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Semantic experiments on '*remember*' as Gettier cases of memory

Draft

ABSTRACT

This paper brings together my existing semantic and experimental work on memory reports. The composition in (Rosina − Liefke 2024b) zooms in on the German memory predicate 'noch wissen' ('still know') combining with 'dass' ('that') and 'wie' ('how') clauses and unifying the two cases propositionally. Extended to memory predicates in general, we predict that "remembering how" requires better evidence than "remembering that".

Our experimental data (Rosina − Liefke 2024a) suggests an even broader phenomenon of experientiality in memory reports, confirming also the unacceptability of 'Blue remembers Grandma swimming in the sea' when Blue did not personally experience the swimming. For the case of 'dass'/'that' complements in the same situation (so concerning the question whether indirect experiencers remember at all), the results depend heavily on the study format. Our semantics predicts acceptability, possibly blurred by pragmatic competition. I suggest that pragmatic effects interact in different ways depending on the study format, and that this poses a circularity challenge for experimental methodology.

The second lesson from the investigation of my experiments as support for our semantics is that a specific opposing claim is hard or impossible to falsify. Our semantics predicts that experientiality (i.e. the requirement that one must have directly experienced an event in order to "remember how") is only a pragmatic inference from what we consider good evidence. Alternatively, one can write experientiality directly into the semantics (Stephenson 2010). However, experience and evidence are in practice so connected that examples that would show cancellability are situated in very far-fetched worlds. I put forth an internalist interpretation of our semantics that predicts that beliefs about other people's reliability intervene between truth-conditions and experimental results. Furthermore, the concepts of direct experience and of evidence are both philosophically nontrivial, so our own philosophical and everyday conceptions play a special role in research on memory reports.

KEYWORDS
memory reports; knowledge; evidence; experiential memory; experimental methodology

1. Introduction

1.1 Aim and scope of this paper

This paper centers the question whether there is one remembering, linguistically speaking. I do not answer this question in the end. Instead, I introduce various ways of understanding it in the rest of the introduction, and then address these in the following sections. Naturally, addressing the question whether there is one remembering, say, in terms of a shared morphological core of memory predicates (as an example of a possible interpretation) involves discussing different candidates for such a shared core.

The discussion involves both a compositional semantic account of memory predicates and empirical data from six different experiments, but it does not do justice to either.[1] Rather, I aim at bringing the two closer together than it is commonly done, asking conceptual, methodological and inter-disciplinary questions. Going beyond its linguistic contribution to the semantics of memory reports, I am writing this paper also as a philosopher of linguistics. Human memory involves reasoning about different kinds of evidence (Ünal – Papafragou 2020). When we use memory reports in natural language, we cannot factor out our beliefs about cognition and even trustworthiness. As a linguist who wants to argue for a particular semantics of predicates like 'remember', I should maybe settle on a claim like "Experiential memory is

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[1] The compositional semantics is going to appear in (Rosina – Liefke 2024b) and the detailed experimental design in (Rosina – Liefke 2024a).

not encoded semantically", or else "Our experiments prove the existence of semantic experientiality markers". The truth is that we can see both claims as supported, depending on our focus and understanding of some core concepts.

Finally, the discussion of two different experimental setups with seemingly contradictory results will drag into the light the many pragmatic factors that influence our results. The experiment-independent truth about memory predicates is out of reach, but we can still say things about it, much as we grant our interlocutors knowledge, or even memory, sometimes.

1.2 Structure of this paper

Section 2 discusses various ways in which the question "Is there one remembering?" can be understood and motivates the importance I give to methodological and philosophical questions in Section 5. Section 3 gives the necessary background on our semantics of the German memory predicate 'noch wissen' ('still know'). Section 4 contains a brief presentation of our experiments and findings. Section 5 discusses the impact of our semantics and our experiments on the questions raised in Section 2. Section 6 mentions some open issues and concludes.

2. Ways of asking "Is there one remembering?"

Probably the most salient linguistic task in the given context is the decomposition of memory reports as in (1)–(2) into memory predicates – possibly further decomposable –, their complements, and the attitude holder.

(1)	a.	Red remembers that Grandma swam in the sea.
	b.	Red remembers how Grandma was swimming in the sea.
	c.	Red remembers Grandma swimming in the sea.
	d.	Red remembers Grandma's swimming.

(2)	a.	Red	weiß	noch,	dass	Oma	im	Meer	geschwommen	ist.
		Red	knows	still	that	Gran-ny	in-the	sea	swim	is
		'Red remembers Grandma swimming in the sea.'								
	b.	Red	erinnert	sich,	dass	Oma	im	Meer	geschwommen	ist.
		Red	reminds	REFL	that	Gran-ny	in-the	sea	swim	is
		'Red remembers Grandma swimming in the sea.'							(German)	

The question whether there is one remembering, understood classically, asks whether there is one shared semantic core of memory verbs like English 'remember', German 'sich erinnern', and German 'noch wissen', even though they look very different on the morphological surface. For example, 'noch wissen' clearly decomposes into 'noch' ('still') and 'wissen' ('know'), which is the starting point for our semantics in (Rosina – Liefke 2024b) that is briefly introduced in Section 3. I do not yet know whether this sample of three verbs is in any way representative of natural languages, so even if we do manage to "unify" these predicates, there will be epistemic pressure (which I hope to resist) to make later findings "fit" the existing story.

Several more considerations make this common kind of linguistic investigation methodologically non-trivial: First, asking whether there is a shared semantic core of *predicates of remembering* assumes such an intuitive class to begin with. Speaking of the semantics of memory predicates as *remember'* and only dealing with its combinatory properties

is only a viable option if we leave to philosophers the task of linking these properties to the intuitive objects of remembering, such as events in one's life. Without a philosophical investigation of remembering, we can still ask whether the three predicates that I more or less randomly chose share a semantic core, and in fact that is how many good linguists work. What this means for potentially controversial cases like German 'noch wissen' ('still know') is that the same empirical and compositional investigation can be sold in different ways. If it turned out, for example, that 'remember' and 'sich erinnern' share a core *remember'*, but 'noch wissen' does not, this can be sold as "'noch wissen' is not a memory predicate" or as "memory predicates do not form a semantic class". If, on the other hand, we manage to reduce all three cases to 'noch wissen', and so to retained knowledge, this can be sold as "remembering is a kind of knowledge, linguistically speaking" or as "remembering does not exist, linguistically speaking". Ideally, linguists only use such catchphrases as snappy titles and look beyond them in other people's work. The more likely it is that scholars from other disciplines engage with our subject, though, the more it makes sense at least for some of us to bridge the gaps.

