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Factivity Variation in Experiential *Remember*-Reports^{*}

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Abstract Recent work in experimental semantics has found that some *remember*-reports fail to give rise to theoretically predicted factivity-inferences (see e.g. White and Rawlins; de Marneffe, Simons, & Tonhauser). Our paper accounts for one domain of such failures, viz. factivity variation in experiential *remember*-reports. The latter are reports like *John remembers a woman dancing* that require the agent's personal experience of a past event or scene. We argue that, in experiential memory reports, the factivity inference (if any) is not triggered by the verb *remember* or its complement, but by the veridicality of the underlying experience: if the experience is veridical (as is often the case in perception), the factivity inference arises. If the experience is counterfactual (as is the case in hallucination and dreaming), the inference does not arise. We give a compositional semantics for experiential *remember*-reports that captures this dependence.

Keywords: Experiential attitude reports · Factivity inferences · Factivity variation · Presuppositional verbs · *Remember* · Cross-attitudinal parasitism

1 Introduction

The verb *remember* and its cognates (e.g. *recall*, *recollect*, *reminisce*) often give rise to factivity inferences.¹ The latter are inferences like (1a) that conclude the truth of a tensed clausal complement (in (1a): *(that) a woman was dancing*) from the truth of a sentence whose matrix verb embeds this complement. Since these inferences project through entailment-cancelling operators (e.g. through matrix negation, see (1b), or through the scope of a question, see (1c)) – and are

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¹ In [33], such inferences are called *veridicality inferences*. We prefer the name *factivity inferences* since it takes seriously the 'backgrounding' of these inferences (for a similar argument, see [10]) and since it allows us to reserve the name *veridicality* for a different (though related) property (see Sect. 5).

often backgrounded (in the sense that they do not contribute at-issue content) –, they are generally assumed to be presuppositional ([10]; see [11, 14]). (Below, we use Uegaki’s [31] notation for presupposition, $\overset{\text{presup}}{\Rightarrow}$):

- (1) a. John remembers that a woman was dancing.
 $\overset{\text{presup}}{\Rightarrow}$ ‘A woman was dancing.’
- b. John does not remember that a woman was dancing.
 $\overset{\text{presup}}{\Rightarrow}$ ‘A woman was dancing.’
- c. Does John remember that a woman was dancing?
 $\overset{\text{presup}}{\Rightarrow}$ ‘A woman was dancing.’

The factivity of the *remember*-report in (1a) is evidenced by the observation that the truth of its complement cannot be denied without yielding a contradiction (see the semantic deviance of (2)):

- (2) #John remembers that a was woman dancing, but (in fact) no woman was dancing.

It is also evidenced by the observation that, in contexts in which the speaker explicitly acknowledges their ignorance about the truth of the complement, this acknowledgement cannot be felicitously combined with a sentence that embeds this complement under *remember* (as in (3a); due to [3, 4], following [27]):

- (3) a. #I do not know whether a woman was dancing, but John remembers that a woman was dancing.
- b. *Contrast*: ✓I don’t know whether a woman was dancing, but Mary believes that a woman was dancing.

The factivity of (1a) is further evidenced by the observation that, in contexts in which the truth of the CP has been established, a speaker can only make a genuine conversational contribution by expressing a knowledge-like attitude towards the content of this CP (see (4-i); due to [3]):

- (4) A: A woman was dancing in the park.
 - i. B: ✓I {know, remember} that a woman was dancing in the park.
 - ii. B: #I {believe, think} that a woman was dancing in the park.

Analogously to the above, factivity inferences are also valid in *remember*-reports with (untensed) gerundive small clause complements:

- (5) *Context*: During last week’s picnic in the park, John saw a woman dancing.
 - a. John remembers a/the woman dancing.
 $\overset{\text{presup}}{\Rightarrow}$ ‘A woman was dancing(-in-@).’
 - b. John does not remember a/the woman dancing.
 $\overset{\text{presup}}{\Rightarrow}$ ‘A woman was dancing(-in-@).’

The factivity of (5a) is evidenced by the observation that this report likewise passes the contradiction test from (2) (see (6)), the speaker’s ignorance test from (3)

(see (7)), and the vacuous dialogue test from (4) (see (8)):²

- (6) #John remembers a woman dancing, but there was no such woman./
 ..., but no woman was dancing.
- (7) a. #I do not know whether a woman was dancing(-in-@), but John remembers a woman dancing(-in-@).
 b. *Contrast*: ✓I don't know whether a woman is dancing(-in-@), but Mary imagines a woman dancing(-in-@).
- (8) A: A woman was dancing in the park.
 i. B: ✓I remember a woman dancing(-in-@).
 ii. B: #I imagine a woman dancing(-in-@).

