknowledge that these readings exist and that *see* and *hear* as well as their counterparts in German do not completely split into inferential and reportative readings, respectively.

Margaret saw that Mary killed the king.

#Margaret saw Mary kill the king.

- b. Margaret knew that Mary went out to kill the king and heard a loud scream from the king as he fell down from the castle wall.

Margaret heard that Mary killed the king.

#Margaret heard Mary kill the king.

(12) *Report context*

Someone told Margaret that Mary killed the king.

- a. Margaret heard that Mary killed the king.

- b. #Margaret heard Mary kill the king.

2.4 Prepositional *an*-phrases

In German, PVs with a FC can be accompanied by a prepositional *an*-phrase that indicates the source of the inference, as in (13).² While *hören* with a FC often receives a reportative interpretation, the presence of such an *an*-phrase forces an inferential reading, as in (14).³

- (13) a. *An dem blutigen Messer sah Margarete, dass*

at the-DAT bloody-DAT knife[DAT] saw Margaret that

Maria den König umgebracht hat.

Mary the-ACC king[ACC] killed has

‘Margaret sees from the bloody knife that Mary killed the king.’

- b. *An dem Geräusch hörte Margarete, dass Maria den*
at the-DAT sound[DAT] heard Margaret that Mary the-ACC

König umgebracht hat.

king[ACC] killed has

‘Margaret heard from the sound that Mary killed the king.’

²They are already attested as indicators of inference in Old High German (Axel-Tober & Müller 2017; Müller 2019).

³The word *daran* (see (14)) is a contracted PP headed by *an* with the literal meaning ‘at it’ or ‘at that’.

- (14) a. *Es gab einen Schrei. Daran hörte Margarete, dass*
 it give.PST a scream there.at heard Margaret that
Marie den König getötet hat.
 Mary the-ACC king[ACC] killed has
 ‘There was a scream. From that Margaret heard that Mary killed the king.’
- b. *Margarete sprach mit Marion. #Daran hörte Margarete,*
 Margaret talk.PST with Marion there.at heard Margaret
dass Marie den König getötet hat.
 that Mary the-ACC king[ACC] killed has
 ‘Margaret talked to Marion. From that Margaret heard that Mary killed the king.’

In this use, *an*-phrases are possible with all kinds of perception predicates with *dass*-clauses in German, e.g. *sichtbar / hörbar / spürbar, dass* ‘visible / audible / sensible that’, but neither with nouns or BIs in a direct perception reading, as seen in (15), nor with belief predicates, as seen in (16).

- (15) a. **Daran sehe ich eine Katze.*
 there.at see I a-ACC cat[ACC]
 ‘From that I see a cat.’
- b. **Daran sehe ich dich kommen.*
 there.at see I you.ACC come-INF
 ‘From that I see you come.’
- (16) **An dem Messer glaube ich, dass ...*
 at the-DAT knife[DAT] believe I that
 ‘From the bloody knife I believe that ...’

However, there is a certain type of noun that can be accompanied by an *an*-phrase and that is the trope denoting type. In these cases, we observe the same kind of inferential reading – as opposed to an extensional reading as in *Ich sehe eine Katze* ‘I see a cat’ – that we observe with FCs. Accordingly, the content of the noun can be rephrased as a FC, as illustrated

in (17b).^{4,5}

- (17) a. *An seinem Gesichtsausdruck sah sie seine Schuld.*
 at his expression see.PST she his guilt
 'From his expression, she saw his guilt'
- b. *An seinem Gesichtsausdruck sah sie, dass er schuldig war.*
 at his expression see.PST she that he guilty
 was
 'From his expression, she saw that he was guilty.'

In contrast to pure perception predicates like *sehen* 'see' and *sichtbar* 'visible', *erkennen* 'recognize' and its corresponding modal adjective *erkennbar* generally allow for an *an*-phrase together with a nominal complement, as in (18).

