An anti-intellectualist treatment of German wissen (‘know’)¹
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Abstract. German wissen (‘know’) can embed both finite clauses (‘wissen-FIN’) as well as infinitives (‘wissen-INF’). Based on novel empirical observations, we argue that wissen-INF cannot be reduced to the standard analysis of wissen-FIN, i.e. that wissen with infinitival complements does not involve a propositional attitude. As cross-linguistic evidence suggests that German wissen is not ambiguous, it follows that wissen-FIN cannot denote a propositional attitude, either. Accordingly, we require a new, uniform meaning for wissen. We derive this meaning by first considering wissen-INF, arguing that it combines semantic properties of ability modals with semantic properties of implicative verbs and enough to-constructions. We then show that these properties can also be used to characterize wissen-FIN, as long as certain non-standard assumptions are made about the denotation of the complement. This gives us a new, unified analysis of wissen and also helps to explain some properties of this verb (with both kinds of complements) that traditional analyses cannot account for.

Keywords: propositional attitudes, ability modals, actuality entailments

1. Introduction

Most treatments of English know and analogous expressions in other languages take its occurrence with finite declarative complements as their point of departure. Our focus here will be on German wissen (‘know’) – its finite declarative pattern is given in (1a). In these contexts, wissen (‘wissen-DECL’) seems to express a propositional attitude, i.e. a particular relation between the referent of the matrix subject and the content of the embedded clause. More specifically, following Hintikka’s 1969 treatment of attitudes, the meaning of wissen-DECL involves a bi-partition of the set of possible worlds – those worlds compatible with the subject referent’s belief about the world of evaluation on the one hand vs. all the others – and the subsequent evaluation of the proposition w.r.t. the belief-worlds – the proposition must hold in all of them. (Henceforth we simply write ‘x believes p in w’ for ‘p holds in all of x’s belief-worlds relative to w’). In addition to this, wissen-DECL is factive, i.e. it presupposes the truth of its complement (cf. Kiparsky and Kiparsky (1970)), so that we end up with the lexical entry in (1b).

(1) a. Der Frank weiß, dass der Hedde die Pommes gegessen hat. The Frank knows that the Hedde the french-fries eaten has ‘Frank knows that Hedde ate the French fries.’ wissen-DECL

b. [wissen-DECL] = λx. p(x, t), λx. p(w) = 1. x believes p in w

The core insight that wissen-DECL denotes a propositional attitude carries over to cases where wissen embeds a finite interrogative (‘wissen-INT’), as in (2a) and (2b) (cf. Karttunen (1977))

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a.o.). Essentially, an individual can be said to wissen-INT a question iff it believes all the propositions that are true answers to that question in the world of evaluation. This is captured in the (simplified) lexical entry in (2c) (where $Q(w)$ is the set of true answers in $w$).

(2)  

a. Der Frank weiß, wer die Pommes gegessen hat.  
The Frank knows who the french-fries eaten has  
‘Frank knows who ate the french fries.’ wissen-INT

b. Der Frank weiß, ob der Hedde die Pommes gegessen hat.  
The Frank knows whether the Hedde the french-fries eaten has  
‘Frank knows whether Hedde ate the french fries.’ wissen-INT

c. $[\text{wissen-INT}] = \lambda x . \lambda Q(x) \lambda x. x \in Q(w)$ in $w$

Like many other attitude verbs, wissen does not only embed finite clauses as in (1) and (2) (here generalised as ’wissen-FIN’) but also infinitives, (3). The question is, how this occurrence of wissen (’wissen-INF’) and its meaning relates to wissen-FIN and its meaning. (Note that the English paraphrase in (3) is a rough approximation and will be refined below.)

(3)  

Der Frank weiß sich zu verteidigen.  
The Frank knows REFL to defend  
‘Frank is able to defend himself.’/’Frank knows how to defend himself.’ wissen-INF

There are two general strategies to tackle this question. On the one hand, wissen could be taken to be ambiguous, i.e. the meaning of wissen-INF would be independent of that of wissen-FIN. Below, we will show that this assumption is implausible, as several genetically unrelated languages behave like German. On the other hand, we could maintain that the denotation of wissen is uniform, i.e. that wissen-INF and wissen-FIN have the same denotation. Within the latter view, we can distinguish two positions. The first one could be considered a linguistic version of what is known in the philosophical literature as the ‘intellectualist’ position. Stanley and Williamson (2001) and Stanley (2011) take such a view w.r.t. English know, which embeds both finite clauses, (4a-c) as well as $w$-infinitives, (4d): They argue that know embedding $w$-infinitives is semantically reducible to know with finite complements, i.e. that know generally denotes a propositional attitude. Applied to German, this would mean that wissen-INF reduces semantically to wissen-FIN and that wissen generally denotes a relation between the subject-referent and a proposition, mediated by the subject-referent’s epistemic state.

(4)  

a. Frank knows that Hedde ate the french fries.  
b. Frank knows who ate the french fries.  
c. Frank knows whether Hedde ate the french fries.  
d. Frank knows how to defend himself.

This paper argues that the intellectualist position is untenable for German wissen, and proposes an alternative analysis that is essentially ‘anti-intellectualist’: It maintains a uniform meaning for wissen, but denies that this meaning (by itself) ever involves a propositional attitude.

