

# Knowledge reports with and without true belief

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## 1 Introduction

In Turkish, with what are known from other languages as ‘cognitive factive’ verbs, **the availability of the factive inference is conditioned by the syntax of the embedded clause.**

(1) **The factivity alternation:**

- |   |   |
|---|---|
| a. <b>Tensed embedded clause + <i>bil</i>:</b>                      | Non-factive   |
| Tunc [Hillary kazan-di diye] biliyor<br>T. H. win-PST diye knows    |   |
| Tunc believes (lit. ‘knows’) that Hillary won.                      |   |
| b. <b>Nominalized embedded clause + <i>bil</i>:</b>                 | Factive   |
| Tunc [Hillary'nin kazan-digin-i] biliyor<br>T. H. win-NMZ-ACC knows |   |
| Tunc knows that Hillary won   |   |
| c. ama kazanmadı.<br>but she didn't win.                            | $\left. \begin{array}{l} \\ \end{array} \right\}$ ✓ after (1a); # after (1b). |

**Question:** How to account for the FA, given a unified semantics for attitude verbs that undergo it?

- ✗ Some accounts of the factive inference encode it in the lexical semantics of the attitude verb.  
⇒ The non-factivity of (1a) is unexpected.
- ✗ Some encode factivity in the denotation of the embedded clause.  
⇒ Nominalizations do not necessarily denote facts/true propositions.
- ✓ Proposal:
  - Predicates like *bil*- are not inherently factive.  
In particular, *bil*- denotes a ***de re justified belief*** relation.
  - **The factive inference arises in the composition** between cognitive factives and nominalizations.

### Accounting for the alternants:

- *bil*- introduces a RES DESCRIPTION and a BELIEF PREDICATE.
- The non-factive alternant:  
The RES DESCRIPTION and the BELIEF CONTENT **may mismatch**.
  - (2)  $\llbracket(1a)\rrbracket$  is true iff  
Tunc has the justified belief about  $\overbrace{\text{the Trump victory...}}^{\text{RES}}$   
 $\dots$  that  $\underbrace{\text{it is a Hillary victory.}}_{\text{BELIEF CONTENT}}$
- The factive alternant:  
The RES DESCRIPTION and the BELIEF CONTENT **must match**.
  - (3)  $\llbracket(1b)\rrbracket$  is true iff  
Tunc has the justified belief about  $\overbrace{\text{the Hillary victory...}}^{\text{RES}}$   
 $\dots$  that  $\underbrace{\text{it is a Hillary victory.}}_{\text{BELIEF CONTENT}}$

### The match is enforced in the semantic composition.

- Outline:
  - Section 2: The FA is a regular alternation
  - Section 3: Justified belief
  - Section 4: Proposal
  - Section 5: Remaining issues

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## 2 The FA is a regular alternation

Nominalized clause + *bil* : Factive.  
Tensed clauses + *bil* : Not factive.

- When triggered, the factive inference **projects**.

- (4) Tunc [Trump'in kazandigini] *bilmiyor*.  
 Tunc Trump win.NMZ know.NEG  
 Tunc doesn't know that Trump won.  $\rightsquigarrow$  Trump won.

- The negation of non-factive *bil*- reports gives rise to meanings similar to NEG[*S believes p*]. (In particular wrt neg raising.)
- Verbs that we know of from other languages as **cognitive factives participate in the alternation**.

- (5) Factive interpretation (5)  $\rightsquigarrow$  Trump won
- Tunc [Trump'in kazandigini] *hatirliyor*.  
 T. Trump win.NMZ remembers
  - anladi*.  
 understood
  - ogrendi*.  
 learned
  - gordu*.  
 saw
- Tunc {remembers, understood, ...} that Trump won.

- (6) Non-factive interpretation (6)  $\not\rightsquigarrow$  Trump won
- Tunc [Trump kazandi diye] *hatirliyor*.  
 T. Trump win.PST diye remembers
  - anladi*.  
 understood
  - ogrendi*.  
 learned
  - gordu*.  
 saw
- Tunc {remembers<sub>NF</sub>, understood<sub>NF</sub>, ...} that Tr. won.

