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. $[\![\textbf{wissen-DECL}]\!] = \lambda w_s.\ \lambda p_{\langle s,t\rangle}.\ \lambda x_e\!: p(w) = 1.\ x$ 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. $[\![\textbf{wissen-INT}]\!] = \lambda w_s.\ \lambda Q_{\langle s,\langle\langle s,t\rangle,t\rangle\rangle}.\ \lambda x_e.\ x$ believes $\bigcap Q(w)$ 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 *wh*-infinitives, (4d): They argue that *know* embedding *wh*-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 REFL defend   can/should
            'Frank knows how he/one can/should defend him/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).

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[2]It should be noted that Stanley (2011) explicitly refrains from making a similar point about German.

(7)   a. $\llbracket \textbf{wissen-INF} \rrbracket = \llbracket \textbf{wissen-INT} \rrbracket = \lambda w_s.\ \lambda Q_{\langle s, \langle\langle s,t\rangle, t\rangle\rangle}.\ \lambda x_e.\ x$ believes $\bigcap Q(w)$ in w
      b. $\llbracket \textbf{INF} \rrbracket = \llbracket \textbf{INT} \rrbracket = \lambda w.\lambda p_{\langle s,t\rangle}.\ \exists m[m$ is a technique &
            $p = \lambda w.$ one should use m in w for self-defence] & $p(w) = 1]$

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 REFL defend   can/should
            'Frank knows how he/one can/should defend him/oneself.'   *wissen*-FIN
      b.   Der Frank weiß sich zu verteidigen.   *wissen*-INF

(10) $\{p : \exists m[m$ is a technique $\& p = \lambda w.$ one should use m in w 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.

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[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 w iff 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.
            the 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) $\{p: \exists m[m$ is a technique $\& p = \lambda w.$ one should use m in w 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.[4]

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[4]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

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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) enthral.
              '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-intiation', 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-threshhold', 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*.

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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 ascpect 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).[5]

(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 ascpect cannot be continuated 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
            gemacht, aber es wäre   ihm ein Leichtes   gewesen.
            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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[5]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.

(22)   Der Frank wusste den Hedde nicht abzulenken
        the Frank knew   the Hedde not   to-divert.

        ⇸ *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 enthrall
              '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

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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
      The Frank is by-chance tripped.   It was not   the case that he thereby the
      Hedde abzulenken wusste.
      Hedde to-divert   knew
      '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.
      a   scream-of-pain   PRT her voice   knew the audience (not)   to enthrall
      INTENDED: 'Extra Gerda fell down during the performance and inadvertently gave a
      yelp of pain. Her voice was (not) able to enthral 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.
          the Frank can   swim   / is in the position to swim.
          'Frank is able to swim'
      b. Der Frank weiß   zu schwimmen.
          the 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
             Well the Frank knows PRT   to swim.   He is PRT not   extremely
             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 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 possibiliy

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 thus that humans   not   fly   can
             '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 thus that humans   not   to fly   know

(34)   a.   Wenn die Riemann'sche Vermutung, nicht beweisbar ist, kann auch der Frank
             If   the Riemann   conjecture not provable is can also the Frank
             sie nicht beweisen.
             it not   prove
             '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   the Riemann   conjecture not provable is knows also the Frank
             sie nicht zu beweisen.
             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 ('*a* did *P* 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:

a is *P*	actuality entailment	**asserted**
a causes an event that is	*P*-event initiation	**presupposed**
intended by someone as a *P*-event		
the threshold for *a* being *P* is high	quality threshold	**presupposed**
it is compatible with the circumstances	circumstantial possibility	**presupposed**
of *w* that some individual is *P*		

<div align="center">

a wissen-INF *P*

</div>

The next section aims at deriving these empirical observations.