Our reasoning is roughly as follows: We first show that wissen-INF as in (3) is not reducible
to a propositional attitude but rather involves semantic properties usually connected to ability modals (cf. Thomason (2005), Bhatt (2006)) and implicative verbs (cf. Karttunen (1971) a.o.): As already noted by Rumfitt (2003) for French, (3) is similar in meaning to (5) (it is not quite identical to it, as we will see below). In addition to this, wissen-INF also displays semantic characteristics observable in enough-to constructions (cf. Meier (2003), Hacquard (2005)).

(5) Frank is able to defend himself.

Since the cross-linguistic data suggest that wissen is not ambiguous and since wissen-INF does not involve a propositional attitude, wissen-FIN cannot do so, either, hence the standard hypotheses about its meaning in (1b) and (2c), respectively, cannot be maintained. In order to arrive at a new, unified meaning of wissen, we ‘reverse-engineer’ the meaning of wissen, taking our findings from wissen-INF and transferring them to wissen-FIN. Broadly speaking, we will submit that wissen always combines with a property of individuals $P$. In the case of wissen-INF, this is straightforward, but in the case of wissen-FIN, this requires us to make non-standard assumptions about the denotations of finite embedded declaratives and interrogatives, respectively: Building on work by Kratzer (2006) and Moulton (2015), we suggest that they denote properties of individuals, namely, the property of having factual evidence for $p$ (in the case of declaratives) (or for one of the alternatives of $p$, in the case of interrogatives).

It turns out that this gives us an empirically adequate treatment of wissen-FIN and furthermore derives data that traditional theories, i.e. the lexical entries in (1b) and (2c), cannot account for.

2. Why wissen-INF is not reducible to wissen-FIN

The intellectualist position taken by Stanley and Williamson (2001), Stanley and Williamson (2001) w.r.t. know involves two core assumptions, which we here apply to German: (i) the denotation of wissen-FIN involves a propositional attitude, and (ii) the denotation of wissen-INF is reducible to that of wissen-FIN.2

The empirical motivation for this hypothesis is that – at least at first sight – sentences with wissen-INF are adequately paraphrased by means of sentences with wissen-FIN – more specifically, with wissen-INT: (6a), from (3) above, and (6b) seem to be semantically equivalent.

(6) a. Der Frank weiß [INF sich zu verteidigen].
   wissen-INF

b. Der Frank weiß, [INT wie er/man sich verteidigen kann/soll].
   The Frank knows how he/one can/should defend oneself.'
   wissen-INT

Given this apparent identity, we can specify the intellectualist hypothesis: wissen-INF has the denotation assumed for wissen-INT above: It holds of a subject-referent and a question iff that subject-referent believes every true answer to the question, (7a). Since wissen-INF is semantically equivalent to wissen-INT, its infinitive complement must also have the same denotation as that of wissen-INT, i.e. it must denote a question - as sketched for (6) in (7b).

2It should be noted that Stanley (2011) explicitly refrains from making a similar point about German.
The following will show that this intellectualist position is untenable. It predicts that both wissen-FIN and wissen-INF require their subject-referent to hold a particular belief – and nothing else (i.e. holding that particular belief is both necessary and sufficient to make the sentence true). This turns out to be descriptively adequate for wissen-FIN, but crucially not for wissen-INF: First, for a sentence of the form in (8) to be true, \( a \) is required to have properties other than believing the true answers to the hypothetical denotation of \( P \) (qua (7b)). Second, for such a sentence to be true, it is is not even required that \( a \) believes the true answers to the hypothetical denotation of \( P \). In sum, holding a propositional attitude is neither sufficient nor necessary for wissen-INF, which falsifies the intellectualist claim.

(8) \( a \) wissen-INF \( P \).

2.1. Propositional attitude not sufficient for wissen-INF

Our first point is that wissen-INF, as opposed to wissen-INT, might require ‘more’ than the subject-referent holding a certain belief. That is, according to the intellectualist hypothesis in (7) above, both sentences should be true in a world \( w \) if Frank believes all propositions in (10) – but this is not sufficient for wissen-INF.

(9) a. Der Frank weiß, wie er/man sich verteidigen kann/soll.
   The Frank knows how er/one can/should defend oneself.

(10) \{ \( p : \exists m \) is a technique \& \( p = \lambda w. \text{ one should use } m \text{ in } w \text{ for self-defence} \} \& p(w) = 1 \}

In particular, wissen-INF in (9b) requires a more ‘practical acquaintance’ with defence techniques than wissen-INT in (9a): A situation where Frank is aware of what the proper techniques of self-defence are, but has never tried to defend himself is adequately described by (9a) but not by (9b): Adding the continuation in (11) to (9a) gives us a well-formed discourse, but if we add it to (9b), the result is extremely odd.\(^3\)

(11) ??Er hat es zwar noch nie versucht, aber die Viola hat es ihm genau erklärt.
   ‘He has never tried it, but Viola explained to him in detail how it works.’

Accordingly, theoretical knowledge – believing the propositions in the complement’s presumed denotation – is sufficient for the truth of a sentence with wissen-FIN, but not for a sentence with wissen-INF. This runs contrary to the predictions of the intellectualist position.

\(^3\)Stanley and Williamson (2001) make similar observations concerning know + wh-infinitives.
2.2. Propositional attitude not necessary for wissen-INF

Our second point is that wissen-INF, as opposed to wissen-INT, does not even require the subject-referent to hold a certain belief. According to the intellectualist hypothesis, both (12a) and (12b) should be true in a world wiiff our friend believes every proposition in (13). Yet sentences with wissen-INF can be adequate descriptions of situations where the subject-referent holds no such belief: In (12), the context specifies that our friend is agnostic about drinking techniques. Whereas (12a) is very odd, in this context, to say the least, (12b) is perfectly fine. Again, this runs contrary to the predictions of the intellectualist position.

