The modal analysis of *fog*

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The problem

- Future time reference+ future operators: TENSE or MODALITY?
- the *tense analysis*: future time reference locates an eventuality in time
- the *modal analysis*: future time reference expresses universal quantification over possible worlds
- the English *will*: some modal component in the interpretation of it (see. e.g. Condoravdi (2000), Copley (2009))
- The literature *fog* 'will, going to':
    1. treats it as future tense (see Lotz (1962)),
    2. a future morpheme that is "*not always void of modal shades*" (Csató 1994:240),
    3. or as a modal operator that can only take **a metaphysical modal base** (Palffy-Muhoray (2016)).

The problem

- HYPOTHESIS: Giannakidou and Mari (2016): Future morphemes cross-linguistically are not used just to make predictions, **but also as epistemic *must*-equivalents**.
- Future and epistemic necessity modals pattern up in being nonveridical ⟶ not compatible with knowledge of p (that direct evidence provides) (Giannakidou and Mari (2018:6)).
- Let F be a unary sentential operator:
  1. F is veridical *iff* $Fp \rightarrow p$
  2. F is nonveridical *iff* $Fp \nrightarrow p$

  (1) {*Yesterday*}, John flew to Paris. (VERIDICAL)

  (2) {*Probably, Possibly, Maybe, Perhaps, Allegedly*}, John flew to Paris. (NONVERIDICAL)

  ⟶ Nonveridicality: the absence of truth entailment (Giannakidou and Mari (2018:8))

Veridicality

- Natural languages do not work like this.

- $\Longrightarrow$ There are different shades of veridicality/ nonverdicality:

  1. It is true that the future is always nonveridical (Giannakidou and Mari (2018)).
  2. However, we should consider the strength of the evidence provided by the context that supports the speaker's assertion.

      - Example 1: You check the starting time of an exam on the internet. $\longrightarrow$ *A vizsga 5 órakor* fog *kezdődni holnap* 'The exam will start at 5 o'clock tomorrow'.
      - Example 2: You believe that something good should happen to you after so many bad things. $\longrightarrow$ *Most már valami jó* fog *történni velem* 'Something good will happen to me'.

  3. The probabilities of the events (in example 1 and 2) being true are different.$\Longrightarrow$ Are these differences pragmatic in nature? OR Do they have a semantic component?

Questions

- Is *fog* an exception to the hypothesis that future morphemes/operators can have an epistemic interpretation cross-linguistically? (Suggested by Pallfy-Muhoray (2016))

- Can *fog* be an equivalent of the epistemic *kell* in some contexts? If yes, what are the characteristics of these contexts?

- How should *fog* be analyzed formal semantically? What is the evidence that supports the validity of the proposed analysis?

Fog as a modal operator

- ITS OPTIONALITY IN FUTURE-REFERRING UTTERANCES: "If _fog_ were a tense, we would expect it to be obligatory in future-referring utterances" (Palffy Muhoray (2016:94)).

- ITS ABILITY TO TAKE THE INFLECTIONAL NUMBER AND PERSON ENDING ASSOCIATED WITH TENSED VERBS: _"Because tenses cannot generally apply to tensed expressions, the fact that fog is inflected for the non-past suggests that fog is not a tense itself"_ (Palffy-Muhoray (2016:95)).

- THE AVAILABILITY OF THE BOULETIC READING

  (3) Holnap   meg fog-om   látogat-ni a
       Tomorrow PRT will-1SG visit-INF the
       szüle-im-et.
       parent-POSS.1SG-ACC
       'Tomorrow, I will visit my parents.'

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- HYPOTHESIS: THE AVAILABILITY OF THE EPISTEMIC
  INTERPRETATION (Pallfy-Muhoray (2016) considers but rejects the idea
  that *fog* can express epistemic modality)

  (4) Situation: You ordered a pair of shoes online last week. According
      to your previous experiences, the store you ordered from usually
      delivers all the orders within a week, so you think that it is very
      likely that your shoes will arrive during the week. You tell your
      friend:

      A   rendelt cipő-m-(nek)   a hét-en   meg fog
      the ordered shoe-POSS.1SG-(DAT) the week-ON PRT will
      érkez-ni/ meg kell érkez-ni-e.
      arrive-INF PRT must arrive-INF-3SG

      'The ordered shoes must arrive this week.'