However, in gerundive *remember*-reports, the validity of the factivity inference seems to vary with the (non-linguistic) context.³ In particular, while this inference is valid in cases (e.g. (5)) where the remembering targets the object of a past (veridical) visual perception, it is invalid in cases (e.g. (9)) where the remembering targets the object of a past counterfactual experience (there, of a dream):

- (9) *Context*: After the picnic, John dozed off and dreamt of a hippo singing.
 a. John remembers a hippo singing.
 $\overset{\text{presup}}{\cancel{\#}}$ 'A hippo was singing(-in-@).'
- b. John does not remember a hippo singing.
 $\overset{\text{presup}}{\cancel{\#}}$ 'A hippo was singing(-in-@).'

The non-factivity of the *remember*-report in (9a) is evidenced by the fact that – unlike the truth of the complement in (5a) (see (6)) – the truth of the complement in (9a) can be denied without yielding a contradiction (see (10)):

- (10) ✓John remembers a hippo singing, but there was no such hippo (who was singing). It all – and only (!) – happened in his dream ...

The report in (9a) further fails (!) the speaker's ignorance test (see (11)), and the vacuous dialogue test (see (12)):

- (11) ✓I do not know whether a hippo was singing(-in-@), but John remembers a hippo singing(-in-his-dream).
- (12) A: A woman was dancing in the park (in John's dream).
 i. B: ✓I remember a woman dancing in the park.
 ii. B: ✓I imagine a woman dancing in the park.

Note: To apply the speaker's ignorance test to (9a), we interpret the occurrences

² Since *know*, *believe*, and *think* do not accept gerund complements, we only consider the *remember*-case of (4) in (8), and replace *believe* and *think* in the 'vacuous' case by *imagine*.

³ We will show below that the factivity inference can also vary with the report's linguistic context. This is the case when the embedded content is obviously counterfactual (e.g. in the case of singing hippos or squared circles) or when the report's complement contains an explicit counterfactual predicate (e.g. *dream(ing)*; see (25) and Sect. 3).

of *singing* from (11) at different indices (viz. at the real/actual world, @, resp. at John’s oneiric [= dream-]scene). If we had not done this, (11) would be straightforwardly false, due to the falsity of ‘John remembers a hippo singing-in-@’.

Our paper seeks to explain the difference in factivity between (5) and (9). To motivate the need for a designated account of factivity variation in gerundive *remember*-reports, we first review leading semantic accounts of factivity and factivity variation, and show that they are unable to account for our findings (Sect. 2). We then introduce the core idea of our account, viz. the parasitic dependence of memory content on the content of a personal past experience (see Sect. 3). Section 4 provides a compositional semantics for gerundively complemented occurrences of *remember* that has built-in the notion of experiential parasitism. Section 5 uses this semantics to account for factivity variation in (5) and (9). The paper closes with a summary of our results and with pointers to future work.

2 Existing accounts

The difference in factivity between (5a) and (9a) poses a challenge for existing semantic accounts of factivity. Most of these accounts explain factivity inferences like (5a) through the lexical-compositional semantics of the embedding occurrence of *remember* (e.g. (13a); see [9, 25]) or through the particular semantics of the complementizer *that* (e.g. (14a); see [13, 14, 16]). In (13a) and (14a), the factivity presupposition (i.e. ‘*p* is true at the actual world, @’) is underlined.

- (13) a. $\llbracket \text{remember}_1 \rrbracket^@ = \lambda p^{(s,t)} : \underline{p}_@ . \lambda z^e . \text{remember}'_@(z, p)$ (factive)
 b. $\llbracket \text{remember}_2 \rrbracket^@ = \lambda p^{(s,t)} . \lambda z^e . \text{remember}'_@(z, p)$ (non-factive)
- (14) a. $\llbracket \text{that}_F \rrbracket = \lambda p^{(s,t)} : \underline{p}_@ . \lambda w^s . p_w$ (factive)
 b. $\llbracket \text{that}_T \rrbracket = \lambda p^{(s,t)} . \lambda w^s . p_w$ (non-factive)

In their simplest form, the above accounts straightforwardly capture the factivity inference in (1b) (see (15) resp. (16)):

- (15) $\llbracket (1b) \rrbracket^@ \equiv \llbracket \text{not} \rrbracket (\llbracket \text{remember}_1 \rrbracket^@ (\llbracket (\text{that}) \text{ a woman danced} \rrbracket) (\llbracket \text{John} \rrbracket))$
 $= \frac{\exists x . \text{woman}_@(x) \wedge \text{dance}_@(x)}{\neg \text{remember}'_@(john, \lambda w \exists y . \text{woman}_w(y) \wedge \text{dance}_w(y))}$
 $\Rightarrow \exists x . \text{woman}_@(x) \wedge \text{dance}_@(x)$
- (16) $\llbracket (1b) \rrbracket^@ \equiv \llbracket \text{not} \rrbracket (\llbracket \text{remember}_2 \rrbracket^@ (\llbracket \text{that}_F \rrbracket (\llbracket \text{a woman danced} \rrbracket)) (\llbracket \text{John} \rrbracket))$
 $= \frac{\neg \text{remember}'_@(john, \exists x . \text{woman}_@(x) \wedge \text{dance}_@(x))}{\lambda w \exists x . \text{woman}_w(x) \wedge \text{dance}_w(x)}$
 $\equiv (\exists x . \text{woman}_@(x) \wedge \text{dance}_@(x)) \wedge$
 $\quad \neg \text{remember}'_@(john, \lambda w \exists y . \text{woman}_w(y) \wedge \text{dance}_w(y))$
 $\Rightarrow \exists x . \text{woman}_@(x) \wedge \text{dance}_@(x)$

