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FUTURE IN GREEK: A DEGREE EXPRESSION

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Περίληψη

Σε αυτή την εργασία υποστηρίζω ότι οι χρήσεις του μορφήματος «θα» που κυμαίνονται μεταξύ τροπικότητας και χρονικής αναφοράς οφείλονται στο μέγεθος του αληθοσυνόλου της σύζευξης το οποίο και προτείνω ό,τι αποδίδεται ως μια μετρήσιμη συνάρτηση BEST.

Λέξεις-κλειδιά: *modality, Greek, future, certainty, degrees, predictive, measurable, intersection*

1. Background: Future and degrees of certainty

The future morpheme *tha* “will” (FUT) in Greek conveys temporal (predictive) and modal interpretations:

- (1) Ο Pavlos tha figi
The Paul FUT leave.3sg.NP¹
'Paul will leave' temporal / epistemic

(1) expresses either a temporal (shifting the event time forward) or a modal (conveying a probability evaluation) interpretation. FUT morphemes like *tha* are considered

1 Glosses: FUT = future morpheme *tha*; SUBJ = subjunctive; W = superset of possible worlds; pl = plural; sg = singular.

universal quantifiers that convey necessity; they quantify the whole set of possible worlds, and provide interpretations similar to those of *must* (see Copley 2002; Kaufmann 2005; von Stechow and Gillies 2010; Giannakidou and Mari 2014; among others). The interpretation, thus, is equivalent to the epistemic necessity modal *must*. However, the FUT morpheme *tha* “will” exhibits a temporal reading that *must* cannot convey. Observe the interpretational disparity in the following examples:

(2) and (3) show that there is only a limited degree of overlap between *prepi* “must” and *tha* “will”. In the examples (2a) and (3a) *tha* marks a future event, while in the

- (2) a. O Pavlos *tha* thimosi
 The Paul FUT get-mad.3sg
 ‘Paul will get mad’ *dynamic*
- b. O Pavlos **prepi** na thimosi
 The Paul must SUBJ get-mad.3sg
 ‘Paul must get mad’ *teleological*
- (3) a. O Pavlos **tha** figi avrio
 The Paul FUT leave.3sg tomorrow
 ‘Paul will leave tomorrow’ *temporal*
- b. O Pavlos **prepi** na figi avrio
 The Paul must SUBJ leave.3sg tomorrow
 ‘Paul must leave tomorrow’ *deontic*

examples (2b) and (3b), *prepi* “must” expresses a purpose and a deontic necessity respectively. The temporal (predictive) use indicates that *tha* is not uniquely epistemic. In other words, the modal base for the interpretation of *tha* is not homogenous.

A question about *tha* is how the *predictive* (read: temporal) reading is borne out. If we assume, as I do here, that *tha* “will” is a modal morpheme, we have to explain how a temporal reading derives from a modal morpheme. There are many approaches currently in the literature. For instance, Enç (1996) derives temporality via a covert tense-like operator in *will*. Condoravdi (2002), on the other hand, argues that the lexical aspect (statives vs. eventives) derives the temporal reading. In this account, only eventive predicates shift an eventuality’s time forward, thus yielding the future reading. In this paper,

I argue that (a) the interpretational variation of *tha* is due to a *non-homogenous* modal base, (b) facts, beliefs and assumptions are in a proportional relation to the whole set of the propositions in the modal base (Staraki 2014, 2017), and (c) the non-homogeneity of the modal base can be best represented with a measurable intersection I call BEST.

The paper is organized as follows. In section 2, I show that *tha* “will” is a universal necessity modal, exhibiting quantificational gradience (the size of the universal quantificational domain varies). In section 3, I present a formal analysis of *tha* “will” introducing a measurable intersection BEST. Section 4 concludes the paper.

2. Some observations on the parameters of future interpretation

2.1 No generalized pattern

The various interpretations of FUT-structures depend on aspect (see Condoravdi 2002 for the FUT morpheme *will*), adverbs and privileged worlds (Giannakidou and Mari 2013a/b, 2014, 2016 for Greek *tha*) or an inherent tense-like component (Enç 1996 for *will*). However, considering cases of *tha*, we make two observations: (a) the interpretation depends on the type of context that *tha* is in, and (b) the FUT morpheme *tha* expresses degrees of certainty.