- (18) *Daran erkennt / *sieht man einen Betrüger.*
 there.at recognize see one a fraud
 'Thereby you recognize / *see a con man.'

Yet, *erkennen* cannot take a BI as its complement:

- (19) **Ich erkenne dich kommen.*
 I recognize you.ACC come-INF
 'I recognize you come.'

In the translations above, the most literal counterpart *at* 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.⁶ However, there are differences. In contrast to German *an*, English

⁴The English part of the example in (17) was pointed out to me by a reviewer. It works slightly worse in German, but I think well enough to illustrate the point.

⁵Again, this construction and reading is already attested in Old High German (Axel-Tober & Müller 2017; Müller 2019).

⁶A native speaker suggested this; however, another native speaker did not agree. Another possible candidate is the English preposition *by*, which was also used with *recognize* above. A first enquiry has not found it to be substantially better than *from*, though. This is corroborated by a query a reviewer made in the Corpus of Contemporary Ameri-

from is also compatible with pure predicates of inference like *conclude* or *infer*, as in (20), and even more so than with perception predicates. In German, (*dar*)*aus* has to be used with such predicates. So, while English *from* seems to generally indicate a source of knowledge with any knowledge predicate, German *an* is restricted specifically to perception predicates.

- (20) a. From that I conclude / infer that ...
 b. **Daran*(/*Daraus*) *schlieÙe* / *schlussfolgere* / *inferiere* ich ...

For French, a possible candidate is the preposition *à*, as in (21).

- (21) a. *J'ai vu à son air qu'il était fâché.*
 I-have seen at his appearance that-he was angry
 'I have seen from his appearance that he was angry'
 b. *J'ai vu au couteau sanglant que Marie avait tué le roi.*
 I-have seen at.the knife bloody that Mary had killed
 the king
 'I saw from the bloody knife that Mary killed the king.'

While more data from other languages is still to be collected, this shows at least for German that the *an*-phrase is tied specifically to PVs in an inferential reading with a FC or a trope denoting noun or certain predicates like *erkennen* 'recognize'. Such predicates are sometimes treated as perception predicates (e.g. Rau 2011). However, they have a similar inferential meaning already incorporated in a way that makes it available for nominal complements without restrictions regarding their semantic type, but prohibits BI complements.

2.5 Entailments and presuppositions

The complements of PVs are usually entailed such that *I see a cat* entails the existence of a cat and *I see someone come* entails an event of someone coming. Regarding FCs, the truth of the complement of *see* is entailed, but the truth of the complement of *hear* often is not. It might be tempting to attribute this difference to a different reliability of the senses such that visual perception is more reliable than auditory perception. However, this

can English (= COCA), who found five examples for *from*, but only one for *by*.

difference is not due to sensory type but actually due to evidence type, as is shown in the following examples. The example in (22) shows that one cannot say that someone saw that it rained if one knows that it did not rain, even if the subject of the main clause believes that it rained and has reasonable grounds for assuming so. The same holds for *hear* in (23a) with an inferential reading. Only in the reportative reading in (23b) the proposition in the subclause may be known to be false.

(22) *Heidi saw a wet street. It didn't rain.*

#Heidi saw that it rained.

(23) a. *Heidi heard the door open downstairs and thought it was her father. But it was her mother.*

#Heidi heard that her father came home.

b. *Someone told Heidi that her friend Peter was a spy. But he wasn't.*

Heidi heard that Peter was a spy.

Turning to the question of presuppositions, the set of diagnostics called *family of sentences* by Chierchia & McConnell-Ginet (1990) is most established. One of these diagnostics is embedding under questions. In the following German examples, the question in (24a) does not imply that anyone actually came; however, the question in (24b) is only felicitous in a context where the speaker knows that someone did. Hence, the BI is not presupposed, whereas the FC is presupposed.⁷

(24) a. *Hast du jemanden kommen sehen?*

have-2.SG.PRS you someone come-INF seen

'Did you see anyone come?'