- What does it mean to e.g., 'remember,' non-factively?

- (7) **Context:** Who won the election in 2016?  
 Hillary kazandi diye hatirliyorum.  
 Hillary won diye I remember  
 I remember<sub>NF</sub> that Hillary won.  $\not\rightsquigarrow$  Hillary won

There is a 'remembering event,' but Speaker cannot presuppose *p*.

- Vs that we know as **non-factives do not participate in the FA**.

- (8) a. Tunc [Trump'in kazandigini] *hayal etti*.  
 T. Trump win.NMZ imagined  
 b. *dusunuyor*.  
 thinks  
 c. *umuyor*.  
 hopes

Tunc {imagined, thinks, hopes} that Trump won.

- (9) a. Tunc [Trump kazandi diye] *hayal etti*.  
 T. Trump win.PST diye imagined  
 b. *dusunuyor*.  
 thinks  
 c. *umuyor*.  
 hopes

Tunc {imagined, thinks, hopes} that Trump won.

There are subtle meaning differences between (9) and (8), but no FA.

### Core desiderata:

- ✗ No 'accidental homophony' between factive/non-factive Vs.  
 The factivity alternation is too regular.
  - ✗ No 'inherently factive nominalizations' across-the-board.  
 There is no surface difference between a nominalization embedded under *bil*- and one embedded under *dusun*-.
- While hypothesis is workable (Kratzer, 2006; Moulton, 2009, a.o.), the present account deals with the facts differently.

### 3 Justified belief

The focus of this section is reports with **tensed clauses under *bil*-**. When non-factive, they describe situations of **justified belief**.

- Simplified treatments of knowledge reports: (Percus, 2006, a.o.)  
Knowledge is plain belief/thought with an added truth requirement.

- (10) a.  $[\text{think}] = \lambda p. \lambda x. \lambda w : .x \text{ thinks } p \text{ at } w$   
b.  $[\text{know}] = \lambda p. \lambda x. \lambda w : p \text{ holds at } w. x \text{ thinks } p \text{ at } w$

Expectation: ‘know’ minus the truth requirement equals plain belief.

- Turkish has *bil*-, which participates in the alternation, and *dusun*-, which translates ‘think’ in some contexts, and which does not.<sup>1</sup>  
Is non-factive *bil*- felicitous in the same contexts as *dusun*-? **No!**

- Non-factive *bil*- is stronger than *dusun*-:  
The former is licensed in fewer pragmatic contexts.<sup>2</sup>

- (11) THE HYPOCHONDRIAC: Dilara is a hypochondriac.  
According to her, she has an ear infection.
- a. #Dilara [kulagında iltahap var] diye biliyor.  
Dilara in her ear infection exists diye knows  
b. ✓Dilara [kulagında iltahap var] diye dusunuyor.  
thinks  
Dilara {#*bil*, ✓*dusun*} that she has an ear infection.

- (12) THE JUSTIFIED HYPOCHONDRIAC: Someone tells Dilara that she has an ear infection.
- a. ✓Dilara [kulagında iltahap var] diye biliyor.  
Dilara in her ear infection exists diye knows  
b. ✓Dilara [kulagında iltahap var] diye dusunuyor.  
thinks

Dilara {✓*bil*, ✓*dusun*} that she has an ear infection.

- Two additional contexts:

- (13) a. THE OCCASIONAL DRINKER: I once saw Tunc have a glass of raki. A few days later, the host of a dinner party asks me: **What about Tunc, does he drink?**

- b. ✓[Iciyor diye] biliyorum.  
he drinks diye I know  
*I bil* that he drinks. ✓Visual evidence

- (14) a. THE REASONABLE GUESS: Looking for the toothbrush in the bathroom. I can’t find it. **I must have left it in my suitcase!**

- b. #[Cantamda biraktim diye] biliyorum.  
in my bag I left it diye I know  
*I bil* that I left it in my bag. # Reasonable guess

- Generalization: **Justification licenses non-factive *bil*- reports.**

- (15) a. LICENSORS: Inferences based on hearsay, lies, visual and auditory evidence.  
b. NON-LICENSORS: Inferences based on internal thought processes, guesses, wishes, reasonable or otherwise..