In the case of remembering, one such gap concerns the relation between attitude and object of remembering. The question whether there is one remembering always really means "Is there one *kind of* remembering?", where "kind" can be understood as "one cognitive mechanism", "one philosophical natural kind", or "one lexical attitude". Our focus on the attitude – as opposed to the object – of remembering may seem obvious in analogy to transitive verbs like 'hit', where the fact that we can hit different objects is not a fruitful linguistic investigation. It only gets tricky when there are at least two intuitive/pre-theoretical *kinds of* objects, which is the case for remembering. Philosophically speaking, there is "episodic" (i.e. experiential) remembering of personally experienced events and "semantic" remembering (which I will call fact-only) of general facts about the world, learned by indirect evidence (Bernecker 2010; Cheng – Werning 2016; Devitt et al. 2017 a.o. going back to Tulving 1972). It is not uncommon for philosophers to reason backwards from the object to the attitude: Since fact storage and (re-)construction of scenarios work completely differently in our mind and brain (and this is where neuroscience comes in), these two mechanisms do not form a natural kind (Cheng – Werning 2016).

Mapped to linguistics, we may agree that 'x remembers that p' and 'x remembers that q' report the same kind of attitude, if 'that p' and 'that q' have the same semantic type and there is no indication of ambiguity or polysemy of 'remember'. This does not necessarily mean that 'that p' and 'that q' are used to refer to the same kind of thing under any other conception of "the same". If in 'x remembers$_1$ e' and 'x remembers$_2$ that p' the two lexical entries for 'remember' are shown to have clearly distinct truth-conditional contributions and different types, this is a clear case of two different kinds of attitudes. The linguistic toolset provides several options in between, though: What if 'remember' is type-flexible and we can make sense of this by purely syntactic mechanisms? What if it is underspecified with regard to the kind of object? What if 'remember$_1$' and 'remember$_2$' are polysemes, but closely related (Liefke 2023)?

Bringing philosophy and morphosyntax of remembering closer, these questions become relevant if we were to test the idea that proposition-embedding memory predicates reflect "semantic" (fact-only) remembering whereas non-propositional memory predicates (taking events as their complements, for example) reflect "episodic" (experiential) remembering. Under such a view, we would predict that (1a) is accepted in a scenario where Grandma's swimming was not a part of Red's personally experienced past, but (1b)–(1d) are not accepted (given that all of them are non-propositional). Indeed, the acceptability of (1a) versus (1b) in

an experiential versus fact-only scenario is the target of the English experiment sketched in Section 4.1. What the results actually show will become clearer when I give an upshot of the semantic composition in (Rosina – Liefke 2024b) in Section 3.

Stepping back from type-combinatorial questions for a moment, we can remain closer to the empirical surface and ask whether *that*-clauses under memory predicates are unique in being able to express fact-only remembering. If (1a) is accepted when Red did not witness Grandma's swimming, but (1b)–(1d) are not, this claim would be supported. Pre-experimentally, the intuition that (3a) and (3b) are weird out of the blue, if Red is an ordinary human living today, also supports this idea. The same holds for the German contrast in (4) where the complement only has a fact reading and 'wie' is not a possible complementizer in (4a). As soon as the complement can express a personally experienced event, as in (4b), both 'dass' and 'wie' are possible.[2] (Rosina – Liefke 2024b)

(3)	a.	Red remembers Napoleon dying.
	b.	Red remembers Napoleon's death.

(4)	a.	Mia	weiß	noch	{dass/#wie}	Juist	eine	Insel	ist.
		Mia	knows	still	that/how	Juist	an	island	is
		'Mia remembers that Juist is an island.'						(German)	
	b.	Mia	weiß	noch,	{dass / wie}	Paul	im	Meer	geschwom-men	ist.
		Mia	knows	still	that/ how	Paul	in-the	sea	swim	is
		'Mia remembers Paul swimming in the sea.'						(German)	

Finally, another axis along which we can ask whether there is one kind of remembering is the stative/eventive distinction illustrated in (5), where (5a) is a contextually clear case of (only) stative remembering and (5b) of (also) eventive remembering.[3]

(5)	a.	I'm sure Mom remembers my first bike accident. She's just not thinking about it right now.
	b.	I'm sure Dad is remembering my first bike accident right now. He always looks so terrified when he does.

While eventive remembering intuitively entails stative remembering (because we cannot be reminded of / make conscious a memory that is not "there" in *some* sense), stative without eventive remembering can informally be paraphrased as "remembering in the back of one's mind". Comparing the German predicates 'noch wissen' ('still know') and 'sich erinnern' ('REFL remind'), only 'sich erinnern' has both eventive and stative uses, working in the closest German equivalents of (5a) and (5b). 'noch wissen' is limited to the stative use and yields a contextually nonsensical meaning in the German equivalent of (5b). The felicity and/or interpretability of the structures forcing eventivity in (6a)–(6b) is drastically lower with 'noch wissen' than with 'sich erinnern', and (6c) lacks a deontic reading only in the 'noch wissen' case.

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[2] It is unclear from this data point whether this is due to 'dass' being flexible with regard to the fact-only/experiential distinction, or due to (4b) entailing the fact that Grandma swam in the sea, see Section 3.
[3] I thank Deniz Özyıldız for bringing both the importance of this issue in general and of the judgements in (6) to my attention.