⁷However, one might imagine a court room situation, where a witness is questioned whether he actually *saw* that something happened, implying that if he did not see it, it might not have happened at all. Moreover, in the wake of Simons et al. (2010), the traditional notion of presupposition has come into question especially for complements of factive verbs. Tonhauser et al. (2018) report that verbs do not behave in strict accordance with the distinct categories of factive and non-factive, but factive presuppositions are subject to gradiency. Nonetheless, even in the experiments reported in Tonhauser et al. (2018), *see* is usually on the upper end of the scale. The courtroom example seems to be a special case and presuppositions to be more prone to cancelling in interrogations. In German, a non-presuppositional complement of a PV with *dass* has to be marked with the subjunctive mood.

- b. *Hast du gesehen, dass jemand gekommen ist?*
 have-2.SG.PRS you seen that someone come-PRF is
 ‘Did you see that someone came?’

3 Analyses

Most analyses have focused on the combination of perception verbs with bare infinitives, which have been widely discussed in event and situation semantics (see e.g. Barwise 1981; Barwise & Perry 1983; Higginbotham 1983; 1999; Vlach 1983). Rau (2011) provides an account for PVs with FCs which relies on a relation between two events, the SEE-event and the event described in the FC. Hintikka (1969b), on the other hand, extends his famous analysis for propositional attitudes from predicates of knowledge and belief to perception predicates.

Assuming a Davidsonian event-based account for BIs can explain the restrictions from §2.1 if we posit that not all verbs describe a Davidsonian event (Maienborn 2005; 2011) and that for a perceptual relation to hold between two individuals, there must be a temporal overlap between both. Assuming a similar account for FCs as well not only faces the problem of epistemic load described in §2.2, which might be remedied by introducing an additional epistemic function, but also needs to explain why these restrictions hold in one case but not the other.

In (25), a pure propositional attitude analysis along the lines of Hintikka (1969a;b) is shown.

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

This analysis captures the lack of restrictions for the predicate within the FC as well as the accompanying epistemicity. Since this analysis has been deemed inadequate for the bare infinitive constructions by most authors, the question arises whether there is any link between a PV with a nominal argument or a BI and the same PV with a FC.⁸ In the case of *hear / hören*, a general analysis describing a set of worlds which is compatible

⁸However, Saarinen (1983) defends a Hintikkan treatment also for BI complements.

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 together with the presence or absence of factive presuppositions.

In the following I will first elaborate on the role of the perceiving subject and the perceived object for an analysis. Based on the data discussed I will then propose an analysis for all inferential readings of PVs with a FC and explain its relationship to standard extensional uses of PVs. Finally, I will show a different analysis for the reportative readings of *hear* / *hören* by extending the analysis given by Kratzer (2016) for verbs of belief and verbs of speech.

3.1 Subjects and objects of perceptions

The perceiving subject The perceiving subject of the main clause is responsible for the conclusion described by the FC. Imagine the context in (26).

- (26) *A woman consults Holmes and Watson. Both see the same things. For instance, both see elm leaves on her boots. Both recognize they are elm leaves. Holmes knows that elms grow only on East End next to the river Thames. Watson does not know this.*
- a. Holmes saw that she was coming from East End.
 - b. #Watson saw that she was coming from East End.

Though both men see exactly the same things, only the sentence in (26a) would be acceptable in this context. In a strictly Hintikkan analysis like (25), it is not clear why the FC should not be compatible with what Watson saw. In fact, it is compatible with what both saw, but not with what both know.

This example shows that these PVs do not rely solely on the object of perception nor on general rules about the world, but they also interact with the previous knowledge of the attitude holder about the world. Only Holmes knows that the elm leaves grow on East End, so only he knows them to be evidence for the embedded statement. Furthermore, what can be evidence for someone for a certain conclusion varies across worlds, since there would be possible worlds in which elms do not grow on East

End, as well as possible worlds in which they do but Holmes does not know about it.