Assuming Stephenson’s [28] semantics for ‘experiential’ [= event-directed] occurrences of *remember* (see (17)), ‘verb-based’ accounts (i.e. accounts like (15) that explain factivity inferences through the semantics of the embedding verb) will

also be able to capture the non-tensed variant of (1a), i.e. (5a). In (17), s is a Kratzer-style situation [15]. Since the relevant relation in (17) involves situations rather than propositions, we use a different constant, viz. *remember''*, in (17):

$$(17) \quad \llbracket \text{remember}_3 \rrbracket^{\textcircled{a}} = \lambda p^{(s,t)} \lambda z^e \exists s : p_s \wedge p_{\textcircled{a}}. \text{remember}''_{\textcircled{a}}(z, s)$$

The need for a different semantics for the interpretation of (5a) (*vis-à-vis* of (1a)) is apparent from the observation that (5a) has different truth-conditions from (1a): to be true, (5a) requires that John has personally (here: visually/perceptually) experienced a woman dancing. In contrast, the truth of (1a) does not make such requirement. In particular, only (1a) – but not (5a) – is true in a scenario in which Mary told John that a woman had been dancing in the park.

Its merits notwithstanding, the above accounts fail to capture the non-factivity of (9a): To explain the non-validity of factivity-inferences, ‘verb based’-accounts could employ so-called PLUGS [12] (which block presuppositions from projecting) or could assume that the verb *remember* is ambiguous between two homophonous lexical entries, viz. a factive *remember*₁ and a non-factive *remember*₂ (see (13)).⁴ The non-factivity of (9a) could then be captured by analyzing its matrix verb as *remember*₂ (see (13b)):

$$(18) \quad \begin{aligned} \text{a. } \llbracket (9a) \rrbracket^{\textcircled{a}} &\equiv \llbracket \text{remember}_2 \rrbracket^{\textcircled{a}}(\llbracket \text{a hippo sang} \rrbracket)(\llbracket \text{John} \rrbracket) \\ &= \text{remember}'_{\textcircled{a}}(\text{john}, \lambda w \exists x. \text{hippo}_w(x) \wedge \text{sing}_w(x)) \\ &\not\equiv \exists x. \text{hippo}_{\textcircled{a}}(x) \wedge \text{sing}_{\textcircled{a}}(x) \end{aligned}$$

However, these strategies are ruled out by the observation that the complements in (5a) and (9a) can be embedded under a single experiential use of *remember* (in (19a); see [4]). For example, this is possible under the assumption of the combined contexts from (5) and (9):

- (19) When his friend asked John about his day at the park, John reported the following:
- a. I remember a woman dancing and a hippo singing.

A similar argument can be provided against the assumption that *remember* is always factive, but has a non-literal use in (9a).

Analogous to the above, ‘complement-based’ accounts [13, 16] (i.e. accounts like (16) that explain factivity inferences through the semantics of the complement) could try to locate the difference between (5a) and (9a) instead in the matrix verb’s complement. The difference in factivity of these reports could then be explained through the use of two different (silent) complementizers, \emptyset_1 (our earlier *that*_F; see (20a)) and \emptyset_2 (our earlier *that*_T; see (20b)), or of two different silent determiners, Δ_1 and Δ_2 , (see (21), where σ is a variable over events or scenes). The former strategy follows Kratzer’s [16] assumption of a factive and a ‘trivial’ complementizer *that*. The latter strategy follows Kastner’s [13] assumption of a covert presuppositional determiner, Δ .

$$(20) \quad \text{a. } \llbracket \emptyset_1 \rrbracket = \lambda p: p_{\textcircled{a}}. \lambda w. p_w \quad (\text{factive})$$

⁴ These two alternatives are given – and later rejected – as explanatory options in [4].

- (21) b. $[[\emptyset_2]] = \lambda p. \lambda w. p_w$ (non-factive)
 a. $[[\Delta_1]] = \lambda p: \underline{p_\oplus}. \eta\sigma. p_\sigma$ (factive)
 b. $[[\Delta_2]] = \lambda p. \eta\sigma. p_\sigma$ (non-factive)

The possibility of rephrasing (1a) – but not the finite-clause variant, (23a), of (9a) – through a *fact*-DP (see (22) *vis-à-vis* (23b)) makes the Kastner-style route promising.