- Can *fog* be a *must*-equivalent in certain contexts?

The Study

- AIM: to show that *fog* can express epistemic modality, and thus it can be equally acceptable in certain contexts as the future oriented, epistemic use of *kell* 'must'

- FORM: Google Questionnaire (12 test situations divided into 3 types (4 situations in each type), and 6 distractors)

- PARTICIPANTS: adult speakers of Hungarian (n=98), after the control sentences (**n=70**)

- FORMAT: included **3 types of situations** and the respondents had to evaluate the acceptability of three sentences (one containing *fog*, one containing *kell* 'must', and one containing the non-past) in each situation on a scale of 1 to 6 (1= totally unacceptable, 6=totally acceptable in the given situation).

- TYPE 1 SENTENCES: the situation provided evidence (coming from a reliable source) that the proposition p is going to be true shortly after the utterance time

- unnatural with adverbials expressing subjectivity like *szerintem* 'according-to-me'

  (5) Situation: You heard in the news that enough vaccines will arrive for the vaccination of thousands of people at Ferihegy tomorrow. The shipment is already on its way. You are happy to tell the news to your roommate:

  a. Több ezer ember oltására elegendő vakcina érkezik a ferihegyi repülőtérre. (non-past) 5.07 (1.53)

  b. Több ezer ember oltására elegendő vakcinának kell érkeznie a ferihegyi repülőtérre. (epistemic *kell* 'must') 2.9 (1.64)

  c. Több ezer ember oltására elegendő vakcina fog érkezni a ferihegyi repülőtérre. (*fog* construction) 5.24 (1.4)
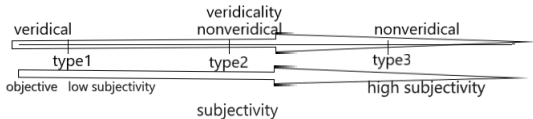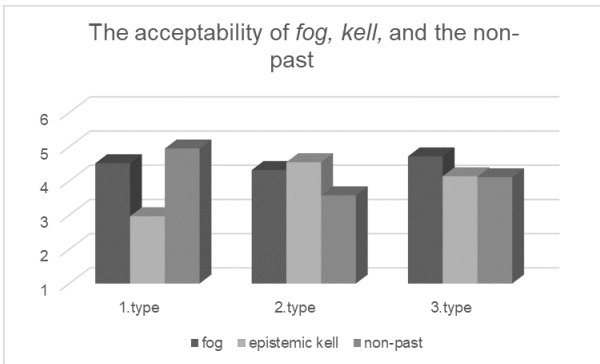   'Enough vaccines will arrive at Ferihegy to vaccinate thousands of people.'

- TYPE 2 SENTENCES: the assertions were based on what the speaker knows about the world (epistemic state)

- '*based on what I know about our world and my previous experiences p must be true some time after the utterance–time*'

- natural with adverbials expressing subjectivity like *szerintem* 'according-to-me'

  (6)   Situation: John works until 4 p.m every day. According to your previous experiences, the journey is about 45-60 minutes long from John's workplace to his home. You think that he will probably arrive home by five o'clock in the evening, so you tell your friend who asks you about the whereabouts of John:
      a. János 5 órára már hazaér. (non-past) 3.61 (1.8)
      b. János 5 órára már haza fog érni. (*fog* construction) 4.16 (1.85)
      c. Jánosnak 5 órára már haza kell érnie. (the epistemic *kell* 'must')
          4.44 (1.72)
          'John must/ will be at home by 5 o'clock'

- TYPE 3 SENTENCES: the predictions were based on past experiences and **they entirely lacked factual support at the time of speaking**

- '*in view of how things should be/ how I think they should be, p must be true in the future*'