(6)	a.	i.	Red ist dabei, sich zu erinnern, ...		
		ii.	#Red ist dabei, noch zu wissen, ...		
			'Red is about to remember / in the course of remembering'		
	b.	i.	Red {versucht/schafft}, sich zu erinnern, ...		
		ii.	??Red versucht/schafft, noch zu wissen, ...		
			'Red is trying to / manages to remember'		
	c.	i.	Red {muss/will} sich erinnern, ...	+deontic	+epistemic
		ii.	Red {muss/will} noch wissen, ...	- deontic	+epistemic
			'Red has to / wants to remember'		

Again, depending on one's conception of remembering, this can be turned into evidence that 'noch wissen' is not really a memory predicate at all, because it behaves so differently from 'remember' and 'sich erinnern', or into support for the idea that stative uses are at the core of remembering, because they are what all considered memory predicates have in common. While a unification of stative and eventive uses is not a concern of this paper, it is an important open issue and the restriction to stative uses is a starting point of our semantics. The main motivation for introducing the problem here was to show that my research could easily have taken another, just as valid, direction, if I had started wondering about parallels between 'think' (see Özyildiz 2021) and 'remember' with regard to eventivitiy before I noticed the possibility to decompose memory predicates into 'noch' ('still') and 'wissen' ('know').

3. Upshot of a composition of 'noch wissen'

'noch wissen' ('still know') is very common as a matrix verb in German when people report past experiences (data from P4, FOR2812; cf. Zöllner et al. 2023), and it is used both with 'dass' ('that') and 'wie' ('how') complements. This is exemplified by (4b), the 'wie' version of which is repeated as (7).

(7)	Mia	weiß	noch,	wie	Paul	im	Meer	geschwommen	ist.
	Mia	knows	still	how	Paul	in-the	sea	swim	is
	'Mia remembers Paul swimming in the sea.'								(German)

This is surprising for cases of 'noch wissen, wie' reports, given a few standard assumptions. It is often assumed that the object of experiential remembering of personally experienced events is fundamentally different from the object of fact-only remembering, with only the latter possibly a form of knowledge. Non-manner 'wie'/'how' clauses seem to mark experientiality (Umbach et al. 2022). So the first surprise is that a knowledge predicate can embed these 'wie' clauses at all – does that mean that there is experiential knowledge? Before our semantics in (Rosina – Liefke 2024b), giving 'remember' a polysemous semantics (Liefke 2023) was the only suggestion of giving both 'dass'- ('that') and 'wie'- ('how') clauses the same, propositional, type, while at the same time accounting for the episodic/experiential nature of remembering events from one's own past. Starting from the observation about German 'noch wissen', we developed a unified propositional account of remembering as a kind of knowledge. The compositional version will be published in (Rosina – Liefke 2024b). Here, I am only going to introduce the elements necessary to understand the predictions we make for the experiments in Section 4, or in order to understand why we cannot make clear predictions about some aspects as discussed in Section 5.

The main idea of our semantics is that even experiential remembering 'wie' ('how') is retained knowledge of a proposition, just of an informationally rich proposition ("what was the case when p"). In [noch[wissen, [wie p]]], 'noch' contributes a certain temporal requirement, 'wissen' knowledge, and 'wie' turns an informationally poor proposition into a rich proposition.

In the light of the broader discussion in Section 2, I view our proposal as a narrowing down the space of issues and zooming in on a specific aspect along several dimensions. We start with (i) stative uses of (ii) 'noch wissen' reports with (iii) 'dass' vs. 'wie' complements, and try to see how far we get with unification of experiential and fact-only cases, first. There are obvious extensions to other memory predicates, other complements, and potentially eventive uses. On the way, we may need to add extra claims for the new cases or modify our semantics to reflect the bigger picture of memory reports. Starting with (i) stative cases makes sense because all memory predicates we know have them, so at least we say something about one possible reading they have in common, if we give a potentially universal semantics. Starting with (ii) German 'noch wissen' ('still know') makes sense because it has two transparent morphemes, which have been given a lexical semantics in extensive existing literature. Seeing if we get close to the desired truth conditions by composing them is a concrete goal in a messy and understudied area. Consequently, our claim is that 'noch wissen' is just the morphologically transparent version of 'remember'. (I will qualify and slightly modify this claim later.)

Finally, starting with a unification of (iii) 'dass' ('that') and eventive 'wie' ('how') clauses provides natural links to existing literature. Liefke's (2023) and Umbach et al.'s (2022) semantics of non-manner 'how' provides the tools for capturing both of them as propositions, and the way our semantics links kinds of evidence with 'wie' ('how') shows clear parallels to perception reports (Davis – Landau 2021) and the general debate on evidentiality in cognition reports (Ünal – Papafragou 2020). Some nice properties of our semantics are the following:

(A) Due to its unification of experiential and fact-only remembering, it makes sense of the observation that the two cases are expressed by the same lexical item (e.g. English 'remember') across many languages.

(B) Since our unified meaning of 'noch wissen' is proposition embedding, it is compatible with general attitudinal propositionalism (Zimmermann 2023).

(C) It is independently supported by predicting the intuition that 'genau' in 'noch genau wissen, wie' is best translated as 'vividly', and in 'noch genau wissen, dass' as 'for sure'.[4]

An intuitive way to grasp our semantics is to focus on four factors that contribute to someone *not* remembering 'dass p' or 'how p'. Consider our evidence-based entry for 'wissen' ('know') in (8), formalizing Lewis (1996), using elements from Kiparsky – Kiparsky (1970), and the model in Figure 1:

(8)	$[\![\text{wissen}]\!]^{@,c} = \lambda p{:}p_@.\lambda x.\text{CONS}_{@,c} \cap \text{EVI}_{x,@} \subseteq p$
	'p holds in the actual world; and p holds in all considered worlds (CONS) that are compatible with the agent x's evidence (EVI).'

Fig. 1: A model of x knowing p while not knowing p'

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[4] ... using Wurm's (2020) semantics of 'genau' for both cases. See (Rosina – Liefke 2024b) for the argument.
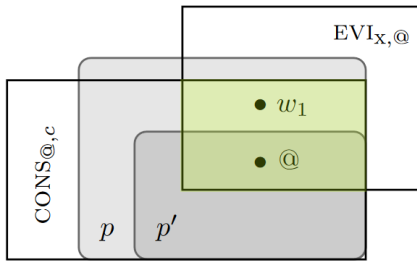
Figure 1

For a '(noch) wissen' report to be true, our semantics demands that the intersection of EVI and CONS – the green area in Figure 1 – is a subset of p. Paraphrasing informally, this means that for all contextually relevant, considered not-p worlds, my evidence has to be good enough to exclude them as a candidate for the actual world. In the model in Figure 1, the agent x knows p but does not know p', because the green area is a subset of p, but not of p'. We identify 'dass p' with p in Figure 1, and 'wie p' with p' in Figure 1, so the agent knows 'dass p', but not 'wie p'. We achieve this by treating 'wie' as an Informational Richness operator (Liefke 2023; Umbach et al. 2022) sending an informationally poor proposition '(that) Grandma was swimming in the sea' to an informationally rich proposition p' corresponding roughly to "how things were when Grandma was swimming in the sea", a subset of p. Four different factors interact on the way to remembering, three of which are due to 'wissen' and its complements:

(I)   EVI can be "too large", i.e. the agent does not have enough evidence.