(12) Ich habe unseren neuen Freund aus Pennsylvania mit auf’s Feuerwehrfest genommen. Es war unglaublich – er hatte noch nie von Alkohol gehört aber ich kann Dir sagen:’

‘I took our new friend from Pennsylvania with us to the party of the local fire department. It was unbelievable – he had never even heard of alcohol, but I can tell you:

a. ??Der Mann weiß, wie er/man trinken kann/soll.

This man knows how he/one drink can/should

‘This man knows how he/one can/should drink.’ wissen-FIN

b. Der Mann weiß zu trinken.

The man knows to drink wissen-INF

(13) \{ p : \exists m | m \text{ is a technique } \& p = \lambda w. \text{ one should use } m \text{ in } w \text{ for drinking}| p(w) = 1 \} \\

The following data provide even stronger evidence for the same point: wissen-FIN does not license inanimate subjects, as illustrated by (14a) and (15a). If wissen-FIN involves a propositional attitude, the reason is obvious: Inanimate individuals cannot entertain beliefs. However, wissen-INF may combine with inanimate subjects, as witnessed by (14b) and (15b).

(14) a. #Ihre Stimme weiß, wie man das Publikum fesseln kann/soll.

Her voice knows how one the audience enthral can/should

‘Her voice knows how one can/should enthral the audience.’ wissen-FIN

b. Ihre Stimme weiß das Publikum zu fesseln

Her voice knows the audience to enthral

‘Her voice is able to enthral the audience.’ wissen-INF

(15) a. #Dieses Produkt weiß, wie man Leute überzeugen kann/soll.

This product knows how one people convince can/should

‘# This product knows how can can/should convince people.’ wissen-FIN

b. Dieses Produkt weiß zu überzeugen.

This product knows to convince

‘This product is able to convince people / is convincing’ wissen-INF

Accordingly, whereas wissen-FIN requires its subject-referent to entertain beliefs, wissen-INF does not, which shows that the meaning of wissen-INF cannot involve a propositional attitude.\footnote{One could object that (14b) and (15b) involve coercion (of the subject or the verb). However, this begs the question why, if wissen-INF and wissen-INT are semantically identical, coercion is only easily available for \footnote{\textsuperscript{4}}}
2.3. Interim summary

The previous paragraphs have shown that wissen-INF is not reducible to the meaning traditionally assigned to wissen-FIN: Attributing a propositional attitude to the subject-referent is neither sufficient nor necessary for a sentence with wissen-INF to be true. We are left with two questions: First, what is the meaning of wissen-INF? And second, does it bear any relation to the meaning of wissen-FIN? The next section addresses the first question.

3. wissen-INF: ability and quality

At first sight, ability modals, such as English able and German können (‘can, be able’) and in der Lage sein (‘be able’) provide an adequate paraphrase for wissen-INF (cf. Rumfitt (2003) for French). Our example from (3) above, repeated in (16a), and the modal sentences in (16b) more or less convey the same meaning. The same holds for (17a) with an inanimate subject, repeated from (14b) above: It is roughly identical in meaning to the sentences in (17b).

(16) a. Der Frank weiß sich zu verteidigen.
   b. Der Frank ist in der Lage zu / kann tanzen.
      The Frank MOD to / MOD dance.
      ‘Frank is able to dance.’

(17) a. Ihre Stimme weiß das Publikum zu fesseln.
   b. Ihre Stimme ist in der Lage / kann das Publikum (zu) fesseln.
      Her voice MOD / MOD the audience (to) enthrall.
      ‘Her voice is able to enthrall the audience.’

So, does wissen-INF have the same denotation as an ability modal? This hypothesis would not only be attractive in terms of its simplicity, but also because it would provide an obvious explanation for the data discussed in section 2.2, including the facts about inanimate subjects: ability modals don’t impose any requirements on the sentence’s subject-referent in terms of intentionality (but cf. Kratzer (1981) for more discussion).

We will show that the situation is slightly more complex. wissen-INF does indeed share several semantic traits with ability modals (in particular, with the English be able, Bhatt (2006) and Hacquard (2006, 2010, ta)): So-called actuality entailments and what we here call ‘P-event-initiation’, namely, that the subject-referent causes an event that is intended to be an event of the kind specified by the complement (the latter is henceforth referred to as ‘P’). However, it also exhibits two meaning components that ability modals arguably lack: A ‘quality-threshold’, namely, the requirement that the subject-referent be good at P and the condition that it must be compatible with the facts of the evaluation world that some individual is P.

wissen-INF. It also doesn’t explain cross-linguistic differences in the infinitival patterns (see below).
3.1. Actuality entailments

As observed by Bhatt (2006) and Hacquard (2014) for English and French, ability modals with an episodic past / perfective aspect come with actuality entailments, i.e., from the truth of ‘x abil-modal P’ at some point in the past it can be concluded that ‘x P’ is true at that point in the past. This also holds for the German modal können on an ability reading, as shown in (18).

(18) Im Endspiel konnte der Frank das Tor treffen.  
In-the final can-PAST the Frank the goal hit.  
‘In the final, Frank was able to score a goal.’  ~ In the final, Frank scored a goal

This pattern carries over to wissen (‘know’) + INF: a sentence like (19a) with an episodic past / perfective aspect cannot be continued by (19b) since this would contradict the actuality entailment of (19a).