     (7)   Situation: Your partner is very upset because his parents are angry at him because of something he did not do. You know from past experience that the truth is usually revealed after a while, so you try to reassure your partner:

         a.   Nyugodj meg, idővel ki fog derülni az igazság. (*fog* construction) 5.29 (1.25)

         b.   Nyugodj meg, idővel ki kell derülnie az igazságnak. (epistemic *kell* 'must') 3.79 (1.85)

         c.   Nyugodj meg, az igazság idővel kiderül. (non-past construction) 5.1 (1.36)
            'Calm down, the truth will be revealed one day.'

Hypothesis and Results

- H1: Type 1 sentences: The use of non-past is equally acceptable as the use of *fog*, and the use of the epistemic *kell* 'must' is unacceptable.
  RESULTS: The non-past proved to be more acceptable than the use of *fog* (t(551)=3.0241, p<0.05), and the use of the epistemic *kell* 'must' was unacceptable (average: 2.97).

- H2: Type 2 sentences: I expected *fog* to be equally acceptable as the epistemic *kell* 'must'. I assumed the non-past cannot convey this meaning.
  RESULTS: There was no statistically significant difference in the acceptability of *fog* and *kell* (t(557)=-1.4567, p>0.05) in this group, the non-past proved to be significantly less acceptable than *fog* (t(557)=-5.3134, p<0.05) and *kell* (t(557)=-6.7344, p<0.05). $\implies$ *Fog* is no exception to the hypothesis that future morphemes can have epistemic interpretation cross-linguistically.

- RESULTS: Type 3 sentences: *Fog* proved to be the most acceptable and the acceptability of *kell* and the non-past depended on the time adverbials they were used with.

Results

Results

- The standard deviation of the means of sentences was high in the case of type-3 *kell* 'must' and type-3 non-past sentences. 0.84 and 1.34 respectively. (Type 3 *fog* sentences: sd:0.6)

- Type 3 Sentences: The acceptability of the sentences depended on the adverbials they continued.

adverbial	non-past	fog	kell
most már 'by now'	2.32 (1.45)	4 (1.7)	5.37 (1.23)
hamarosan 'soon'	3.96 (1.78)	4.5 (1.66)	3.48 (1.99)
egyszer 'some day'	5.04 (1.44)	5.16 (1.35)	3.91 (1.68)
idővel 'in time'	5.1 (1.36)	5.29 (1.25)	3.79 (1.85)

- $\implies$ Must be further investigated: *egyszer* 'some day', and *idővel* 'in time' can strengthen (or even convey) nonveridicality

The formal semantic analysis of *fog*

- The lexical entry by (Pallfy-Muhoray (2016))– *to be reconsidered*
  $||FOG||=\lambda P\lambda i\lambda w.\forall w'[w' \in Best(MB_M)(OS)(w)(now) \longrightarrow AT(P,i,w')]$

- *MB* is the modal base, that can only be metaphysical in her view, and *OS* is the ordering source (,which can be bouletic or inertial). $Best(MB_M)(OS)(w)(now)$ denotes a set of worlds(MB_M) in w at the speech time (*now*) that are best ranked with respect to the ordering source (*OS*). $fog(P)(i)$ holds of a world w iff $P(i)$ holds in the best worlds w' in the modal base according to the ordering source. (Palffy-Muhoray 2016:100).

- THE PROBLEM WITH THE ANALYSIS:

  1 *fog* can be used with an epistemic modal base
  2 sentences with *fog* can have *the future in the past reading*

What is *the future in the past reading*?

(8) Az-t   gondol-t-am,   hogy a   csomag-om-(nak)   meg
     That-ACC think-PST-1SG that the parcel-POSS.1SG-(DAT) PRT
     kell érkez-ni-e/   meg fog érkez-ni a   hét-en.
     must arrive-INF-3SG   PRT will arrive-INF the week-ON

     'I thought that my parcel had to/would arrive during the week.'