(II)   CONS can be "too large", which is the case e.g. in epistemological contexts (where we do not even know anymore that we are not brains in a vat), and in the case of 'exactly' modification, see our discussion in (Rosina – Liefke 2024b) applying Wurm (2020).

(III) p/p' can be "too small". The more informationally rich a proposition, the harder it is to be known. Since 'wie p' is always a subset of p, it is harder to "know how p" than it is to "know that p". For example, agent x in Figure 1 cannot exclude worlds like w1 where e.g. Grandma did swim in the sea, but under circumstances that conflict with "the way things were when she actually did". In order to exclude these extra worlds, the agent would have to compensate for the tiny p' by collecting extra evidence and thereby shrinking EVI.

(IV)   Finally, even when knowledge is given, it can fail to be retained in the right way, as specified in our composition with a standard entry for 'noch' ('still'; simplified from Beck 2019; Löbner 1990; Krifka 2000): 'x weiß noch, wie p' presupposes that x has had evidence for the informationally rich p' in a preceding time interval.

To conclude this section, let us take stock of what we have and have not achieved with our semantics of 'noch wissen, wie p'. A semantics of experiential memory reports should make sense of the inferences from (7) to (9a)–(9c).

| (9) | a. | Mia remembers what it was like when Paul was swimming in the sea: (he was wearing blue shorts, his body was being tossed about by the waves …) | **Informational Richness**, (D'Ambrosio and Stoljar 2023 a.o.) |
| | b. | Mia has (perceptually and/or emotionally) experienced Paul swimming in the sea. | **Experientiality**, (De Brigard 2023 a.o.) |
| | c. | Mia remembers that Paul was swimming in the | *that*-**Entailment** |

		sea.	

We account for the inference to (8a) by analyzing 'wie' as an Informational Richness operator in Umbach et al.'s (2022) sense, and the inference to (8c) follows by (III) above. We do not, however, account in our semantics for the common claim that previous direct experience of the remembered event is necessary for experiential remembering (Stephenson 2010 a.o.). Our story for the common (not necessary) inference to (8b) is that it is a consequence from world knowledge. What follows semantically is a small EVI, i.e. high standards for evidence, and in the actual world, direct experience is usually the best kind of evidence. I will pick up this discussion again in Section 5.2. For the upcoming experimental Section 4, this means that I will call German 'wie' and English gerundive '-ing' (potential) 'e-markers', where 'e' is underspecified between 'experience' and 'evidence'.

4. Experimenting with experiments
4.1 Attesting e-markers

With the help of Kristina Liefke and our student assistants, I designed an experimental paradigm that is aimed at detecting e-markers in memory reports. It includes the background story of a family gathering and a set of teenage cousins who represent different types of experience/evidence with respect to different past events of something bad happening to their grandma. The detailed experimental set-up will appear in (Rosina – Liefke 2024a), can be experienced directly with our mock version of the English experiment available at [omitted], and is introduced in some more detail in the preregistration of our main experiment (Rosina – Liefke 2024c). For the present purpose, the most important distinction to bear in mind is between the teenagers RED and BLUE in Figure 2.

Fig. 2: Composition of screenshots and text from the English version of the experiment
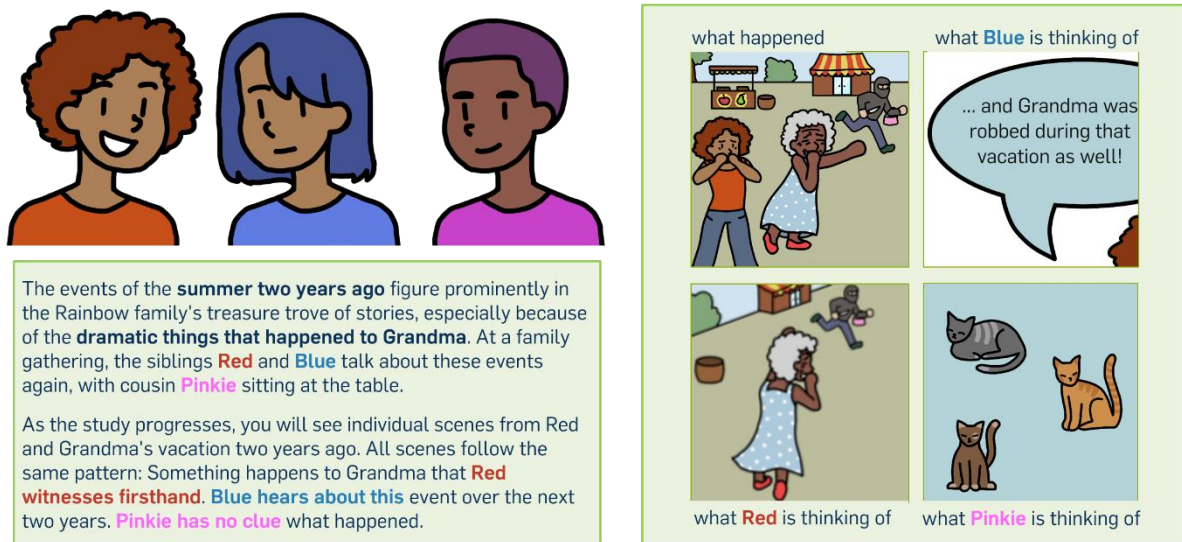
Our main experiment targets the 'dass'/'wie' contrast in German memory reports using the verb 'sich erinnern' ('REFL remember'). Both the character uttering a sentence (RED, BLUE) and the complementizer (DASS, WIE) are manipulated variables in the main experiment, so for each scene (in this case, of Grandma being robbed) we get a set of four target items:

(11)	a.	Red	sagt:	Ich	erinnere	mich,	dass	Oma	überfallen	wurde.

	b.	Blue	sagt:	Ich	erinnere	mich,	dass	Oma	überfallen	wurde.
	c.	Red	sagt:	Ich	erinnere	mich,	wie	Oma	überfallen	wurde.
	d.	Blue	sagt:	Ich	erinnere	mich,	wie	Oma	überfallen	wurde.
		{Red/ Blue}	says:	I	remind	REFL	{that/ how}	Gran- ny	robbed	was
		'{Red/Blue} says: I remember {that/how} Granny was robbed.'						(German)		

In the main experiment, participants had to rate the acceptability of these sentences against the background of a given scene and the teenagers' perspectives on it, illustrated in Figure 2 for the robbery scenario. We recruited via Prolific, tested within-subjects, and gathered data from 54 (after exclusions) German mono-lingually raised native speakers. (See Rosina – Liefke 2024a for the preregistration.) The results confirm both of our hypotheses in (12) with high significance, which we consider evidence for 'wie' as an e-marker in German 'sich erinnern' reports, in line with our semantics sketched in Section 3.[5]
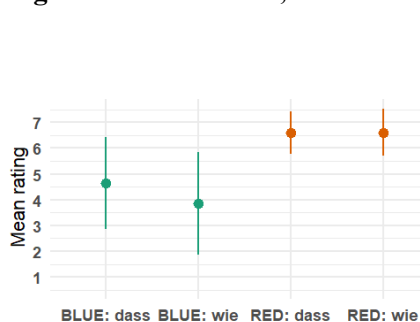
(12)	a.	✓ HYP. I: Higher ratings for RED+WIE than for BLUE+WIE ***
	b.	✓ HYP. II: Higher ratings for BLUE+DASS than for BLUE+WIE ***

In two other experiments, we extend our findings to the German memory predicate 'noch wissen' ('still know') and to English 'remember' with 'that' clauses versus gerundive '-ing' small clauses as in (13) for the robbery scenario. All of our experiments use the same basic cast of characters and a subset of the scenarios from the main experiment.
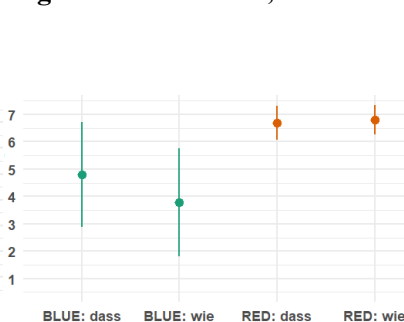
(13)	a.	Red says: I remember that Grandma got robbed.
	b.	Blue says: I remember that Grandma got robbed.
	c.	Red says: I remember Grandma getting robbed.
	d.	Blue says: I remember Grandma getting robbed.
	e.	Red says: I remember that Grandma was getting robbed.
	f.	Blue says: I remember that Grandma was getting robbed.

We confirmed (equivalents of) Hypotheses I and II in (12) for 'noch wissen' reports and for English 'remember' reports when the 'that' clause uses past simple as in (13a)–(13b).[6] Figures 3–5 visualize the strikingly similar results of all three experiments.
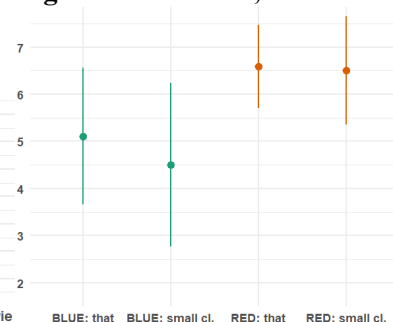
Fig. 3: 'sich erinnern', n=54 **Fig. 4: 'noch wissen', n=37** **Fig. 5: 'remember', n=27**

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[5]All analyses use Cumulative Link Mixed Effect Models fitted with the Laplace approximation. For motivation of the choice, see Liddell – Kruschke (2018). Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1

[6] The effect is not quite significant for '…that Grandma was getting robbed' (13e)–(13f), suggesting that '-ing' itself contributes to experientiality/evidentiality.

Note that our experiments so far provide no reason to characterize e-markers as clear evidentiality markers (as predicted by our semantics, only considering truth-conditions) *or* markers of direct experience as predicted by Stephenson 2010), since RED both has good evidence for the informationally rich proposition 'how Grandma was robbed' *and* has directly experienced the corresponding event. The fact that the phenomenon of e-marking ranges over different memory predicates, complements, and even languages constitutes further support that cognitive concepts of evidentiality "precede" its natural language realizations (Ünal – Papafragou 2020). It suggests that we need at least very similar use conditions for all of the cases we tested. So far, an extension of our semantics for 'noch wissen' is a good candidate, and our finding that it behaves just like 'sich erinnern' supports our treatment of 'noch wissen' as a true memory predicate.

The only thing that remains mysterious to this point is the highly significant main effect of the speaker in all experiments, coming with lower ratings for BLUE+DASS than we had informally expected. It seems that some participants do not grant the character with reliable indirect evidence, BLUE, any remembering at all, not even fact-only "remembering that". I will come back to this phenomenon in Section 5.1.

4.2 Experiments on pragmatic effects

Our Speaker-ID study is the only one of our six experiments that has a different format. It is supposed to control for possible pragmatic effects on the results of the scale experiments and makes participants choose "Who said this?" (RED, BLUE or the control character PINKIE) for each of the sentences presented in a given scene. The sentences are the same as in the 'noch wissen' scale experiment and so identical to the ones in (11) for the robbery scenario apart from the memory verb. This leads to a 2x2 setup with the speaker as the dependent variable and the complementizer the only manipulated variable. In this format (inspired by Davis – Landau 2021), we forced participants to decide for exactly one character, instructing them to choose the one who said the sentence more likely, if they think that more than one or none of them could have said it. The results (from 29 German native speakers) confirm both hypotheses in (14):

(14)	a.	✓ HYP. I: RED is selected more often in the WIE condition (84%)
	b.	✓ HYP. II: BLUE is selected more often in the DASS condition (64%)

Two more things are noteworthy about these results. First, the effect of BLUE>RED for the DASS condition is weaker than the effect of RED>BLUE for the WIE condition. This supports our idea that WIE is actually an e-marker, semantically, and the preference for BLUE for the DASS case is due to pragmatic competition (and not due to DASS being an indirectness marker, semantically).