- (22) John remembers *the fact* that a woman was dancing (in the real world).
 (23) a. John remembers that a hippo was singing (in his dream).
 b. ??John remembers *the fact* that a hippo was singing.

The promise of this route is further strengthened by the observation that the complement in (5a) behaves syntactically very much like a definite DP (see [8]). However, this promise is dampened by the observation that (5a) and (9a) display the same syntactic behavior. As a result, it seems implausible to analyze them through different silent determiners. The use of Δ_1 and Δ_2 is further challenged by the difficulty of integrating it into existing semantics for the verb *remember*. This holds both for the ‘classical’ semantics in (13) and for Stephenson’s semantics in (17).

Strategy

We propose to explain the difference in factivity between (5a) and (9a) through the observation that the content of the reported remembering depends on the content of an underlying experience.⁵ In the context for (5a) (i.e. (5)), this experience is John’s (visual) perceiving. In the context for (9a) (i.e. (9)), the relevant experience is John’s dreaming. To capture this content-dependence, we call remembering the *parasite attitude* (following Maier [20]; see [1, 2, 21]), call the experience the *host attitude* (or the *host experience*), and describe their dependence as *experiential parasitism* (see [19]). The different veridicality properties of these experiences (typically: the veridicality of (visual) perception and the anti-veridicality of dreaming) then explain the different inference behavior of (5a) and (9a): since perception is typically veridical, the factivity inference arises in (5a). Since dreaming is typically counterfactual [= non-veridical], the inference does not arise in (9a).

3 Background: experiential parasitism

Our example reports in (5a) and (9a) have explicitly introduced a visual, respectively an oneiric [= dream-] experience on which John’s remembering is parasitic. The parasitic dependence of the relevant remembering-events on these primary experiences is supported by the observation that, in the contexts from (5) and

⁵ It is this dependency that motivates the name ‘*experiential* remembering’. In psychology and cognitive science, experiential remembering is called ‘*episodic* remembering’, following the work of Endel Tulving (see e.g. [5, 29, 30]).

(9), (5a) and (9a) can be paraphrased by reports, i.e. (24a, b) resp. (25a, b), that explicitly refer to the target of this experience (here: to the visual scene that features a dancing woman resp. to the oneiric scene that features a singing hippo). In the paraphrases below, the parasite attitude [= remembering] is given a grey frame. The host experience [= perception vs. dreaming] is highlighted in grey.

- (24) a. John remembers a (particular) visual scene in which a woman was dancing.
 b. John remembers the woman whom he saw at the park last week dancing in the park .
- (25) a. John remembers an oneiric scene in which a hippo was singing.
 b. John remembers the hippo from his dream singing in his dream .

Other examples of experiential parasitism are given in (26) and (27). Example (26) is due to Ninan [24, ex. (18)]. Example (27) is inspired by Blumberg [2, ex. (102)]:

- (26) Ralph is imagining the man whom he sees sneaking around on the waterfront flying a kite in an alpine meadow (in his imagination.)
- (27) Ida is imagining the unicorn of which she dreamt last night basking in the sun (in her imagination).

In (24)–(27), the parasitic behavior of the reported attitude (there: remembering resp. imagining) is made explicit by the presence of predicates for the host experience (there: *visual/see* resp. *oneiric/dream*). However, the experience-dependence of gerundive *remember*-reports is also evidenced when the underlying experience is not made explicit. This evidence includes the intuitive validity of inferences to the remembering agent’s experience of the described scene [28] (see (26)–(27)):

- (26) a. John remembers a woman dancing. (see (5a))
 ⇒ b. John has seen/perceptually experienced a woman dancing.
- (27) a. John remembers a hippo singing. (see (9a))
 ⇒ b. John has mentally/counterfactually experienced a hippo singing.

Relevant evidence further includes the observation that some ‘memory’ reports (esp. *misremember*-reports like (28a)) only have intuitive truth-conditions on a reading that evaluates some of their complements’ constituents at the experienced scene itself (in (16b)). (The example below is modelled on Blumberg’s [2] ‘burgled Bill’-case):

- (28) *Context*: Last night, Bill dreamt of a woman with tattoos (no one in particular whom he has come across in real life).

- a. Now, he misremembers her having clear, untattooed skin.
- ≠ i. *de re*: There exists a tattooed woman whom Bill mis- (✗)
remembers having clear, untattooed skin.
- ≠ ii. *de dicto*: Bill remembers (wrongly) an inconsistent scene (✗)
in which a woman does and does not have tattoos.
- ≡ b. Bill misremembers the tattooed woman from his dream (✓)
having clear, untattooed skin.