(19) a. Bei ihrem letzten Mittagessen wusste der Frank den Hedde abzulenken.  
at their last lunch knew the Frank the Hedde to-divert.  
‘During their last lunch, Frank was able to divert Hedde.’

b. #Er hat es aber dann doch nicht gemacht, weil er ein schlechtes Gewissen hatte.  
‘But he didn’t actually do it, because he felt bad.’

In contrast to the observations by Bhatt (2006), Hacquard (2014) for English and French, we even find ‘unspecific’ actuality-entailments for ability modals in German with a generic past or present / imperfective aspect.

(20) Ja, früher, da konnte der Frank das Tor treffen.  
Yes, in-those-days, EXPL can-PAST the Frank the goal hit.  
‘Well, in those days, Frank was able to score a goal.’  ~ At some point in the past, Frank scored a goal.

We call these entailments ‘unspecific’ since there is no particular point in the past for which it has to be true that x P’s as long as there is such a point for which it is true. Again, the same can be observed for wissen (‘know’) + INF with a generic past or present / imperfective aspect:

(21) Ja, früher, da wusste der Frank zu tanzen – #er hat es zwar nie  
Yes, in-the-old-days, EXPL knew the Frank to dance – he has it PRT never  
done but it would-have him an easy-thing been  
‘In the old days, Frank had the ability to dance – although he never did it, it would have been easy for him.’

These entailments have to be taken care of by the assertive component, since the entailments, as with ability modals, disappear under negation, see (22).

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In German, there is no overt marking of aspect. Nonetheless, we are assuming a semantic feature corresponding to perfective aspect for German, see Kratzer (1998) for a discussion.
Der Frank wusste den Hedde nicht abzulenken.
the Frank knew the Hedde not to-divert.  
\[\rightarrow \text{Frank diverted Hedde’s attention.}\]

3.2. P-event initiation

Ability modals furthermore require that their subject-referent is conceptualized as the causer of the P-event (cf. related discussion in Bhatt (2006)). The decomposed lexical meaning of ‘P’ in ‘x abil-modal P’ must contain a CAUSE-relation – otherwise the assertion is odd, as in (23).

(23) #Der Frank kann besorgt sein
The Frank can worried be
# ‘Frank is able to be worried.’ BE

This property can also be observed for wissen (‘know’) + INF: While the examples in (24a) and (24b) take a predicate as their argument that introduces a CAUSE-relation, the example in (24c) with a predicate that doesn’t involve a CAUSE-relation is as odd as (23).

(24) a. Der Frank weiß ein Gedicht vorzutragen.
The Frank knows a poem to-recite
‘Frank is able to recite a poem.’ CAUSE(BEC(BE))

b. Ihre Stimme weiß zu fesseln.
Her voice knows to enthral
‘Her voice is able to enthral the audience.’ CAUSE(BEC(BE))

c. Der Frank weiß besorgt zu sein.
The Frank knows worried to be BE

Crucially, the P-event has to be intended by someone to be a P-event. This is what goes wrong in (25), where the unintended outcome is highlighted by the adverb zufällig (‘by chance’).

(25) #Der Frank ist gestolpert und wusste dadurch zufällig den Hedde abzulenken.
The Frank is tripped and knew thereby by-chance the Hedde to-divert
‘Frank tripped and, by chance, WUSSTE thus to distract Hedde’

Again, we find a parallel for ability ascriptions with fähig sein (‘be able’) in (26).

(26) Der Frank ist gestolpert und war dadurch zufällig fähig den Hedde abzulenken.
The Frank is tripped and was thereby by-chance able the Hedde to-divert
‘?Frank tripped and, by chance, was thus able to distract Hedde.’

The negated sentence in (27) has the same entailments – the subject-referent is the causer of an event and that has to be intended as a P-event – which indicates that the entailments are presuppositions of wissen+ INF. Accordingly, we conclude, as a first step, that wissen-INF presupposes the subject-referent to make an effort/try to P. This is in analogy for Bhatt’s 2006
claims for *able*, which he directly relates to the behavior of implicative verbs such as *manage* discussed by Karttunen (1971); Karttunen and Peters (1979) (cf. also Thomason (2005)).

(27)  #Der Frank ist zufällig gestolpert. Es war nicht der Fall, dass er dadurch den Hedde abzulenken wusste.

‘Frank tripped by chance. It was not the case that he thereby WUSSTE to distract Hedde’

However, the situation is complicated by the fact that examples like (17a) above showed that *wissen*-INF licenses inanimate subjects: An inanimate subject-referent cannot try/make an effort to *P*, yet we get the same intuition, namely, that there must be an intention for the subject-referent to *P* – even if it is not the subject-referent’s own intention. This is shown by the fact that the discourse in (28) seems incoherent.

(28)  #Komparsin Gerda fiel während der Aufführung hin und stieß aus Versehen Extra Gerda fell during the performance PRT and pushed inadvertently einen Schmerzensschrei aus. Ihre Stimme wusste das Publikum (nicht) zu begeistern.

**INTENDED:** ‘Extra Gerda fell down during the performance and inadvertently gave a yelp of pain. Her voice was (not) able to enthrall the audience.’

So the correct generalisation is that *wissen*-INF requires the subject-referent to cause some event that *someone* intends to be a *P*-event.