The perceived object The perceived object of the inferential readings is not an intensional object itself. In reportative readings, *hören* can take a noun like *Gerücht* ‘rumor’ as a complement. For inferential readings of *sehen* or *hören*, nouns meaning ‘fact’ or ‘conclusion’ cannot act as a complement of the PV. However, English *see* behaves differently. In English, *fact* is a perfectly adequate nominal complement.⁹

- (27) a. *Heidi hörte das Gerücht, dass ...*
 Heidi hear-PST the rumor that
 ‘Heidi heard the rumor that ...’
- b. **Heidi sah die Tatsache / Schlussfolgerung, dass ...*
 Heidi see.PST the fact conclusion that
 ‘Heidi saw the fact / *conclusion that ...’

While the previous paragraph might suggest that the FC describes the content of a conclusion made by the subject of the main clause, this conclusion does not seem to be present as an individual argument in German or, at least, it does not act directly as the internal argument of the perception predicate.

Furthermore, the perceived object is not necessarily described by any part of the FC. It is, however, necessarily described by the *an*-phrase. This is illustrated in (28) and (29). Out of (29a-e), only (29e) would always be a false statement in the context.

⁹I am indebted to a reviewer who made me aware of this fact. In fact, he found that *fact* is the third most frequent noun returned by the query *[see] the [n*] that* in the COCA. In the German Reference Corpus (= DeReKo), there was only one example of this type, which is part of a speech by Angela Merkel. In German, the combination of *sehen* and *Tatsache* only occurs within constructions that are usually considered small clauses but are different from BIs in German, e.g. *Ich sehe die Sache nicht so dramatisch*. ‘I don’t see the matter as dramatic.’

- (28) *You know that every time Hannah is working, Anna hangs out a red ribbon for her lover.*
An dem roten Band sehe ich, dass Hannah arbeitet.
 at the-DAT red-DAT ribbon.[DAT] see I that Hannah works
 ‘I see (/ know) from the red ribbon that Hannah is working.’
- (29) a. I don’t see Hannah work.
 b. I don’t see anyone work.
 c. I don’t see Hannah.
 d. I don’t see anyone.
 e. #I don’t see a red ribbon.

This shows that at least in German, inferential readings of PVs with a FC still involve regular perception, only what is perceived is not expressed in the FC, but can be expressed optionally with the German *an*-phrase.

3.2 Inferential readings

In the spirit of event semantics, I presuppose that standard readings of PVs with noun phrases or BIs involve an extensional relation between three individuals, the perception event, the perceiving subject and the perceived object, which may be another event.¹⁰ What is its relationship to the inferential readings of a PV with a FC?

As shown above, the perceiving subject is necessarily the one who draws the conclusion described by the FC. It was also argued for German that this construction still involves an act of actual sensory perception, only that the object which is perceived in this act is independent of the FC, but can be overtly realized. We can thus conclude that an analysis of the inferential readings in German needs to include a standard perception predicate as described above and an additional part which introduces a conclusion and relates it to the perception event. This part is provided in (30) as a function from a piece of evidence, an attitude holder, and a world of evaluation to a set of worlds.

- (30) $I_{inference}(y)(x)(w) = \{w' \in W : w' \text{ is compatible with the conclusions } x \text{ draws (wrt. to } x\text{'s knowledge in } w) \text{ from } y \text{ in } w\}$

¹⁰Since this is not the focus of this paper, I will leave the discussion aside. The interested reader is referred to the articles mentioned above.