- Whose perspective to take into account when evaluating justification:  
Attitude holder? Speaker?

- Licensing conditions on some Turkish attitude reports

		requirement		
		<i>belief</i>	<i>justification</i>	<i>truth</i>
attitude	factive <i>bil</i>	yes	yes	yes
	non-factive <i>bil</i>	yes	yes	no
	<i>think/believe</i>	yes	no	no

<sup>1</sup>The predicate *san*- translates ‘believe.’ I use *dusun*- for the purposes of exposition.

<sup>2</sup>‘S p diye bil’ does entail ‘S p diye dusun-.’

## 4 Proposal

Is the factive inference *defeated* or is it *built from the bottom up*?  
 ✓ Built from the bottom up.

### 4.1 To be set aside: Factivity defeated

- Internal factivity hypothesis:

The factive inference is encoded in the definition of the attitude verb.

- (16) ‘Know’ as a semantic presupposition trigger:

$\llbracket \text{know} \rrbracket(w)(\llbracket \text{Hillary won} \rrbracket)(\llbracket \text{Tunc} \rrbracket)$  is defined iff  
 Hillary won at  $w$

- ✗ If  $\llbracket \text{bil} \rrbracket$  were, e.g., a semantic presupposition trigger, attitude reports introduced by *bil-* would all be factive, contrary to observation.

Accounts taking veridicality as basic (Abusch, 2002; Abrusán, 2011; Romoli, 2015, a.o.), or ones that claim that ‘know’ is not a factive verb (Hazlett, 2010, 2012) face a similar challenge: The availability of the inference should not depend on the embedded clause.

- Perhaps propositions introduced by *diye* are in some sense non-actual.  
**diye could take on the denotation of a modal.**

#### Motivating observation:

The word *diye* derives from the root *de* for ‘say.’

Perhaps this meaning component is retained.

- (1a) Tunc Hillary kazandi diye biliyor.  
 Tunc Hillary win.PST **SAY** know  
 Tunc (non-factively) knows that Hillary won.

Truth conditions based on internal factivity+modal:

$\llbracket (1a) \rrbracket = 1$  iff Tunc knows that it is said that, Hillary won.  
diye

**Predicted presupposition:** It is said that Hillary won.

✓**Not:** Hillary won.

- The issue with similar proposals is that it does not capture the intuitive truth conditions of (1a).

If you ask Tunc what the outcome of the election was, he would reply with the bare proposition (17a), not the modalized (17b).

- (17) a. Hillary kazandi.  
 Hillary won.  
 b. Hillary kazandi deniyor.  
 Hillary won it is said  
 It is said that Hillary won.

A similar conclusion applies to *diye* introducing clauses embedded under *dusun*, for ‘think.’

- The presence of *diye* in the structure is not required for non-factive attitude reports under *bil-*.

- (18) Annem [ben-i Ankara'da] biliyor.  
 my mother 1S-ACC in Ankara knows  
 My mother ‘knows’ that I’m in Ankara.

⇒ Although it is tempting to give *diye* a modal semantics derived from its connection to ‘say,’ this is not a straightforward solution to the challenge raised by the FA.

## 4.2 To be retained: Factivity is built up

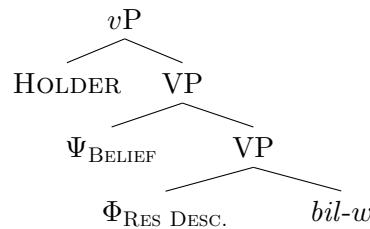
- The entry for *bil* introduces two intensional predicates of eventualities (of type  $< v < st >>$ ):