To capture parasitic dependencies like the above, Blumberg [1] has proposed to parametrize the familiar semantic values of attitude complements (i.e. sets of possible ‘parasite’ worlds; above: Bill’s misremembering-alternatives) by the respective ‘host’ worlds (here: Bill’s oneiric alternatives). This parametrization yields sets of ordered pairs of worlds [= Blumberg’s *paired propositions*] (see also [23, Ch. 2], [19]). The first element in these pairs is a ‘host’ world/alternative. The second element is a ‘parasite’ world that depends on the host alternative.

Since the different constituents of experiential *remember*-complements are always interpreted at the same worlds (see (24) and (25) *vis-à-vis* (26), (27), and (28a)), we do not need to resort to a fully-fledged two-dimensional semantics. However, to account for factivity variation in experiential *remember*-reports, we still need to capture the dependence of the remembered content on the content of the experience:

4 A uniform semantics for experiential *remember*

To capture the parasitic dependence of remembering on an experience, we give the occurrences of *remember* from (5a) [*John remembers a woman dancing*] and (9a) [*John remembers a hippo singing*] the semantics in (29). This semantics treats experiential remembering as a relation to a scenario, σ , that is constructed during the agent’s recall of the originally experienced scene (see [5, 28]). To ensure that scenario-construction proceeds on the basis of this scene,⁶ we require that the remembering agent, z , (above: John) is related to the linguistically expressed content, p , of σ (in (5a): ‘a woman dance’) through an experience with content p (see the presupposition on the remembering event e).⁷

In the context from (5), the host experience is the event of John’s looking around in [= visually perceiving] the park; the content of this experience is ‘a woman dances/is dancing’. In (29), ‘ $exp_{w_{@}}(z, p)$ ’ expresses that, in (some specific spatio-temporal location of) the world, $w_{@}$, of which @ is part, z has (had) an experience with content p .

$$(29) \quad \llbracket \text{remember}_{\text{EXP}} \rrbracket^@ = \lambda p \lambda z \exists e : \underline{exp_{w_{@}}(z, p)}. \text{remember}_{@}(e, z, \eta_e \sigma. p \sigma)$$

⁶ A large number of works in psychology have shown that remembering is a constructive process that is compatible with the generation of new contents (see e.g. [5, 7, 22, 26]). As a result, we cannot identify $\iota_e \sigma. p \sigma$ with the experienced scene.

⁷ To keep our semantics as simple as possible, we here omit the requirement that this experience temporally precedes e .

To capture the intuition that σ varies with the particular remembering-event, e (and, thus, with the remembering agent, the time, and the content of remembering), we identify σ through a choice function, η_e , that is dependent on e . Letting σ vary only with the remembering agent, z , would not be enough. In particular, this move would fail to capture the observation that, in different (temporal, social, or communicative) contexts, the same agent may construct different scenarios in which p is true. For example, in remembering one’s first day of school, one would typically construct a very different scenario today that one would have twenty years ago.

Note that the role of the presupposition in (29) cannot be alternatively played by an entailment (see the competitor semantics in (30)):⁸

$$(30) \quad \begin{aligned} & \llbracket \text{remember}_{\text{EXP}} \rrbracket_{alt}^{\textcircled{a}} \\ & = \lambda p \lambda z \exists e. \text{exp}_{w_{\textcircled{a}}}(z, p) \wedge \text{remember}_{\textcircled{a}}(e, z, \eta_e \sigma. p_{\sigma}) \end{aligned}$$

Doing so would fail to capture the inference in (5b) (see (31)):

$$(31) \quad \begin{aligned} \llbracket (5b) \rrbracket^{\textcircled{a}} &= \llbracket \text{not} \rrbracket (\llbracket \text{remember}_{\text{EXP}} \rrbracket_{alt}^{\textcircled{a}} (\llbracket \text{a woman dance} \rrbracket) (\llbracket \text{John} \rrbracket)) \\ &= \neg(\exists e) [\text{exp}_{w_{\textcircled{a}}}(john, \lambda s \exists y. \text{woman}_s(y) \wedge \text{dance}_s(y)) \wedge \\ & \quad \text{remember}_{\textcircled{a}}(e, john, \eta_e \sigma. (\exists x. \text{woman}_{\sigma}(x) \wedge \text{dance}_{\sigma}(x)))] \\ & \not\Rightarrow \exists x. \text{woman}_{\textcircled{a}}(x) \wedge \text{dance}_{\textcircled{a}}(x) \end{aligned}$$

The non-validity of (31) even holds in cases in which the experienced scene is a spatio-temporal part of \textcircled{a} (see Sect. 5). This is so since the interpretation of (5b) from (31) is already true if the first conjunct in the scope of the negation is false.