This inferential function is not supposed to replace a standard perception predicate, but to augment it. I assume a predicate SEE_1 for standard readings of *sehen* with noun phrases and BIs which encodes an extensional eventive relation between a perceiving subject and a perceived object. It shares two arguments with the inferential function such that the perceived object functions as a piece of evidence from which a conclusion can be drawn in a world and the perceiving subject is the attitude holder to draw the conclusion from it. The presupposition is rendered by a partial function which requires the embedded proposition to be true not only in all worlds w' of the inferential function, but also in w . The complete analysis for *sehen* with a FC can be seen in (31):

$$(31) \quad \lambda p \lambda x \lambda e \lambda w : p(w). \exists y [SEE_1(y)(x)(e)(w) \wedge \forall w' [w' \in I_{inference}(y)(x)(w) \rightarrow p(w')]]$$

Returning to our initial problems posed by the differences described in §2, the presupposition and the evidence type is wired directly into the analysis. The valid and invalid conclusions of (8) and (9), respectively, can be explained as well. Given the extensional analysis for PVs with a BI we expect premises and conclusions to be evaluated with respect to the same parameters. So, if x sees an event involving an individual z in w in the first premise and the same individual z is poison in w in the second premise, we can conclude that x sees an event involving z and z is poison in w , given that x and z are assigned the same values.¹¹ For PVs with a FC, however, the inferential function in the conclusion would require an individual z to be poison not only in w as given by the second premise but in w' as well, the epistemic world of the perceiver, which is not given by the premises. The selectional restrictions exemplified in §2.1 can be explained by the assumptions that stative predicates like *know* or *have red hair* do not provide a Davidsonian event argument for the perception predicate (Maienborn 2005; 2011). Though we maintain the same perception predicate as a part of our analysis for the inferential interpretation, the same restrictions

¹¹For the sake of simplicity, I neglect the assignment function in my examples. Dynamic semantics would be another possibility to achieve this. In any case, it is obvious that the conclusion can only hold if the white powder in the first premise is the same as in the second premise.

do not hold, since it does not require the perceived object to be the event or any individual of the embedded clause.

In the following examples (32)–(35), I spell out the analyses for *sehen* with a noun phrase, a BI, a FC, and a FC with an additional *an*-phrase (where tense is neglected).¹²

- (32) a. *Margarete sah einen Marder.*
 ‘Margaret saw a marten.’
 b. $\lambda w \exists e \exists y [\text{SEE}_1(y)(\text{Mrgt})(e)(w) \wedge \text{marten}(y)(w)]$
- (33) a. *Margarete sah Marie den König töten.*
 ‘Margaret saw Mary kill the king.’
 b. $\lambda w \exists e \exists e' [\text{SEE}_1(e')(\text{Mrgt})(e)(w) \wedge \text{kill-the king}(\text{Mary})(e')(w)]$
- (34) a. *Margarete sah, dass Marie den König getötet hatte.*
 ‘Margaret saw that Mary had killed the king.’
 b. $\lambda w : \exists e' [\text{killed-the king}(\text{Mary})(e')(w)].$
 $\exists e \exists y [\text{SEE}_1(y)(\text{Mrgt})(e)(w) \wedge$
 $\forall w' [w' \in \text{Inference}(y)(\text{Mrgt})(w) \rightarrow$
 $\exists e'' [\text{killed-the king}(\text{Mary})(e'')(w')]]]$
- (35) a. *An einem blutigen Messer sah Margarete, dass Marie den König getötet hatte.*
 ‘From a bloody knife Margaret saw that Mary had killed the king.’
 b. $\lambda w : \exists e' [\text{killed-the king}(\text{Mary})(e')(w)].$
 $\exists e \exists y [\text{SEE}_1(y)(\text{Mrgt})(e)(w) \wedge \text{bloody}(y)(w) \wedge \text{knife}(y)(w) \wedge$
 $\forall w' [w' \in \text{Inference}(y)(\text{Mrgt})(w) \rightarrow$
 $\exists e'' [\text{killed-the king}(\text{Mary})(e'')(w')]]]$

One of the main benefits from such an analysis for the inferential construction is that its relationship to the other reading becomes perspicuous. It is not necessary to involve metaphoric mechanisms to change what seeing means in this context or to resort to fact perception as a different kind of perception. In contrast, the perception part stands unaltered but is related to an epistemic part by sharing arguments.

¹²In (34) and (35), e' in world w has to be counterpart-identical with e'' in world w' . I ignore this issue in these analyses.