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 inifinitival 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 [$_{T'}$ [$_{AspP}$ [$_{VP}$ t [$_{V'}$ [$_{vP}$ PRO [$_{v'}$ 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) $[\![\textbf{wissen}]\!]^c = \lambda w_s.\ \lambda P_{\langle s,\langle e,\langle v,t\rangle\rangle\rangle}.\ \lambda x_e.\ \lambda e_v.\ P(w)(x)(e)$ 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) $[\![\textbf{wissen}]\!]^c = \lambda w_s.\ \lambda P_{\langle s,\langle e,\langle v,t\rangle\rangle\rangle}.\ \lambda x_e.\ \lambda e_v$: there is an $e' <_{\text{init}} e$ such that x causes e' and someone intends e' to become a *P*-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 stereotypocal *P*-

degrees of performance quality in R_c

$$I = \text{the interval such that all the maximal degrees of performance quality in the contextually relevant respect } R_c \text{ of any stereotypical } P\text{-event lie in } I \text{ in } w$$
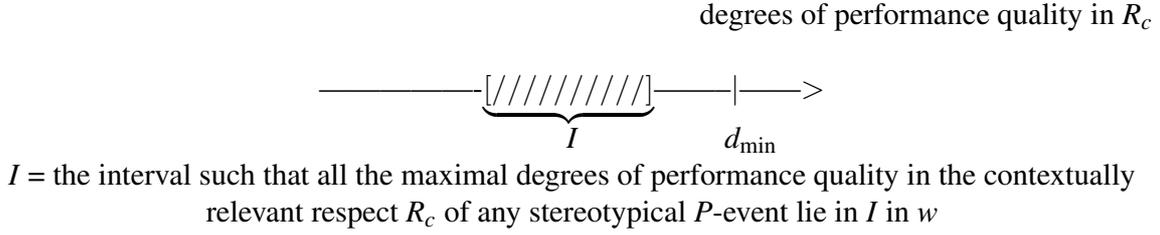
Figure 1: quality-threshhold

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) $[\![\textbf{wissen}]\!]^c = \lambda w_s.\ \lambda P_{\langle s, \langle e, \langle v, t \rangle \rangle \rangle}.\ \lambda x_e.\ \lambda e_v$: there is a situation $s \le w$

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

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

$P(w)(x)(e)$ final

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) a. Frank **wusste** zu trinken.
          Frank knew   to drink
    b. [$_{T'}$ [$_{AspP}$ [$_{VP}$ Frank [$_{V'}$ [$_{vP}$ PRO [$_{v'}$ zu-trinken AGENT]] wußte]] PERF] PAST]

(40) a. $[\![\textbf{zu-trinken}]\!]^c = \lambda w_s.\ \lambda e_v.\ \text{drink}(e)(w)$

    b. $[\![\text{PERF}]\!]^c = \lambda w_s.\ \lambda P_{\langle v, t \rangle}.\ \lambda t_i: D_c \subseteq \text{dom}(P).\ \exists e \in D_c.\ (\text{time}(e) \subseteq t \wedge P(e))$, where $D_c \ne \varnothing$

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

    d. $[\![\text{AGENT}]\!]^c = \lambda w.\ \lambda P_{\langle v, t \rangle}.\ \lambda x_e.\ \lambda e_v.\ \text{agent}(x)(e)(w) \wedge P(e)$

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(41) $[\![(39\text{b})]\!]^c = \lambda w_s$: c provides time $t \leq t_c \land D_c \subseteq \{e$: there is a situation $s \leq w$ such that there is an $e' <_{\text{init}} e$ and Frank causes e' and someone intends e' to become a drinking-event in $s \land$ the minimal degree d_{min} of performance-quality in the contextually relevant respect R_c required by s in w for e' to become a drinking-event is considerably higher than the maximal degree of performance quality in the contextually relevant respect R_c of any stereotypical drinking-event in $w\}$. $\exists e \in D_c$. (time$(e) \subseteq t \land$ agent(Frank)$(e)(w) \land$ drink$(e)(w))$