Second, while the confirmation of Hypothesis II is expected taking the Speaker-ID experiment by itself, it is not relative to the results of all five scale experiments. The preference for BLUE>RED in the DASS condition clashes with significantly higher ratings for RED+DASS than for BLUE+DASS in all scale experiments. If we give participants the German equivalent of the sentence "I remember that Grandma was swimming in the sea", they choose BLUE as a speaker. However, if we ask them about this very sentence uttered by BLUE, they rate it lower than when RED utters the same sentence. I will come back to this puzzle in Section 5.1.

One explanation could have been that the acceptability scale design is more sensitive to effects of the Question under Discussion (QUD), simplifying: the purpose of the conversation.

Our preregistered QUD study [link omitted] with 38 participants (after exclusions) tested for this. In the case of all five other experiments, the background story was as in Figure 2 and involved sharing stories about Grandma at a family gathering. This background story could have made the QUD "Who had which direct experiences with Grandma?" salient, leading to the speaker main effect and the impression that BLUE does not have good memory at all, compared to RED, even in the fact-only DASS case. Consequently, the QUD study was a version of the main experiment (with the same exact target items) with a fact-centred background story (a quiz "Who knows which facts about Grandma?"), reminders of this with every item, and fact-controls like the colour of Grandma's motorbike. However, falsifying our hypothesis, there was no significant reduction of RED>BLUE in the QUD:FACT condition of a pooled analysis with the main study, so the QUD does not seem to make the difference between the formats. On a positive note for our experimental design, we also reproduced all of the original findings from the main study, which means that the background story was not a disturbing variable in any sense in the other experiments.

To conclude the series of experiments, we designed a version of the main study (n=36 after exclusions, preregistered) with less scenes but one additional character, GOLDIE, who always missed the things that happened to Grandma by a few minutes, but saw the immediate result (like a broken leg). The idea behind GOLDIE is that she has "intermediate evidence", but no direct experience, and so ratings between RED's and BLUE's for GOLDIE in the WIE condition would confirm the gradability of the concept licensing e-marking. (For complications with this idea, see the discussion in Section 5.2.) This is exactly what we found. There were highly significant main effects of RED>GOLDIE>BLUE, and the DASS/WIE contrast shrinks "in the RED direction", see Figure 6.

Fig. 6: Ratings by condition, Goldie experiment
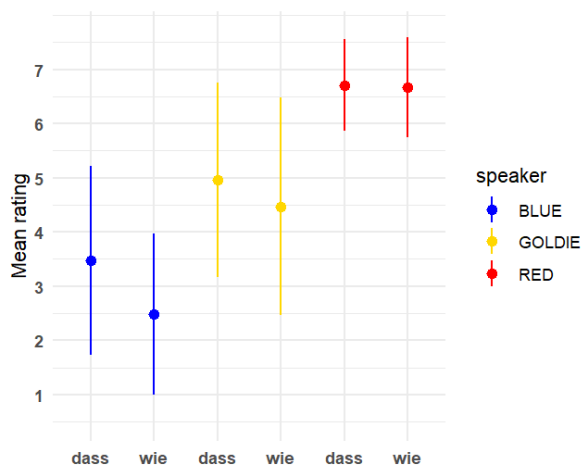
5. Pragmatics as a gate for epistemology

5.1 A competition of competitions?

Taken together, the experimental results from Section 4 support the existence of e-markers in in the complements of verbs of remembering. Given the minimal pairs that we tested, German 'wie' ('how') is such a marker in opposition to 'dass' ('that'), and gerundive '-ing' small clauses are in contrast to 'that' clauses in present simple tense. The results of our scale experiments

show that 'dass'/'that' is also acceptable for a direct experiencer, and the results of the speaker-ID format suggest that some circumstances give rise to a competition that makes indirect experiencers better speakers of the 'that' version. Hence, the rest of the discussion takes for granted that 'dass' is semantically licenced for RED and BLUE, 'wie' only for RED. Subsection 5.2 addresses the question what makes RED the best candidate (and GOLDIE an ok candidate) for experiential remembering. This subsection 5.1 discusses which pragmatic competitions seem to play into our experiments. Both subsections focus on German 'wie' and 'dass', but our English experiment suggests that we are going to need a story that is similar in effect for English gerundive '-ing' small clauses.

Having excluded the interference of QUD effects, the relatively low ratings of BLUE+DASS in the scale experiments could be a result of competition with other sentences that BLUE could have said instead. Both (15b) and (15c) are morphosyntactically simpler than (15a),[7] so if they convey the same in a given context, we expect them to lower the acceptability of (15a) due to a pressure to minimize complexity.

(15)	a.	Ich weiß noch, dass Oma im Meer geschwommen ist.
		'I {remember / still know} that Grandma was swimming in the sea.'
	b.	Ich weiß, dass Oma im Meer geschwommen ist.
		'I know that Grandma was swimming in the sea.'
	c.	Oma ist im Meer geschwommen.
		'Grandma was swimming in the sea.'

Why would (15a)–(15c) convey the same information in many contexts? According to our semantics of 'noch wissen, dass p', the truth of p in the actual world is presupposed, and having good evidence for p (EVI) given the contextually relevant worlds (CONS) is asserted. While this construction *can* be used to add p to the common ground,[8] it does so unnecessarily indirectly, if EVI and CONS are not relevant. Thinking about it, EVI and CONS are just the truth-conditional equivalents of general principles of cooperativity (EVI) and contextual restriction or modal base (CONS). Making them explicit only serves a purpose when these are in question.[9]

Importantly, the competition in (15) is not active for RED (RED+DASS is rated as high as RED+WIE), and it is unaffected by changing the overall QUD to "Who knows which facts about Grandma?" This means it must be something about BLUE, the indirect experiencer, that makes it irrelevant in the scenarios in our experiments for them to stress the quality of their evidence.