- A RES DESCRIPTION predicate  $\Phi$ , from which a RES is recovered.<sup>3</sup> This is an actual world event.  
An acquaintance rel. holds between the attitude holder and the RES.
- A BELIEF predicate  $\Psi$ , which the RES satisfies in holder's belief *ws*.  
For example:  $\llbracket \Phi \rrbracket = \lambda e. \lambda w. \text{win}(e)(w)(\text{trump})$   
 $\llbracket \Phi \rrbracket = \lambda e. \lambda w. \text{rain}(e)(w)$

### The lexical entry

- (19) For all  $w \in D_s$ ,  $\Phi, \Psi \in D_{v(st)}$ ,  $x \in D_e$   
 $\llbracket \text{bil} \rrbracket(w)(\Phi_{\text{RES DESC.}})(\Psi_{\text{BELIEF}})(x)$  is true iff  
 $\exists R_{\text{acquaintance}}[\Phi(\iota e[R(x, e, w)])(w) \wedge$   
 $DOX_{x,w} \subseteq \{w' | \Psi(\iota e'[R(x, e', w')])(w')\}]$

### A minimal structure



- In other words:

There is an acquaintance relation  $R$  such that

- the event  $e$  that the attitude holder  $x$  is acquainted with at  $w$  is a  $\Phi$  event at  $w$ , and
- for all of  $x$ 's belief worlds  $w'$ , the event  $e'$  that  $x$  is acquainted with at  $w'$  is a  $\Psi$  event at  $w'$ .

<sup>3</sup>Note: Although the LFs resemble *de re* beliefs about individuals, I am not committed to an analysis in terms of *res* movement.

- The derivation of the factive and non-factive alternants depends on how  $\Phi$  and  $\Psi$  are valued:
- Tensed clauses and nominalizations saturate the BELIEF argument  $\Psi$ .

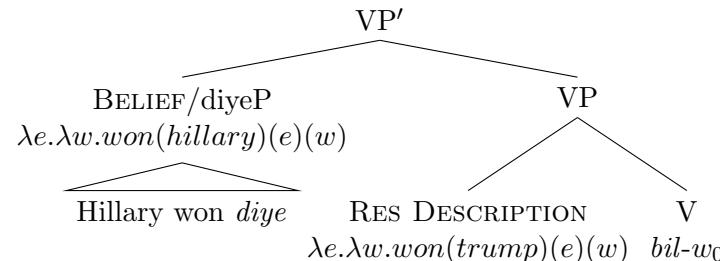
- (1a) Tunc [[ $\Psi$ Hillary kazandi diye] [ $\Phi_7$  biliyor]]  
T. H. win.PST diye know

- The RES DESCRIPTION argument is interpreted like a pronoun.
- Only the BELIEF part is (usually) visible on the surface.

### 4.2.1 Deriving the non-factive alternant

The RES DESCRIPTION and the BELIEF PREDICATE need not match.

- (20) **Context:** Trump won. Tunc watched a **prank** news report about the Trump victory. The report said that it was a Hillary victory.
- Tunc [[ $\Psi$ Hillary kazandi diye] [ $\Phi_7$  biliyor]]  
T. H. win.PST diye know
  - RES DESCRIPTION  $\Phi: \lambda e. \lambda w. \text{won}(\text{trump})(e)(w)$
  - BELIEF PREDICATE  $\Psi: \lambda e. \lambda w. \text{won}(\text{hillary})(e)(w)$
  - $R = \lambda x. \lambda e. \lambda w. x$  watched a news report about  $e$  at  $w$



$$\llbracket (1a) \rrbracket = 1 \text{ iff } \exists R[\text{won}(\text{trump})(\iota e[R(tunc, e, w_0)])(w_0) \wedge \\ DOX_{tunc,w_0} \subseteq \{w' | \text{won}(\text{hillary})(\iota e'[R(tunc, e', w')])(w')\}]$$