3.3 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.

Relativization, modal anchors and content functions Generally, *that*-clauses occur as complements for a variety of verbs, e.g. verbs of speech, thought, and belief. However, *that*-clauses can also complement or modify nouns like *idea*, *possibility*, or *thought*, denoting their content. As a consequence, we can associate propositional content with informational objects, i.e. objects like ideas, stories or rumors. Such informational objects may be modeled by taking an individual argument as a modal anchor (Hacquard 2006). Modal functions can project sets of possible worlds from such a modal anchor, i.e. from an individual argument. Kratzer (2016) argues that the contribution of mood is the introduction of a free variable ranging over domain projection functions, as in (36).

$$(36) \quad \llbracket \text{Mood} \rrbracket = \lambda p \lambda x \forall w' [w' \in f(x) \rightarrow p(w')] \quad (\text{Kratzer 2016})$$

One possible assignment for $f(x)$ in (36) is a content-related domain projection function with defeasible normalcy conditions which can be introduced by the *that*-clause via relativization relating x to an individual in the main clause, as in (37) (Kratzer 2016).

$$(37) \quad \lambda x.C_{\text{content}}(x) = \{w' \in W : w' \text{ is a world that is compatible with the content of } x \}$$

Undefined if x doesn't have intensional content (Kratzer 2016)

In (38), this is exemplified with a noun phrase.

$$(38) \quad \text{a. the [rumor that Ortcutt is a spy]}$$

$$\text{b. } \lambda x \lambda w [\text{rumor}(x)(w) \wedge \forall w' [w' \in C_{\text{content}}(x) \rightarrow \text{spy}(\text{Ortcutt})(w')]]$$

(Adapted from Kratzer 2016)

Syntactically, it has been argued that what were previously considered to be sentential complements actually involve relative structures (Arsenijevic 2009; Kayne 2008; Moulton 2009; diachronically for German: Axel 2009; Axel-Tober 2017). Kratzer (2016) draws upon these ideas and proposes an

analysis like (39) for speech act verbs like *say*. In (39), the speech event produces an argument which acts as a modal anchor for the content function in (37) relating it to the speech content.

- (39) a. Margaret [says that Mary killed the king].
 b. $\lambda x \lambda e \lambda w \exists y [\text{say}(y)(x)(e)(w) \wedge \forall w' [w' \in C_{\text{content}}(y) \rightarrow \exists e' [\text{killed-the king}(\text{Mary})(e')(w')]]]$

In other words, if I say *something*, this *thing* is an informational object with a propositional content. The *that*-clause acts as a relative clause restricting its content to a specific set of worlds.

Application to reportative If verbs of saying relate to an object associated with the content of the speech act, it can be assumed that this object is received by the addressee. Hence, the analysis from (39) naturally carries over to reportative readings of *hear*. In (40) Margaret hears something which is related to the worlds in which Mary killed the king via the content function.

- (40) a. Margaret [heard that Mary killed the king].
 b. $\lambda x \lambda e \lambda w \exists y [\text{hear}(y)(x)(e)(w) \wedge \forall w' [w' \in C_{\text{content}}(y) \rightarrow \exists e' [\text{killed-the king}(\text{Mary})(e')(w')]]]$

While this analysis is intensional, it is not epistemic, since it does not relate to what Margaret knows, believes, or thinks about the world. Accordingly, there is no argument or parameter for any attitude holder present in the content function.

In §2.5, it was noted that the truth of the embedded proposition is not entailed or presupposed and no presupposition or entailment follows from this analysis. One can expect some variation in the degree to which the received information is probable or reliable. This can be explained by the fact that the informational object x in (40) is not further qualified. Pragmatic enrichment may lead to different specifications of x . If x is taken to be a rumor as in *She heard the rumor that ...*, the associated proposition will receive more doubt than it would if x is taken to be news.