The comparison with the speaker-ID format – where DASS sentences were assigned to BLUE in 64% of the cases, shows that it is not the case that experiential memory is generally the "better" memory, and the competition in (15) must be inactive or overruled by other effects. For example, RED is being more precise by using a 'wie' sentence than by using a 'dass' sentence, because remembering 'wie' is harder, and RED has good evidence for both the informationally poor and the informationally rich proposition. This competition for RED does not show at all in the scale experiments, but it is a plausible explanation for the results of the speaker-ID experiment, adding something like competition between the speakers that is focussed by the format: "RED could have been more precise, so BLUE uttered the 'dass'

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[7] For (15b), this is reflected in our semantics for 'noch' modifying 'wissen' in 'noch wissen'. If an extension to 'noch wissen'='remember' holds (in stative cases), this straightforwardly explains why the same competition appears for mono-morphemic memory verbs.

[8] "My brother just called" can introduce the existence of a brother, even if it presupposes it.

[9] Our preliminary results from a corpus analysis of [omitted] support this claim.

sentence." The instructive formulation in our scale experiments ('beschreibt die Situation gar nicht/völlig richtig', 'describes the situation not correctly at all / completely correctly') is aimed at truth-conditional semantics as far as possible (see Zhu – Ahn 2023 for the influence of instructive formulations), so it makes sense that it might block some competitions that show in the speaker-ID format.[10]

While these differences in active competitions between formats make intuitive sense as an a posteriori explanation, they are extremely hard to falsify. If we already knew the semantics of memory reports, the contrast between our speaker-ID study and our 'noch wissen' scale study could provide the necessary evidence. As things actually are, we only know that the two sets of results differ relative to one another, and we have no access to any underlying "true semantics". In order to make claims like "the speaker-ID format permits competition in terms of precision", we have to assume the semantics of *some* expression, which is then competing with others. This semantics can itself not be experimentally supported, if the validity of our experimental methods is what is tested for to begin with.

5.2 Experience as evidence

As for the matrix predicate, our experiments detect extremely similar patterns for German 'noch wissen', 'sich erinnern' and English 'remember'. This is support for the idea that we should aim at a unification of experiential and fact-only remembering and of the semantic core of (stative uses of) morpho-syntactically diverse memory verbs. Our experiments support Informational Richness (9a) as a part of the semantics of reports of experiential remembering, because RED who has evidence/experience of the informationally rich "what it was like when Grandma ..." is the best speaker of experiential memory reports. The high ratings for RED+DASS/THAT support the entailment of the 'that'-sentence in (9c). Five of our six experiments are neutral with respect to a possible inference to (9b), a direct experience requirement. The GOLDIE experiment provides tentative support that it might not hold, semantically, and that evidence is a better candidate for what e-markers track.

This argument, however, rests on a specific understanding of "direct" and "experience" that a proponent of experientiality as part of the semantics (Stephenson 2010) could reject. For example, they could claim that GOLDIE has direct *enough* experience of Grandma breaking her leg, assuming that directness of experience is gradable. Alternatively, the duration/granularity of the event can be questioned: If the event is not over for some participants when GOLDIE enters the story, it makes sense that GOLDIE has direct experience of it. As a third option for the advocatus diaboli, participants could ascribe vicarious memories of the Grandma events to GOLDIE, such that she experienced them in an emotionally direct way. These three options are where it gets very conceptual: Does this hypothetical opponent term something "experience" that I term "evidence"? At this point, a clarification of what I understand as evidence is called for.

EVI in our semantics is simply the set of worlds that the agent cannot exclude based on their evidence.[11] My interpretation of "evidence" here is conceptually primitive, so evidence is

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[10] Note, however, that the hypothesized competition in (15) appears unaffected by it. An additional effect in the speaker-ID format could be that some people assume roughly equal priors for the characters, leading to the reasoning that "*some* sentences *must* be said by BLUE".

[11] Assuming cognitively and philosophically loaded concepts in our semantics is not ideal, of course, if we can avoid it, but I argue that we cannot in this case: Salient alternatives are "doxastic alternatives", "justification" or "direct experience" in the semantics.

whatever the speaker or the hearer takes to be evidence. An agent utters 'Ich erinnere mich, wie p' ('I remember how p') when they think that the informationally rich p' is true *and* that they have (retained) good evidence for it. A hearer accepts it when *they* grant the speaker that.

In the case of individual remembering, the evidence in question is *internal* evidence, like the scene in my mind (that I have reason to assume is linked to my past in a specific way), or someone else's ability to activate such a scene in their mind.[12] This is where the interdisciplinary discussion from Section 2 enters the picture again. What cognitive scientists and philosophers call "episodic memory" is the real-world correlate of the evidence we ascribe to an agent when we utter 'x remembers how p'. Only in the case of "episodic memory" in the cognitive sense do we find it plausible that someone could have enough evidence for the super informationally rich proposition "how things were when p". We have learned this about other people's cognition, and this made it into natural language. Hence, while there does not seem to be a direct correlate of "episodic" memory in natural language, the bridging of the semantics-pragmatics discrepancy between EVI and experientiality shows that we assume such a thing in other people.

Again, as in Section 5.1 with pragmatics in experiments, this is an a posteriori explanation that makes intuitive sense but is extremely hard to test for. One way to go is constructing scenarios and examples in which evidence and experience diverge. Our evidential semantics combined with world knowledge predicts both that direct experience is neither necessary nor sufficient in some unusual cases. To show non-necessity, we need a case where there is undeniably no direct experience, but the speaker still grants the agent evidence for 'wie p'. Cases going in the direction of (16) are candidates.

(16)	a.	Incredible! This mentalist remembers the Goddess creating the first human!
	b.	Incredible! This humanoid robot remembers how the titanic sank! She can show you a film she generated from all available information.

As for insufficiency, our semantics (under my interpretation) predicts the challenging of experiential remembering in (17) as acceptable, where there was clearly direct experience and there is a mental scene corresponding to it, but the scene is not accepted as good evidence due to the assumed unreliability of the agent's memory process.

(17)	a.	Oh, good to know that that actually happened! I think that I also remember swimming in the Danube at New Year's eve 2020, but it might as well be a hallucination – I was so high that night.
	b.	Sure, *we, your parents*, remember how you fell on your birthday cake as a toddler. But you were two years old, you can't possibly remember it. You're just thinking of the video we showed you.