3.3. The quality threshold

So far, we have determined that *wissen*-INF, just like ability modals, gives rise to actuality entailments and, analogous to ability modals and implicative verbs, requires a *P*-event initiation. However, there is one aspect of *wissen*-INF that sets it apart from (German) ability modals (but cf. Bhatt (2006) for a related discussion of *able*): It requires the subject-referent to be good at (doing) *P*, where *P* is the property expressed by the complement. In other words, there is an intuitive difference between (29b), with *wissen*-INF and (29a), with ability modals: (29b) conveys that Frank is especially good at swimming in some respect – depending on the context, this might relate to endurance, or style or artistic versatility – but the examples (29a) don’t.

(29)  a. Der Frank kann schwimmen / is in der Lage zu schwimmen.

‘Frank is able to swim’

b. Der Frank weiß zu schwimmen.

‘Frank knows to swim.’

This intuition is corroborated by the contrast in (30): With ability *können* (‘can’), a continuation
that explicitly denies the subject-referent being good at $P$ is fine, (30a), but with wissen-INF, such a continuation is definitely odd, as witnessed by (30b).

(30) a. Naja, der Frank kann schon schwimmen. Er ist zwar nicht wahnsinnig gut, Well the Frank can PRT swim. He is PRT not extremely good, aber er schafft es, 20 Bahnen durchzuhalten. but he manages it 20 laps to-hang-on ‘Well, Frank can swim. He might not be particularly good at he, but he manages to do 20 laps.’

b. Naja, der Frank weiß schon zu schwimmen. #Er ist zwar nicht wahnsinnig gut, aber er schafft es, 20 Bahnen durchzuhalten. good, but he manages it 20 laps to-hang-on

In other words, wissen-INF behaves more or less analogously to constructions with ability modals + modification by gut (‘good’). This parallel becomes evident once we look at predicates that one can be ‘good at’ only in a very peculiar way. Consider for instance (31a) with an ability modal: Without gut, the sentence can be used to express pure dispositional possibility. Adding gut immediately gives us a reading where we are talking about a particular skill. As breathing is usually considered something that comes naturally – i.e. does not require a particular design (granted you are a mammal) or technique, the result is odd – unless, of course, it is used in a context where special breathing techniques are required, such as a yoga class. The sentence in (31b) is analogous to (31a) with gut-modification: It is only appropriate in yoga-type contexts, i.e. contexts where breathing involves a particular skill.

(31) a. Frank kann (#gut) atmen. Frank can (well) breathe ‘Frank is able to breathe well’

b. #Frank weiß zu atmen. Frank knows to breathe

In sum, wissen-INF, compared to ability modals, exhibits an additional requirement: That the subject-referent be ‘good’ at the complement property $P$. We henceforth refer to this as the ‘quality threshold’ of wissen-INF. Just as $P$-event initiation, the quality threshold can be shown to be part of the presuppositional, rather than the assertive component of wissen-INF: When negating wissen-INF $P$, we don’t only negate that the subject-referent is good at (doing) $P$ (but is still able to do $P$), as witnessed by the fact that (32) is extremely odd:

(32) #Naja, der Frank weiß nicht zu tanzen, aber er kann es schon etwas. Well the Frank knows not to dance, but he can it PRT a-little ‘Well, Frank doesn’t wissen to dance but he can dance a little’
3.4. Circumstantial possibility

Another trait that sets wissen-INF apart from ability modals such as können (‘can, be able’) and in der Lage sein (‘be able’) is that sentences with wissen-INF require that having the property \( P \) must be compatible with the facts of the world. Put differently: wissen-INF requires the facts of the world to be compatible with some individual being \( P \). (Cf. Kratzer’s 1981 discussion of ‘circumstantial’ possibility’ in this respect.) This particular property of wissen-INF is reflected in (33) and (34): In both examples, the possibility of someone being \( P \) is explicitly denied. Whereas it is fine to negate ‘abil-modal \( P \)’ in this context, as shown by (33a) and (34a), it is extremely odd to negate wissen-INF \( P \) in the same context.

(33) a. Es ist generell so, dass Menschen nicht fliegen können.
   ‘It is generally the case that humans are not able to fly.’

b. #Es ist generell so, dass Menschen nicht zu fliegen wissen.
   ‘It is generally the case that humans are not to fly.’

(34) a. Wenn die Riemann’sche Vermutung, nicht beweisbar ist, kann auch der Frank
   ‘If Riemann’s conjecture is unprovable, Frank won’t be able to prove it.’

b. #Wenn die Riemann’sche Vermutung, nicht beweisbar ist, weiß auch der Frank
   ‘If Riemann’s conjecture is unprovable, Frank knows also the Frank
   ‘It not to prove’

In other words: If it is generally impossible for any individual to \( P \), we cannot negate a wissen-INF \( P \). This shows, that wissen-INF presupposes the circumstantial possibility that some individual is \( P \).

3.5. Interim summary

In the preceding paragraphs, we tried to isolate the different meaning components of wissen-INF. We first showed that wissen-INF, just like ability modals, involves actuality entailments: Depending on its aspectual properties, a sentence a wissen-INF \( P \) has a specific actuality entailment (‘at point \( t \)’) with perfective aspect and an unspecific actuality entailment (‘at some point \( t \), a did \( P \)’) with imperfective. We argued that this meaning component must be asserted, as it does not survive under negation. As opposed to this, the three other components we identified must be presupposed, as they cannot be explicitly negated: The \( P \)-event initiation, i.e. that the subject-referent must cause an event someone intends to be a \( P \)-event, the quality-threshold, i.e. the intuition that some particular ‘skill’ is required for \( a \) to count as \( P \), and circumstantial possibility, namely, that it must be compatible with the facts of the world that some individual is \( P \). This is summarized in the following table:
4. The proposal

On the syntactic side, we assume that wissen-INF is a restructuring verb that shares properties with control and raising verbs. This is in agreement with common assumptions in the syntactic literature on German infinitival embedding verbs, see Reis (2001), Haider (2010), but is not motivated here for reasons of space. For a sentence like (35a), we assume a structure like in (35b).