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

(43) $[\![\text{IMPERF}]\!]^c = \lambda w_s.\ \lambda P_{\langle v,t\rangle}.\ \lambda t_i$: $D_c \subseteq$ dom(P). GEN $e \in D_c$. (time$(e) \approx t \rightarrow P(e))$, where $D_c \neq \varnothing$

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

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b.   Az autó **tudte** lelkesíteni.
        the car   knew to-make-enthusiastic
        'The car was able to /made people enthusiastic.'   INF

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'

(48)

$$
\begin{array}{c}
\text{V'} \\
\langle s, \langle e, \langle v, t \rangle \rangle \rangle
\end{array}
$$

         CP   weiß

$\langle s, \langle e, \langle v, t \rangle \rangle \rangle$ $\langle s, \langle \langle s, \langle e, \langle v, t \rangle \rangle \rangle, \langle e, \langle v, t \rangle \rangle \rangle \rangle$

     dass   TP

$\langle s, \langle \langle s, t \rangle, \langle e, \langle v, t \rangle \rangle \rangle \rangle$ $\langle s, t \rangle$

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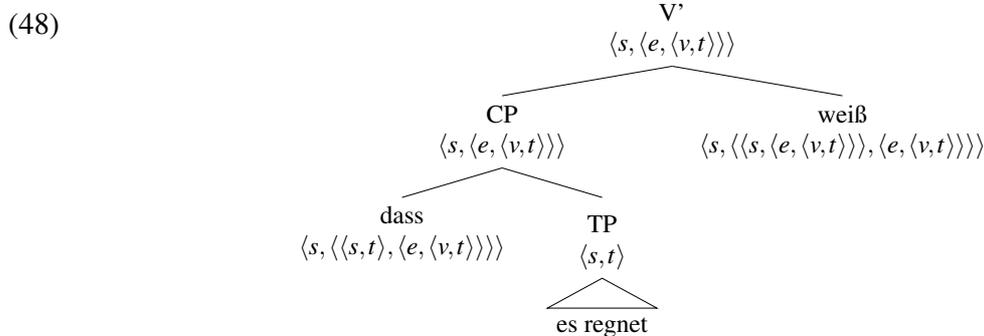
In the spirit of recent proposals for the semantics of complementizers (Kratzer (2006), Moulton (2015)), we propose the following meaning for *dass* in (49). (An analogous treatment can be given for interrogative complementizers, which would involve existential quantification over the alternatives of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

(49) $[\![\textbf{dass}]\!]^c = \lambda w_s.\ \lambda p_{\langle s,t \rangle}.\ \lambda x_e.\ \lambda e_v.$ there is a situation *s* such that $p(s) = 1\ \wedge$ experiencer$(x)(e)(w) \wedge$ acquainted$(s)(e)(w)$

(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.   [$_\text{T'}$ [$_\text{AspP}$ [$_\text{VP}$ Frank [$_\text{V'}$ [$_\text{CP}$ dass es regnet] weiß]] PERF] PAST]

(51) $[\![(50b)]\!]^c = \lambda w_s$: *c* provides time $t \leq t_c \wedge D_c \subseteq \{e$: there is a situation $s \leq w$ such that there is an $e' <_{\text{init}} e$ such that Frank causes e' and someone intends e' to become an acquaintance-event in $s \wedge$ the minimal degree d_{min} of performance-quality in the contextually relevant respect R_c 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_c of any stereotypical acquaintance-event in $w\}$. $\exists e \in D_c$. (time$(e) \subseteq t \wedge$ there is a situation *s* such that $p(s) = 1 \wedge$ experiencer(Frank)$(e)(w) \wedge$ 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 intution 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
        The Frank knows that the Hedde dangerous is   but   the poor Viola knows it   PRT
        viel   **besser**.
        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
         The Frank believes that the Hedde dangerous is   but   the poor Viola believes it

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]   / [FIN 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 enthral the audience.
        b.   Frank/# Frank's car knew to leave.
        c.   Frank was able to leave.

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