All of these cases remain to be tested, and many of them involve counterfactual human cognition and other scenarios very far from the actual world, which somewhat compromises intuitions. Finally, I also expect (e.g. gender-based and racist) biases about other people's credibility to influence the acceptability of experiential memory reports.

7. Conclusion and open issues

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[12] Collective forms of remembering (for example of a nation remembering) could make use of a different, external kind of evidence.

Our experiments show that, pragmatically speaking, there is a class of experientiality markers in memory reports that ranges over languages, memory predicates and complement kinds. Unless direct experience is taken to be gradable, the GOLDIE experiment supports our evidence-based semantics and the claim that experientiality is an inference from world knowledge. The similarities between 'noch wissen' and 'remember' and 'sich erinnern' support our decomposition of memory verbs into *still+know*. To make this compositional for 'remember' and 'sich erinnern', we would have to link this to their morphology and explain why they allow for eventive uses in addition. Broad typological data would tell us more about the most common shapes of memory predicates and possible correlations with their use.

We have managed to unify 'noch wissen' embedding experiential 'wie' and fact-only 'dass' complements, but other complements (like German 'zu' infinitives and DPs) remain to be integrated. Depending on the distribution of these memory reports, we have to decide whether we still want to pursue attitudinal propositionalism.

At the inter-disciplinary level, I claim that "episodic memory" as distinct from fact storage in psychology and philosophy is supported by the specifics of experiential memory reports, but only enters the picture at the semantics-pragmatics interface, in the form of our belief that "episodic memory" is the best evidence for informationally rich propositions.

REFERENCES

Beck, Sigrid. 2019. Temporal noch/still and further-to readings of German noch. *Proceedings of Sinn und Bedeutung* 20, 4–25.

Bernecker, Sven. 2010. *Memory: A philosophical study.* Oxford: Oxford University.

Cheng, Sen, – Werning, Markus. 2016. What is episodic memory if it is a natural kind? *Synthese* 193(5): 1345–1385.

D'Ambrosio, Justin – Stoljar, Daniel. 2023. Imagination, fiction, and perspectival displacement. In: Kriegel, Uriah (ed.): *Oxford Studies in Philosophy of Mind 3*, 219–240.

Davis, E. Emory – Landau, Barbara. 2021. Seeing vs. Seeing That: Children's Understanding of Direct Perception and Inference Reports. *Proceedings of ELM* 1, 125–135.

De Brigard, Felipe. 2023. *Memory and Remembering.* Cambridge: Cambridge University.

Devitt, Aleea L. – Addis Donna Rose – Schacter, Daniel L. 2017. Episodic and semantic content of memory and imagination: A multilevel analysis. *MemCog* 45(7): 1078–1094.

Kiparsky, Paul – Kiparsky, Carol. 1970. Fact. In: Bierwisch, Manfred – Heidolph Karl E. (eds.), *Progress in Linguistics*, 143–173. The Hague: Mouton.

Krifka, Manfred. 2000. Alternatives for Aspectual Particles: Semantics of still and already. *Proceedings of the Twenty-Sixth Annual Meeting of the Berkeley Linguistics Society*, 401–412.

Lewis, David. 1996. Elusive Knowledge. *Australasian Journal of Philosophy* 74: 549–67.

Liddell, Torrin M. – Kruschke, John K. 2018. Analyzing ordinal data with metric models: What could possibly go wrong? *Journal of Experimental Social Psychology*: 328-348.

Liefke, Kristina. 2023. Two kinds of English non-interrogative, non-manner how-complements. In: Jedrzejowski, Lukaszukasz – Umbach, Carla (eds.), *Non-Interrogative Subordinate Wh-Clauses*, 24–62. Oxford: Oxford University.

Löbner, Sebastian. 1990. *Wahr neben Falsch.* Berlin, New York: Niemeyer.

Özyildiz, Deniz. 2021. *The event structure of attitudes*. Amherst: University of Massachusetts. URL: https://hdl.handle.net/20.500.14394/18513

Rosina, Emil E. – Kristina Liefke. 2024a. Experientiality markers in memory reports: a semantics-pragmatics puzzle. invited to the Proceedings of ELM3.

Rosina, Emil E. – Kristina Liefke. 2024b. German 'noch genau wissen': Uniform semantics, distinct effects. invited to the Proceedings of WCCFL42.

Rosina, Emil E. – Kristina Liefke. 2024c. German 'wie' in memory reports. OSF preregistration. https://doi.org/10.17605/OSF.IO/V5PEH.

Stephenson, Tamina. 2010. Vivid attitudes: Centered situations in the semantics of remember and imagine. *Proceedings of SALT* 20,147–160.

Tulving, Endel. 1972. Episodic and semantic memory. In: Tulving, Endel – Donaldson, Wayne (eds.), *Organization of memory*, 381–402. New York: Academic Press.

Umbach, Carla – Hinterwimmer, Stefan – Gust, Helmar. 2022. German wie-complements: Manners, methods and events in progress. *Natural Language and Linguistic Theory* 40: 307–343.

Ünal, Ercenur – Papafragou, Anna. 2020. Relations Between Language and Cognition: Evidentiality and Sources of Knowledge. *Topics in Cognitive Science* 12: 115–135.

Wurm, Valerie. 2020. *Modification of German attitude verbs.* Vienna: University of Vienna. URL: https://fatcat.wiki/release/jevilderpnf45jy2ej6qiflwn4

Zhu, Ziling – Ahn, Dorothy. 2023. Effects of instruction on semantic and pragmatic judgment tasks. Proceedings of *ELM* 2, 322–330.

Zimmermann, Thomas Ede. 2023. *Remarks on Propositionalism(s)*. Handout from a talk at Ruhr University Bochum. URL: https://www.dropbox.com/s/s8z3svupajsdpqm/EdeIn Bochum.mp4?dl=0

Zöllner, Carina – Klein, Nicole – Cheng, Sen – Schubotz, Ricarda – Axmacher, Nikolai – Wolf, Oliver. 2023. Where was the toaster? A systematic investigation of semantic construction in a new virtual episodic memory paradigm. *Quarterly Journal of Experimental Psychology* 76(7): 1497–1514.

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