(35)  a. ... dass der Frank zu trinken weiß

... that the Frank to drink knows

b. [TP Frank [T [AspP [VP [V [v zu-trinken AGENT ]] weiß-INF ]] IMPERF ]] PRES ]

Tracking the results of the previous section, we distinguish four parts of our proposal for the semantics of wissen-INF.

First, the assertive component: wissen predicates the denotation of the infinitival complement of its matrix subject-referent, (36). This – together with certain assumptions about the interpretation of AspP (see (39) – (44) below) accounts for the actuality entailments in case of a non-negated assertion.

(36)  \[ \text{wissen}^c = \lambda w_x \cdot \lambda P(w, (x, (e_0))) \cdot \lambda x_e \cdot \lambda e_0 \cdot P(w)(x)(e) \]

prefinal

Second, wissen presupposes the initiation of an action with the individual denoted by the matrix subject as the agent. We assume there to be an initial part of the main event that is intended by someone – typically the agent – to be an event of the type denoted by the embedded predicate, (37). This accounts for the fact that unintended events don’t qualify as abilities in the relevant sense for wissen.

(37)  \[ \text{wissen}^c = \lambda w_x \cdot \lambda P(w, (x, (e_0))) \cdot \lambda x_e \cdot \lambda e_0 \cdot \exists ! e' <_{\text{init}} e \text{ such that } x \text{ causes } e' \text{ and someone intends } e' \text{ to become a } P \text{-event in } s. \ P(w)(x)(e) \]

prefinal

Third, wissen presupposes that the situation in which the event is initiated requires of the agent a minimal degree of performance-quality for the initiated event to become a P-event: it has to be considerably higher than the maximal degree of performance quality of any stereotypical P-
degrees of performance quality in $R_c$

\[\begin{array}{c}
I = \text{the interval such that all the maximal degrees of performance quality in the contextually relevant respect } R_c \text{ of any stereotypical } P\text{-event lie in } I \text{ in } w \\
\end{array}\]

Figure 1: quality-threshold

event, as illustrated in figure 1. This part of the meaning combines aspects of the semantics of enough to-constructions, see Meier (2003), and the semantics of very, see von Stechow (2009).

Reference to requirements by the situation highlights the factual modality of wissen-INF which is close in spirit to the factual modality of modals following Kratzer (2013). (38) gives the final version of the lexical entry for wissen-INF.

\[(38) \quad [\text{wissen}]^c = \lambda w. \lambda P_{\langle (\cdot , (e, (w))) \rangle}. \lambda x. \lambda e: \text{there is a situation } s \leq w\]

a. \quad x \text{ initiates } P: \text{there is an } e' <_{\text{init}} e \text{ such that } x \text{ causes } e' \text{ and someone intends } e' \text{ to become a } P\text{-event in } s

b. \quad s \text{ requires skill: the minimal degree } d_{\text{min}} \text{ of performance-quality in the contextually relevant respect } R_c \text{ required by } s \text{ in } w \text{ for } e' \text{ to become a } P\text{-event is considerably higher than the maximal degree of performance-quality in the contextually relevant respect } R_c \text{ of any stereotypical } P\text{-event in } w.

\[P(w)(x)(e)\]

Note that the last aspect of the semantics, the circumstantial possibility, is not explicitly represented in (38). The basic idea is that there only is a minimal degree of performance-quality required by the situation of an agent, if all the other circumstantial requirements are already satisfied, i.e., we assume as a part of the conversational background a hierarchy of circumstantial requirements that culminate in the situational requirements of the agent with respect to his performance. Following this logic, the presupposition of there being a quality-threshold for the agent presupposes that all other circumstantial requirements are already met.

Here are two examples illustrating the interaction of (38) with Perfective (39) and Imperfective Aspect (42).

\[(39) \quad \text{a. } \text{Frank wusste zu trinken.} \quad \text{Frank knew to drink} \]

\[\text{b. } [\text{zur-trinken}] = [\text{zu-trinken}] = \lambda w. \lambda e: \text{drink}(e)(w) \]

\[(40) \quad \text{a. } [\text{zur-trinken}]^c = \lambda w. \lambda e: \text{drink}(e)(w) \]

b. \quad [\text{PERF}]^c = \lambda w. \lambda P_{\langle x, (e, (w)) \rangle}. \lambda t: \text{where } D_c \neq \emptyset

c. \quad [\text{PAST}]^c = \lambda w: \text{c provides time } t \leq t_c. t$

d. \quad [\text{AGENT}]^c = \lambda w. \lambda P_{\langle x, (e, (w)) \rangle}. \lambda x. \lambda e: \text{agent}(x)(e)(w) \wedge P(e)\]