Both *news* and *rumor* are compatible among other nouns as direct objects of *hear*. In contrast, the object of perception is never realized as the direct object of an inferentially interpreted PV, as argued above, but indi-

rectly with the preposition *an* in German. Hence, when the object of perception is realized, existentially bound and described by an *an*-phrase, the listener / reader knows that it can no longer be an object associated with the *that*-clause and a reportative interpretation is excluded.

3.4 Comparison between both analyses

Two very different analyses have been proposed for a seemingly single phenomenon, i.e. PVs with finite complement clauses, one analysis for inferential and another for reportative readings. Aside from the difference in evidence type, this has been motivated by the accompanying differences in presupposition, the prepositional phrase, and the availability of abstract nouns as direct objects to which the finite complement clause would be related.

Furthermore, the two analyses extend to very different phenomena. The reportative analysis carried over from Kratzer (2016) extends to a very wide range of predicates. It also extends to specific cases of *see*, as in *Did you see the memo that ...*, but in this case, the interpretation is not much different from *Did you get the memo that ...* and analogue to *I sent out a memo that ...*. It can be viewed as a special case of the reportative interpretation and can occur with various visual objects that carry information like memos, notes, and billboards. It is not specific to PVs.

The inferential interpretation, however, is very specific. Here, the prepositional *an*-phrases from German constitute an important piece of evidence. As shown, they do not generally occur with PVs in all syntactic constructions. Neither do they generally occur with verbs with clausal complements. And they do not generally occur with PVs with clausal complements, which is evident from the reportative constructions. They appear with PVs with clausal complements with an inferential reading. This indicates that something must have changed for the PV which is particular to this exact combination. What has changed is that additional meaning components have been introduced.

So far, an extensional core of visual perception could be upheld, while the intensionality carried by the FC was integrated by introducing additional meaning components. However, since – as argued – the *an*-phrase relates to the actual object of perception, in contrast to the FC, it has to be noted that this prepositional phrase can relate to a propositional ob-

ject as well. This can be achieved by embedding a second FC under the preposition with an integrated pronominal, as in (41).

- (41) *Daran, dass die Aktienkurse gestiegen sind, sehe ich, dass es*
 there.at that the stock.prices risen AUX see I that it
dem Konzern gut geht.
 the corporation well goes
 ‘From the fact that stock prices went up I can tell that the corpora-
 tion is doing well.’

Examples like this one can be analyzed by combining both analyses. The first *dass*-clause in (41), however, does not relate content to an information bearing object, rather it refers to a fact. Remember that according to Kratzer (2016) mood introduces a free variable for domain projection functions and $C_{content}(x)$ is only one possible assignment. Kratzer (2016) also argues for a factual domain projection $f_{act}(x)$ mapping x onto a set of possible worlds which have a counterpart of x . One argument for not employing the same analysis for both *dass*-clauses in (41) is given in (42): the noun *Tatsache* cannot act as the direct object of *sehen* in (42a), but it can be the complement of *an* in (42b).

- (42) a. **Ich sehe die Tatsache, dass ...*
 I see the fact that
 ‘I see the fact that ...’
 b. *An der Tatsache, dass ..., sieht man (*die Tatsache), dass ...*
 at the fact that see one the fact that
 ‘From the fact that ... you can tell that ...’

Using these tools, we can analyze (41) as in (43).¹³

- (43) $\lambda w : \exists e_1 [\text{do-well}(\text{the-corp})(e_1)(w)]. \exists e \exists y [\text{PERCEIVE}(y)(\text{ego})(e)(w) \wedge$
 $\forall w' [w' \in f_{act}(y) \rightarrow \exists e' [\text{go-up}(\text{stock-prices})(e')(w')]] \wedge$
 $\forall w'' [w'' \in I_{inference}(y)(\text{ego})(w) \rightarrow \exists e'' [\text{do-well}(\text{the-corp})(e'')(w'')]]]$

¹³Though this is not entirely satisfying, only the presupposition of the second *dass*-clause is modeled as a partial function because the function f_{act} is supposed to yield the factivity of the first one.