The semantics in (29) enables the compositional interpretation of (5a) and (5b) as (32) respectively as (33):

$$(32) \quad \begin{aligned} \llbracket (5a) \rrbracket^{\textcircled{a}} &= \llbracket \text{remember}_{\text{EXP}} \rrbracket^{\textcircled{a}} (\llbracket \text{a woman dancing} \rrbracket) (\llbracket \text{John} \rrbracket) \\ &= \frac{\exists e: \text{exp}_{w_{\textcircled{a}}}(john, \lambda s \exists y. \text{woman}_s(y) \wedge \text{dance}_s(y))}{\text{remember}_{\textcircled{a}}(e, john, \eta_e \sigma. (\exists x. \text{woman}_{\sigma}(x) \wedge \text{dance}_{\sigma}(x)))} \end{aligned}$$

$$(33) \quad \begin{aligned} \llbracket (5b) \rrbracket^{\textcircled{a}} &= \llbracket \text{not} \rrbracket (\llbracket \text{remember}_{\text{EXP}} \rrbracket^{\textcircled{a}} (\llbracket \text{a woman dancing} \rrbracket) (\llbracket \text{John} \rrbracket)) \\ &= \neg \exists e: \frac{\text{exp}_{w_{\textcircled{a}}}(john, \lambda s \exists y. \text{woman}_s(y) \wedge \text{dance}_s(y))}{\text{remember}_{\textcircled{a}}(e, john, \eta_e \sigma. (\exists x. \text{woman}_{\sigma}(x) \wedge \text{dance}_{\sigma}(x)))} \end{aligned}$$

The reports (9a) [*John remembers a hippo singing*] and (9b) [*John does not remember a hippo singing*] receive an analogous interpretation.

5 Accounting for factivity variation

Note that, by themselves, the interpretations in (32) and (33) still do not capture the factivity inference in (5a) respectively in (5b). To validate these inferences, we need either (i) a context like (5), (ii) an explicit linguistic specification of the

⁸ I owe the idea for this alternative to an anonymous reviewer. However, since John’s remembering in (5) is directed towards an event or scene, (5a) cannot be interpreted as asserting John’s remembering that a woman was dancing in his experienced scene, as this reviewer suggests.

particular mode of the experience (along the lines of (26)–(27); together with assumptions about the veridicality of this mode), or (iii) an assumption about the default veridicality (or anti-veridicality) of the experiential source of remembering. These assumptions allow the further specification of the experience predicate, exp , in (29) with respect to its veridicality (or anti-veridicality).

For the purposes of this paper, we assume that this specification proceeds through a veridicality operator \mathcal{V} (in (34a)), respectively through an anti-veridicality operator \mathcal{A} (in (34b)). These operators add an assumption about the relation between the propositional content, p , of the experience and the relevant part, $w_{\textcircled{a}}$, of the actual world at which the report is evaluated.

$$(34) \quad \begin{array}{l} \text{a. } \mathcal{V} := \lambda p^{(s,t)} \lambda z. exp_{w_{\textcircled{a}}}(z, p) \wedge p_{w_{\textcircled{a}}} \\ \text{b. } \mathcal{A} := \lambda p^{(s,t)} \lambda z. exp_{w_{\textcircled{a}}}(z, p) \wedge \neg p_{w_{\textcircled{a}}} \end{array}$$

In (32), the veridicality-specification (through \mathcal{V}) is triggered by the context from (5) – especially by the verb *see* and by a default assumption about the veridicality of visual perception. This specification adds a ‘veridicality conjunct’, $p_{w_{\textcircled{a}}}$, in the presupposition of e (see (35a)). This conjunct validates the factivity inference on the global interpretation of the presupposition (see (35b)):

$$(35) \quad \begin{array}{l} \text{a. } \llbracket (5a) \rrbracket^{\textcircled{a}} + \text{‘see’} = \llbracket \text{remember}_{\mathcal{V}(\text{EXP})} \rrbracket^{\textcircled{a}} (\llbracket \text{a woman dancing} \rrbracket) (\llbracket \text{John} \rrbracket) \\ = \exists e: \frac{\mathcal{V}(exp_{w_{\textcircled{a}}}(john, \lambda s \exists y. woman_s(y) \wedge dance_s(y)))}{remember_{\textcircled{a}}(e, john, \eta_e \sigma. (\exists x. woman_{\sigma}(x) \wedge dance_{\sigma}(x)))} \\ = \exists e: \frac{exp_{w_{\textcircled{a}}}(john, \lambda s \exists y. woman_s(y) \wedge dance_s(y)) \wedge}{(\exists x. woman_{w_{\textcircled{a}}}(x) \wedge dance_{w_{\textcircled{a}}}(x))} . \\ remember_{\textcircled{a}}(e, john, \eta_e \sigma. (\exists x. woman_{\sigma}(x) \wedge dance_{\sigma}(x))) \\ \text{b. } (\exists x. woman_{w_{\textcircled{a}}}(x) \wedge dance_{w_{\textcircled{a}}}(x)) \wedge \\ \frac{(\exists e: exp_{w_{\textcircled{a}}}(john, \lambda s \exists y. woman_s(y) \wedge dance_s(y)) \wedge}{remember_{\textcircled{a}}(e, john, \eta_e \sigma. (\exists x. woman_{\sigma}(x) \wedge dance_{\sigma}(x)))} \\ \Rightarrow (\exists x. woman_{w_{\textcircled{a}}}(x) \wedge dance_{w_{\textcircled{a}}}(x)) = \llbracket \text{A woman dance(d)} \rrbracket^{\textcircled{a}} \end{array}$$