Proceedings of Sinn und Bedeutung 21
Edited by Robert Truswell, Chris Cummins, Caroline Heycock, Brian Rabern, and Hannah Rohde
(41) \[(39b)]^c = \lambda w_s c provides time t \leq t_c \land D_c \subseteq \{ e : \text{there is a situation } s \leq w \text{ such that there is an } e' <_{\text{init}} e \text{ and Frank causes } e' \text{ and someone intends } e' \text{ to become a drinking-event in } s \land \text{the minimal degree } d_{\text{min}} \text{ of performance-quality in the contextually relevant respect } R_c \text{ required by } s \text{ in } w \text{ for } e' \text{ to become a drinking-event is considerably higher than the maximal degree of performance quality in the contextually relevant respect } R_c \text{ of any stereotypical drinking-event in } w \}. \exists e \in D_c. (\text{time}(e) \subseteq t \land \text{agent}(\text{Frank})(e)(w) \land \text{drink}(e)(w))

(42) a. Frank wusste zu trinken.
   Frank knew to drink
b. \[T' \text{ [AspP [VP } \text{ Frank [VP zu-trinken AGENT ]] weiß ]] IMPERF ] PAST ]

(43) \[\text{IMPERF}]^c = \lambda w_s \lambda P_{(w,t)} \lambda t_1 : D_c \subseteq \text{dom}(P). \ \text{GEN } e \in D_c. (\text{time}(e) \approx t \rightarrow P(e)), \text{ where } D_c \neq \emptyset

(44) \[(42b)]^c = \lambda w_s c provides time t \leq t_c \land D_c \subseteq \{ e : \text{there is a situation } s \leq w \text{ such that there is an } e' <_{\text{init}} e \text{ such that Frank causes } e' \text{ and someone intends } e' \text{ to become a drinking-event in } s \land \text{the minimal degree } d_{\text{min}} \text{ of performance-quality in the contextually relevant respect } R_c \text{ required by } s \text{ in } w \text{ for } e' \text{ to become a drinking-event is considerably higher than the maximal degree of performance quality in the contextually relevant respect } R_c \text{ of any stereotypical drinking-event in } w \}. \ \text{GEN } e \in D_c. (\text{time}(e) \approx t \rightarrow (\text{agent}(\text{Frank})(e)(w) \land \text{drink}(e)(w)))

5. A unified analysis of wissen-INF and wissen-FIN

Our discussion led to a new semantics for wissen-INF that is incompatible with the standard semantics of wissen-FIN. Does this mean that wissen is ambiguous? After all, wissen-FIN seems like a well-behaved attitude verb – its meaning thus bears no evident semantic connection to the meaning just proposed for wissen-INF.

The answer is: no, as the pattern discussed above is not an idiosyncratic property of German. Several other languages exhibit the same pattern, including dialects of Syrian Arabic (Peter Hallman, pc), south-western Slavic languages (Hagen Pitsch, pc, Moreno Mitrović, pc), Romanian (Edgar Onea, pc) and Hungarian, which we use in (45) for illustration (the examples were provided by Dora Kata Takacz).

(45) a. Frank tudja hogy Hedde megettes a sült krumplit.
   Frank knows that Hedde up-ate the french fries
   ‘Frank knows that Hedde ate the french fries.’
   FIN
b. Frank tudja hogy ki etette meg a sült krumplit.
   Frank knows that who ate up the french fries
   ‘Frank knows who ate the french fries.’
   FIN

(46) a. Frank el tudja terelni Hedde figyelmét.
   Frank PRT knows to-distract Hedde attention.his.ACC
   ‘Frank is able to distract Hedde.’
   INF
b. Az autó tudte lelkesíteni.
the car knew to-make-enthusiastic
‘The car was able to make people enthusiastic.’

Accordingly, the crucial question is: Can we expand our analysis for wissen-INF to wissen-FIN? For this to work, we would have to assume that dass-complements to wissen-FIN share the semantic type that corresponds to the embedded infinitivals under wissen-INF, see the schematic tree in (48) for the example in (47).

(47) Der Frank weiß, dass es regnet.
the Frank knows that it rains
Frank knows that it is raining’

\[
\begin{align*}
\text{V'} & \left\langle s, \langle e, \langle v, t \rangle \rangle \right\rangle \\
\text{CP} & \left\langle s, \langle e, \langle v, t \rangle \rangle \right\rangle \\
\text{weiß} & \left\langle s, \langle e, \langle v, t \rangle \rangle, \langle e, \langle v, t \rangle \rangle \right\rangle \\
\text{dass} & \left\langle s, \langle s, t \rangle, \langle e, \langle v, t \rangle \rangle \right\rangle \\
\text{TP} & \left\langle s, t \right\rangle \\
\text{es regnet} & \left\langle s, t \right\rangle
\end{align*}
\]

In the spirit of recent proposals for the semantics of complementizers (Kratzer (2006), Moulton (2015)), we propose the following meaning for dass in (49). (An analogous treatment can be given for interrogative complementizers, which would involve existential quantification over the alternatives of p.)

\[
\begin{align*}
\text{[dass]}^c = \lambda w_s. \lambda p_{s,j}. \lambda x_e. \lambda e_v. \exists s \in W_s \text{ such that } p(s) = 1 \land \text{experiencer}(x(e(w)) \land \text{acquainted}(s(e(w))
\end{align*}
\]

(51) gives the fully spelled out details for the example in (50).