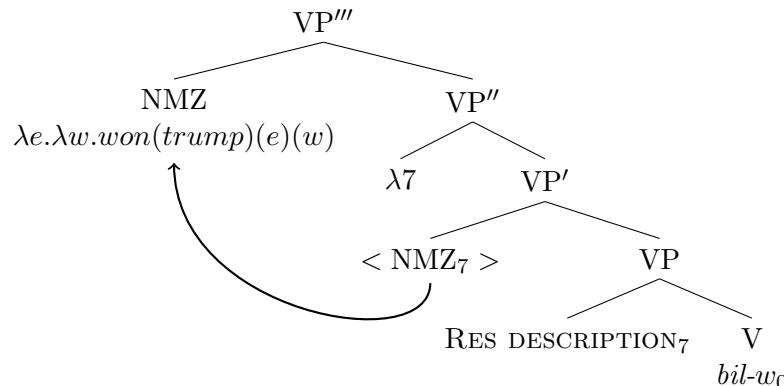
(The event  $e$  that Tunc is acquainted with at  $w_0$  is a Trump victory and believes of  $e$  that it is a Hillary victory.)

#### 4.2.2 Deriving the factive alternant

The RES DESCRIPTION and the BELIEF PREDICATE must match.

- The nominalized clause is generated in the belief argument slot.
- **The clause raises**, leaves behind a trace of the same type and **binds the res description argument**.
- Why do nominalizations raise? Perhaps for case—They are overtly marked for the accusative in this position.

- (21) **Context:** Trump won. Tunc watched a **truthful** news report about the Trump victory. The report said that it was a Trump victory.
- Tunc [[ $\Psi$ Hillary'nin kazandigini] [ $\lambda 7 [\Psi_7 [\Phi_7 \text{ biliyor}]]$ ]]  
Tunc Hillary win.NMZ knows
  - BELIEF PREDICATE  $\Psi$ :  $\lambda e. \lambda w. \text{won}(\text{hillary})(e)(w)$
  - $R = \lambda x. \lambda e. \lambda w. x$  watched a news report about  $e$  at  $w$



$$\llbracket \text{VP}'' \rrbracket = \lambda \Psi. \lambda x. \Psi(\iota e[R(e, x, w_0)]) \wedge \\ \text{DOX}_{x, w_0} \subseteq \{w' | \Psi(\iota e'[R(e', x, w')])(w')\}$$

Plugging in  $\llbracket \text{NMZ} \rrbracket$  and the attitude holder:

$$(22) \llbracket (1b) \rrbracket = 1 \text{ iff } \exists R[\text{won}(\text{trump})(\iota e[R(\text{tunc}, e, w_0)])(w_0) \wedge \\ \text{DOX}_{\text{tunc}, w_0} \subseteq \{w' | \text{won}(\text{trump})(\iota e''[R(\text{tunc}, e'', w')])(w')\}]$$

(The event  $e$  that Tunc is acquainted with at  $w_0$  is a Trump victory and believes of  $e$  that it is a Trump victory.)

## 5 Remaining issues

- Potential evidence for the syntactic reality of the RES DESCRIPTION:

- (23) Tunc **o-nu** [Hillary kazandi diye] biliyor.  
T. that-ACC H. won diye knows  
≈ Tunc knows that as a Hillary victory.

- To derive the factive alternant, the RES DESCRIPTION argument had to be bound by the BELIEF PREDICATE argument.

**Does anything force this binding relation?**

Not in this system. And this predicts that there should be non-factive nominalizations under *bil-*, which is borne out.

The prosodic factivity alternation

- (24) STRING  
Tunc Hillary'nin kazandigini biliyor.  
T. H. win.NMZ knows
- |  |         |
|--|---------|
| <ol style="list-style-type: none"> <li>PROSODIC FOCUS ON MATRIX VERB:<br/>Tunc Hillary'nin kazandigini [biliyor]<sub>F</sub>.<br/>T. H. win.NMZ knows<br/>Tunc knows that Hillary won.</li> <li>PROSODIC FOCUS ON EMBEDDED VERB: Non-factive<br/>Tunc Hillary'nin [kazandigini]<sub>F</sub> biliyor.<br/>T. H. win.NMZ knows<br/>Tunc has the justified belief that Hillary won.</li> <li>ama kazanmadı.<br/>but she didn't win.      } ✓ after (24a); # after (24b).</li> </ol> | Factive |
|--|---------|

- Why can some verbs not be ‘factivized’?