Note that in this case a more general predicate PERCEIVE is employed instead of SEE, because *sehen* may no longer refer to visual perception in this example. It is important to acknowledge, however, that this change from visual perception in a literal sense to a more general, metaphorical kind of perception is not triggered by *sehen* taking a FC, but by *an* taking a FC. In German, the non-metaphoric restriction for *sehen* is not absolute, but quite strong. Consequently, *sehen* with a FC usually involves actual visual perception.

In English, however, this is different. Beside the fact that English *see* can take *the fact that ...* as a complement, there are cases like *I see, I can see that*, or *I see your point*, where no visual perception need be involved at all. Does this mean that the proposed analysis for inferential readings applies only to German?

If we compare a non-visual example like (44) with an example that suggests a visual context, as in (45), there seems to be a crucial difference. In (44), the problem might be that the person addressed has never even thought about it or that they simply refuse to acknowledge the truth. The sentence does not express an inference or a conclusion but rather an insight and an awareness. One might offer certain situations as evidence for the change, but the problem is not that person addressed lacks the evidence, but rather that they lack the insight. The example in (45), on the other hand, would be adequate in a situation where the person addressed is already looking around and they are asked to keep looking. In this situation, it seems odd to insert *the fact* before the FC.

(44) You still can't see the fact that you have changed.

(45) You still can't see that I have cleaned the kitchen.

This suggests that, though English behaves differently in some respects, the proposed analysis for inferential interpretations in German applies to English as well. But since English has a broader variety of metaphorical, non-sensory readings for PVs without a FC, it does so for PVs with a FC as well and these might often be the preferred readings. Depending on the particular example, a more adequate analysis could be achieved by replacing the visual predicate SEE with a cognitive one in the inferential analysis or by taking the structure of the reportative analysis but employing a fact

projection function rather instead of the content projection function and adjusting the visual predicate for metaphorical processes.

4 Conclusion

In this paper, two different semantic analyses of perception verbs with finite complement clauses have been proposed, one for inferential readings and one for reportative readings. While the former are mostly present with *sehen / see* and the latter mostly with *hören / hear*, both readings are generally available for both verbs. In case of *see*, the reportative reading arises in contexts where the subject has read the information somewhere. The reportative analysis extends the analysis by Kratzer (2016) for verbs of speech, where a function projected from a modal anchor maps intensional content onto an information bearing individual.

It has been argued that this analysis cannot be carried over to inferential readings. Instead, I have proposed an analysis where a basic perception predicate may stay unaltered and is augmented by an inferential function from evidence, an attitude holder, and a world of evaluation to a conclusion. Both parts, the perception predicate and the inferential function relate to each other by sharing their arguments. The perceived object acts as evidence from which a conclusion can be drawn and the perceiving subject is the one drawing the conclusion. That is, you do not see a fact, but you see something and draw a factual conclusion from this object. By augmenting the perception predicate, a common core can be upheld and the relationship between readings with nominal complements and readings with finite complements becomes transparent.

The paper has also argued that only perception predicates and only inferential readings of these can be accompanied by a PP introduced by the preposition *an* in German. It is clear that something must have changed for perception verbs with finite complements. The question arises how these additional meaning components are introduced and how the change in valency is achieved. One option is to assume a silent derivational morpheme augmenting its meaning with the inferential function, changing its syntactic and semantic argument structure. Other verbs like *erkennen* ‘recognize’ have already incorporated this part and can exhibit intensionality with nouns as well, but cannot take BI complements. At this point, however, I must leave this issue to further research.

There are more syntactic configurations and more interpretations than the ones considered in this paper. One of these are intensional interpretations of *see* with nominal complements. An illustration of this would be the utterance of *I see a cat* in a situation where you are describing a picture by Piet Mondrian or where you are performing a Rorschach test. In these cases, the *an*-phrase is not available, which separates this phenomenon from the ones discussed.

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