- *'given what I knew at the past salient reference time (defined at the main clause), it was necessary that my parcel arrived/arrives during the week'*.
- the worlds were generated in the modal base at the past reference-time $\implies$ past epistemic state
- it says nothing about the present epistemic state, the epistemic state of the speaker can change over time, so that you can say:

  1. '*Még mindig ezt gondolom*' 'I still think that' (indicating that your epistemic state still has not changed).
  2. *De már tudom, hogy nem fog* 'But now, I know that it will not' (indicating that the expected time of the event is still in the future of the utterance-time)
  3. ,or *De nem érkezett meg* 'But it did not arrived' (indicating that the expected time of the event is past of the utterance-time)

Possible present temporal orientation

- Future morphemes/ operators can have an epistemic interpretation (given what I know and general stereotypical assumptions) and they can have a present temporal orientation.

  (9) a. That **will be** the postman.
       b. The French **will be** on holiday this week. (Palmer (1978))

  The Hungarian *lesz* 'will be/going to be' can convey the above mentioned reading and have a present temporal orientation.

  (10) a. Ez a postás **lesz**.
          'That will be the postman.'
       b. A közmunkások ilyenkor már nem **lesznek** kint az utcán, már régen hazamentek. (sterotypical assuption)
          'The public workers will not be on the streets by now, they went home a long time ago.'

Can *will* (and not *will be*) or *fog* have a present TO?

- The English will: Copley (2002:109): 'dispositional *will*' (metaphysical modal base, with the ordering source being bouletic) allows non-future modal reading (a present temporal input is possible):

  (11) a. Mary will eat beans **these days**.
        b. **I can't believe** that Mary will eat beans these days!

- The Hungarian fog:

  (12) a. ?Judit csak egészséges ételeket fog enni **mostanában**.
           'Judy will only eat healthy food these says.'
        b. ??Nem hiszem el, hogy Judit csak egészséges ételeket fog enni mostanában.
           'I can't believe that Judy will only eat healthy food these days.'

- The only situation I can imagine (12b) in:

  (13)   Situation: Judy eats a lot of unhealthy food at a party, but she
         tells you that she is planning to switch to a healthy diet very soon
         after the party. You would like to express that you are not willing
         to believe that she is really committed.
         Nem hiszem el, hogy Judit csak egszséges ételeket fog
         mostanában enni.
         'I can't believe that Judy is about to eat healthy food only.'

- *Mostanában* 'these days' marks temporal proximity here. (The event will
  happen in the future of the utterance-time and close to it.)

- $\implies$ There is **no evidence** that would support that in the case of *fog*
  'will/going to', a present temporal input is possible.

- Further studies are necessary.

The formal semantic analysis of *fog*

Definition

New lexical entry of *fog*
$||FOG|| = \lambda P \lambda i \lambda w. \forall w'[w' \in Best(MB)(OS)(w)(i) \longrightarrow AT(P, (i, \infty), w')]$

- $Best(MB)(OS)(w)(i)$ represents the set of worlds in the modal base in our world w at i that are ranked as the most ideal ones given the ordering source OS. $Fog(P)$ is true in w at i iff P holds some time after $i((i, \infty))$ in all the best worlds w' in the modal base (MB) according to the ordering source (OS).

Conclusion

- The data collected supports the claim that the Hungarian *fog* is no exception to the hypothesis that future morphemes can have epistemic interpretation cross-linguistically (Giannakidou and Mari (2016)).

- The situations in which *fog* can express epistemic modality can be characterized by the following properties:
  1. the proposition is based on the speaker's knowledge and past experiences and subjective to a great extent
  2. nonveridicality (higher)
  3. the future oriented, epistemic use of the Hungarian necessity modal *kell* 'must' is highly acceptable

- There is no evidence that would support that *fog* can have present temporal orientation (it allows the non-future reading).

- In the case of *fog*, the worlds in the modal base can be generated in the past of the utterance-time in embedded contexts. ⟹ Its formal semantic representation should be able to account for *the future in the past reading*.

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Thank you for your attention!