In contrast to the above, the context from (9) effects an anti-veridicality specification (through \mathcal{A}). This specification adds an ‘anti-veridicality conjunct’, $\neg p_{w_{\textcircled{a}}}$, in the presupposition of e (see (36a)). This conjunct validates the factivity inference on the global interpretation of the presupposition (see (36b)):

$$(36) \quad \begin{array}{l} \text{a. } \llbracket (9a) \rrbracket^{\textcircled{a}} + \text{‘dream’} = \llbracket \text{remember}_{\mathcal{A}(\text{EXP})} \rrbracket^{\textcircled{a}} (\llbracket \text{a hippo is singing} \rrbracket) (\llbracket \text{John} \rrbracket) \\ = \exists e: \frac{\mathcal{A}(exp_{w_{\textcircled{a}}}(john, \lambda s \exists y. hippo_s(y) \wedge sing_s(y)))}{remember_{\textcircled{a}}(e, john, \eta_e \sigma. (\exists x. hippo_{\sigma}(x) \wedge sing_{\sigma}(x)))} \\ = \exists e: \frac{exp_{w_{\textcircled{a}}}(john, \lambda s \exists y. hippo_s(y) \wedge sing_s(y)) \wedge}{\neg(\exists x. hippo_{w_{\textcircled{a}}}(x) \wedge sing_{w_{\textcircled{a}}}(x))} . \\ remember_{\textcircled{a}}(e, john, \eta_e \sigma. (\exists x. hippo_{\sigma}(x) \wedge sing_{\sigma}(x))) \end{array}$$

$$\begin{aligned}
\text{b. } & \neg(\exists x. \text{hippo}_{w_{\text{@}}}(x) \wedge \text{sing}_{w_{\text{@}}}(x)) \wedge \\
& \quad (\exists e : \text{exp}_{w_{\text{@}}}(john, \lambda s \exists y. \text{hippo}_s(y) \wedge \text{sing}_s(y)) \wedge \\
& \quad \text{remember}_{\text{@}}(e, john, \eta_e \sigma. (\exists x. \text{hippo}_{\sigma}(x) \wedge \text{sing}_{\sigma}(x)))) \\
& \Rightarrow \neg(\exists x. \text{hippo}_{w_{\text{@}}}(x) \wedge \text{sing}_{w_{\text{@}}}(x)) = \llbracket \text{No hippo sang} \rrbracket^{\text{@}} \\
\text{c. } & \not\equiv (\exists x. \text{hippo}_{w_{\text{@}}}(x) \wedge \text{sing}_{w_{\text{@}}}(x))
\end{aligned}$$

Alternatively to the above, we could assume that the context in (9) simply refrains from further specifying the veridicality- (or anti-veridicality) properties of the presupposed experience. Since, by itself, our semantics for (9a) neither validates nor blocks the factivity inference in (9a) (see (32)), such refraint would still account for the non-validity of this inference (see (36b)).

We have suggested at the beginning of this section that the particular mode of the ‘host’ experience can also be specified through an explicit predicate (e.g. *visual/see* resp. *oneiric/dream*; see (24)–(25)). For these predicates, we assume the semantics in (37). To allow us to use the semantics for experiential *remember* from (29) (which takes propositions – rather than scenes – as input), these interpretations represent scenes σ as sets, p , of situations:⁹

$$\begin{aligned}
(37) \quad \text{a. } & \llbracket \text{visual} \rrbracket = \lambda p \lambda s \exists z. p_s \wedge (\text{see}_{w_{\text{@}}}(z, p) \wedge p_{w_{\text{@}}}) \\
& \text{b. } \llbracket \text{oneiric} \rrbracket = \lambda p \lambda s \exists z. p_s \wedge (\text{dream}_{w_{\text{@}}}(z, p) \wedge \neg p_{w_{\text{@}}})
\end{aligned}$$

$$(38) \quad \llbracket \text{a scene in which} \rrbracket = \lambda p^{(s,t)} \lambda s. p_s$$