(50) a. Der Frank wusste, dass es regnet.
the Frank knew that it rains
‘Frank knew that it was raining’

b. [T] [AspP [vp Frank [v’ [CP dass es regnet ] weiß ] PERF ] PAST ]

(51) gives time \( t \le t_c \land D_e \subseteq \{ e \} \) there is a situation \( s \le w \) such that there is an \( e' \in \text{init } e \) such that Frank causes \( e' \) and someone intends \( e' \) to become an acquaintance-event in \( s \) the minimal degree \( d_{min} \) of performance-quality in the contextually relevant respect \( R_e \) required by \( s \) in \( w \) for \( e' \) to become an acquaintance-event is considerably higher than the maximal degree of performance-quality in the contextually relevant respect \( R_e \) of any stereotypical acquaintance-event in \( w \). \( \exists e \in D_e. (\text{time}(e) \le t \land \text{there is a situation } s \text{ such that } p(s) = 1 \land \text{experiencer}(\text{Frank})(e)(w) \land \text{acquainted}(s)(e(w))) \)
The resulting semantics is very close in spirit to the semantics for wissen-FIN in Kratzer (1989), Kratzer (2002) and inherits its advantages (for example in dealing with the Gettier-cases). The factivity of wissen follows from an interplay of the presupposition of wissen and the contribution of the complement: the existence of a fact is part of the circumstantial requirements that need to be satisfied so that there can be a minimal degree of performance-quality required of the agent by the situation. Or to put it in different words: the circumstantial possibility for the agent to be able to recognize the fact presupposes the settledness of the matter. Another neat property of the proposal is that it nicely meets the intuition that the use of wissen presupposes a high degree of certainty on part of the subject-referent. This is accounted for by the quality-threshold.

There is another at first sight puzzling piece of data that we want to mention in this connection. First, note that ability modals in German can be modified with besser (‘better’), see (52).

(52) Die Viola kann den Hedde besser ablenken als der Frank.
the Viola can the Hedde better distract than the Frank
‘Viola is better at distracting Hedde than Frank’

Again, this is also true for wissen-FIN, see (53).

(53) Die Viola weiß den Hedde besser abzulenken als der Frank.
the Viola knows the Hedde better to-distract than the Frank
‘Viola has a better ability to distract Hedde than Frank.

On our account, the explanation is straightforward since besser (‘better’) semantically combines with the P-event as the asserted part of the meaning. The more interesting aspect of the besser (‘better’) modification is the fact that a modification with besser (‘better’) is also possible with a finite complement, see (54).

(54) Der Frank weiß, dass der Hedde gefährlich ist, aber die arme Viola weiß es noch viel besser.
The Frank knows that the Hedde dangerous is but the poor Viola knows it much better
‘Frank knows that Hedde is dangerous, but poor Viola knows it even better.’

On the proposed account, the P-event that gets modified with besser (‘better’) is the event introduced by the dass-complement which is an acquaintance-event: besser wissen, dass is understood as ‘being better acquainted with’ which matches our intuitions about the truth conditions of these examples. Notice that an intellectualist analysis with reference to a believe-relation would have problems in explaining examples of this type since glauben (‘believe’) in German cannot be modified with better (‘besser’), see (55).

(55) #Der Frank glaubt, dass der Hedde gefährlich ist, aber die arme Viola glaubt es viel besser.
The Frank believes that the Hedde dangerous is but the poor Viola believes it much better.
noch viel **besser**.

PRT much better

#‘Frank believes that Hedde is dangerous, but poor Viola believes it even better.’

6. Summary and outlook

In this paper, we discussed two types of *wissen* (‘know’) in German: *wissen*-FIN and *wissen*-INF. We presented new data showing that *wissen*-INF cannot be reduced semantically to *wissen*-FIN. A closer look at the data revealed that *wissen*-INF combines semantic properties of ability modals with semantic properties of implicative verbs and *enough to*-constructions. Since the German pattern is found in a wide range of genetically unrelated languages, we argued against an ambiguity-analysis of *wissen* that assumes two different lexical entries for *wissen*-FIN and *wissen*-INF. Starting from *wissen*-INF, we showed how a semantics for *wissen*-FIN can be derived that maintains all the advantages of the standard analysis, if we make certain non-standard assumptions about the denotation of the complement clauses in *wissen*-FIN-constructions. The resulting proposal gives us a new, unified analysis of *wissen* and also helps to explain some properties of this verb (with both kinds of complements) that traditional analyses cannot account for.

It should be noted that our discussion had a very narrow focus, concentrating on German *wissen*. However, *wissen* is not the only verb that selects for both finite and infinitival complements and it is still an open question how our claims here relate to these other cases, which, at least at first sight, show a different behavior (cf. Karttunen (1971) for analogous cases in English). Take for instance *glauben* (‘believe’): It can occur with both types of complements, (56), but as opposed to *wissen*, there is no obvious semantic difference between the two patterns.

(56) Der Frank glaubt [FIN dass er sich verteidigt] / [INF sich zu verteidigen].

   The Frank believes [FIN that he REFL defends] / [INF REFL to defend]

   ‘Frank believes that he is defending himself.’

Another open question is how our claims relate to languages where its lexical correlate does not display the behavior of German *wissen* – English being a particular prominent case (cf. Stanley and Williamson (2001), Stanley (2011)): Neither the pattern with *wh*-infinitives, (57a), nor the one with bare infinitives, (57b), is parallel to German *wissen*-INF. For instance, they don’t license inanimate subjects, nor can they consistently be paraphrased by sentences with ability modals: (57b) and (57c) clearly differ in meaning.

(57) a. Frank/# Frank’s voice knows how to enthrall the audience.
   b. Frank/# Frank’s car knew to leave.
   c. Frank was able to leave.

References