Hypothesis: They do not introduce a RES DESCRIPTION argument.

This could be related to the ability to select non-propositional DP arguments ('✓know/\*think the answer').

- Accounting for justification?

Hypothesis: Encoded in the acquaintance relation.

- (25)
- a. Good acquaintance relation, licenses *bil-* report  
 $\llbracket R \rrbracket = \lambda x. \lambda e. \lambda w. x$  heard a news report about *e* at *w*
  - b. Bad acquaintance relation, does not license *bil-* report  
 $\llbracket R' \rrbracket = \lambda x. \lambda e. \lambda w. x$  made a guess about *e* at *w*
  - c. No acquaintance relation, does not license *bil-* report

## 6 Concluding remarks

- 1 Factivity alternates in Turkish (and other languages—see Appendix).
- 2 The alternation can be captured in the syntactic/semantic composition instead of the lexical entries of particular items. .

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## 7 Appendix

- Optional vs. obligatory non-factivity

The claim that attitude reports formed by tensed clauses + *bil-* are non-factive raises the question of whether (a) they are optionally non-factive, or (b) obligatorily non-factive.

The following test suggests that they are obligatorily non-factive. If they did have a factive reading, they should be acceptable following the assertion of the embedded clause.

- (26)
- A Trump kazandi.  
 Trump won.
  - B [Trump'in kazandigini] biliyorum.  
 Trump win.NMZ I know  
 ✓I know that Trump won.
  - B' #[Trump kazandi diye] biliyorum.  
 Trump win.NMZ I know  
 #I believe (lit. ‘know’) that Trump won.

- Meaning differences with non-factive attitude verbs?

With some attitude verbs, the meaning resulting from an embedded nominalization is difficult to tease apart from the meaning resulting from an embedded tensed clause.

Here are two leads.

1. Immediate ‘taste’ reports—*diye* clauses sound odd.

- (27) **Context:** A and B are at a hot pepper tasting. About a particular pepper, A asks B: “How’s that pepper?”

- a. Bu biberin çok acı olduğunu düşünüyorum.  
this pepper very hot be.NMZ I think
- b. ?Bu biber çok acı *diye* düşünüyorum.  
this pepper very hot.COP *diye* I think  
Intended: I think that this pepper is really hot.

2. Clause size: Tensed clauses can embed high modals like epistemics.

- (28) a. #Ali'nin evde olabileceğini düşünüyorum.  
Ali at home be.NMZ.POSSIB I think

- b. Ali evde olabilir *diye* düşünüyorum.  
Ali at home be.AOR.POSSIB *diye* I think  
Intended: I think that Ali might be home.

• Additional data

- (29) Azeri Murad Suleymanov, p.c.

- a. Əli Aişənin gəldiyini bilir, #amma Aişə gəlməyib.  
Əli Aişə came knows but Aişə didn't come  
Əli knows that Aişə came, #but Aişə didn't come.

- b. Əli elə bilir ki, Aişə gəlib, amma Aişə (əslində)  
Əli so knows C Aişə came but Aişə really  
gəlməyib.  
didn't come  
Əli thinks (lit. knows) that Aişə came, but (in fact) she  
didn't come.

- (30) Uyghur Travis Major, p.c.

- a. Tursun [Alini ketti dep] bilidu.  
Tursun Ali.ACC left *diye* know  
Tursun believes that Ali left.  
(...of Ali that he left?)
- b. Tursun [Alining ketkenlikini] bilidu.  
Tursun Ali.GEN leave.NMZ know  
Tursun knows that Ali left.

- (31) Kazan Tatar Travis Major, p.c.

- a. Timur [Ali(ni) kitte dip] bile.  
Tursun Ali.ACC left *diye* know  
Tursun believes that Ali left.
- b. Timur Alinin kitkenen bile.  
Tursun Ali.GEN leave.NMZ know  
Tursun knows that Ali left.