In (37a/b), the second conjunct (highlighted in grey) serves the same function as the veridicality (or anti-veridicality) conjunct in (34a) (resp. (34b)). When they are built into the compositional semantics of (24a) respectively of (25a), (37a/b) help validate (resp. block) the discussed factivity inferences:

$$\begin{aligned}
(39) \quad \llbracket (24a) \rrbracket^{\text{@}} & \equiv \llbracket \text{remember}_{\text{EXP}} \rrbracket^{\text{@}} \\
& \quad (\llbracket \text{visual} \llbracket \text{scene in which} \llbracket \text{a woman is dancing} \rrbracket \rrbracket \rrbracket) (\llbracket \text{John} \rrbracket) \\
& = \exists e : \text{see}_{w_{\text{@}}}(john, \lambda s \exists y. \text{woman}_s(y) \wedge \text{dance}_s(y)) \wedge (\exists x. \text{woman}_{w_{\text{@}}}(x) \wedge \\
& \quad \text{dance}_{w_{\text{@}}}(x)) \cdot \text{remember}_{\text{@}}(e, john, \eta_e \sigma. \exists x. \text{woman}_{\sigma}(x) \wedge \text{dance}_{\sigma}(x)) \wedge \\
& \quad \text{see}_{w_{\text{@}}}(john, \lambda s' \exists y. \text{woman}_{s'}(y) \wedge \text{dance}_{s'}(y)) \wedge (\exists x. \text{woman}_{w_{\text{@}}}(x) \wedge \\
& \quad \text{dance}_{w_{\text{@}}}(x)) \\
& \Rightarrow (\exists x. \text{woman}_{w_{\text{@}}}(x) \wedge \text{dance}_{w_{\text{@}}}(x)) = \llbracket \text{A woman dance(d)} \rrbracket^{\text{@}}
\end{aligned}$$

$$\begin{aligned}
(40) \quad \llbracket (25a) \rrbracket^{\text{@}} & \equiv \llbracket \text{remember}_{\text{EXP}} \rrbracket^{\text{@}} \\
& \quad (\llbracket \text{oneiric} \llbracket \text{scene in which} \llbracket \text{a hippo is singing} \rrbracket \rrbracket \rrbracket) (\llbracket \text{John} \rrbracket) \\
& = \exists e : \text{dream}_{w_{\text{@}}}(john, \lambda s \exists y. \text{hippo}_s(y) \wedge \text{sing}_s(y)) \wedge \neg(\exists x. \text{hippo}_{w_{\text{@}}}(x) \wedge
\end{aligned}$$

⁹ For reasons of space and perspicuity, this representation – as well as the associated interpretations – are very much simplified. A careful presentation and discussion can be found in [17, 18].

$$\begin{aligned}
& \overline{sing_{w_{\textcircled{a}}}(x)} . remember_{\textcircled{a}}(e, john, \eta_e \sigma. \exists x. hippo_{\sigma}(x) \wedge sing_{\sigma}(x)) \wedge \\
& \overline{dream_{w_{\textcircled{a}}}(john, \lambda s' \exists y. hippo_{s'}(y) \wedge sing_{s'}(y))} \wedge \neg(\exists x. hippo_{w_{\textcircled{a}}}(x) \wedge \\
& \overline{sing_{w_{\textcircled{a}}}(x)}) \\
\Rightarrow & \neg(\exists x. hippo_{w_{\textcircled{a}}}(x) \wedge sing_{w_{\textcircled{a}}}(x)) = \llbracket \text{No hippo sang} \rrbracket^{\textcircled{a}}
\end{aligned}$$

Note that, in (39) and (40), the inference (or non-inference) to the truth of the embedded sentence is not (only) validated by the global interpretation of the pre-supposition (*contra* (35) and (36)). Rather, the inference is a veridicality (!) inference that is based on conjunction elimination. The observation that the complement in (24a) cannot be denied without yielding a contradiction (see (41)) and that the observed inference projects through the negation of (24a) (see (42)) is explained by the fact that (24a) also still presupposes the truth of its complement (see (39)).

- (41) #John remembers a visual scene in which a woman was dancing, but no woman was dancing.
- (42) John does not remember the visual scene in which a woman was dancing.
 $\xRightarrow{\text{presup}}$ ‘A woman was dancing.’

6 Outlook

Our discussion in this paper has focused on factivity variation in gerundive *remember*-reports. Since experiential remembering can also be attributed through *that*-clause reports like (5a) (copied in (43a); see [6, 32]), we expect that our proposed semantics will also be able to account for factivity variation in experientially parasitic *propositional* remembering (e.g. (43)):

- (43) *Context*: During his picnic in the park, John saw a woman dancing
a. (Now,) John remembers that the woman was dancing.

In future work, we plan to investigate the differences between propositional and experiential parasitic remembering. This investigation will particularly focus on the scene- vs. propositional interpretation of the semantic *remember*-complement, and on the compositional contribution of the complementizer *that*. This work will also study whether factivity variation in *remember*-reports is restricted to experientially parasitic reports, or whether it can also be observed in other, non-experiential contexts (possibly in reports like (44) and (45)).

- (44) John remembered that 37 is a prime number.
- (45) John remembered that Ron Weasley has red hair.

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