The example (4a) can also convey an epistemic assessment, instead of the expected predictive reading due to the temporal adverb *avrio* ‘tomorrow’, and the example (4c) can also express a deontic reading, instead of the expected epistemic reading due to the temporal adverb *avrio* ‘tomorrow’:

(4) Context: Expressing a probability

- a. Ta skilia tha pinasun avrio
 The dogs FUT starve tomorrow
 ‘Dogs will starve tomorrow’

Context: Making a prediction (predictive reading)

- b. O Janis tha epistrepsi avrio
 The John FUT return tomorrow
 ‘John will return tomorrow’

Context: Expressing an order or a requirement

- c. De tha pis ksana afta ta logia avrio
NOT FUT say again these the words tomorrow
‘You will not say these words tomorrow’

FUT morphemes are considered necessity modals in all relevant theories with the exception of Kissine’s (2008). However, the set of examples in (4) illustrates that the size of the universal quantificational domain varies. For instance, consider the proposition (4a) *Ta skilia tha pinasun avrio* – an epistemic claim – and the proposition (4b) *O Janis tha epistrepsi avrio* – a predictive (temporal) statement. If we compare (4a) to (4b), the example (4a) conveys less certainty than (4b). Similarly, the example (4c) conveys a greater necessity (more like a requirement). We observe, then, that the various interpretations of *tha* do not uniquely depend on aspect and adverbs, and that, in Greek, the interpretation of *tha* is not limited to the temporal (4b) and epistemic necessity (4a). *Tha* can also convey deontic necessity (4c). We can assume, then, that the disparity in readings is based on how close a proposition *p* comes to actually being true, or, in other words, how certain an individual is about the truth of a proposition *p*. *Tha*, I assume, implies gradience of certainty².

2.2 The set of the competing possible worlds in the modal base

Tha presupposes a *non-homogenous* (contra Giannakidou and Mari 2014)³ set of propositions (modal base) and the relations⁴ that hold among the propositions⁵ in the modal base support this hypothesis. To put it differently, there are logically (conjunctive, disjunctive) or causally linked propositions in the modal base with regard to informa-

2 The relation of the variant modal force of necessity and uncertainty will become clearer in the following section when we talk about the modal base, a parameter of modal interpretation.

3 Giannakidou and Mari (2015) acknowledge that presupposing a metaphysical modal base (in their paper in 2013b) for the interpretation of FUT is misleading and leads to a number of problems. Their new view about a *diverse* modal base coincides with Staraki (2014) that argues for a *non-homogenous* modal base. Nevertheless, the *diverse modal base* in Giannakidou and Mari (2015) and the *non-homogenous modal base* in this paper and in (Staraki 2014) differ in terms of analysis and formalization.

4 The term *relation* implies the links between propositions. For instance, a proposition *p* might reaffirm or negate the content of another proposition *p*.

5 In modality theory, the term *proposition* is considered ontologically to mean a *possible state of affairs*, a fact in a possible world or situation.

tion such that these correlations reflect the overall degree of certainty (Staraki 2013, 2017). Let us examine the example in (4a) from this perspective. If the set of the relevant possible worlds – the modal base – for the interpretation of *tha* contains propositions that involve past knowledge or information which is veridical (when we know if a proposition on which we base our claim is true), then the modal base contains relatively more worlds where *p* is true than worlds that *p* is false. For example, I know based on my past experience that *Paul forgets to feed the dogs* and that *There is none else there to feed the dogs besides Paul* and that *Dogs have starved in the past*, then the modal base is veridical (facts and not assumptions). Now, consider a different set of relevant possible worlds for the same example (4a). Paul just announced to me he is going to Rome for two days. If I do not have previous knowledge on how Paul treats his dogs, then the interpretation of (4a) will be based on a non-veridical (assumptions not facts) set of propositions, because I guess or assume that *Paul forgets to feed the dogs* and that *There is none else there to feed the dogs besides Paul* and that *Dogs have starved in the past*.

A temporal interpretation of future reference, though, presupposes a greater number of propositions that makes us presume a higher degree of certainty (Staraki 2017) to the proposition *John will get back*. Also, a temporal interpretation presupposes a set of propositions in the modal base that are facts (veridical) rather than assumptions (non-veridical). For the example in (4b) *John will get back*; if I know and I am sure that *John scheduled and promised this return; John always keeps his promises*, etc., then, the interpretation is temporal.

Thus, the modal base of *tha* is a *non-homogenous* set of propositions in which facts, beliefs and assumptions are in a proportional relation to the whole set of the propositions in the modal base. This property of the modal base that I call *proportional non-homogeneity* (Staraki 2017) accurately identifies the variant degree of (un)certainly that future reference in general exhibits. In other words, when the modal base⁶ contains a higher percentage of non-veridical propositions (beliefs and assumptions, etc.), then the expression with *tha* expresses less certainty (i.e., an epistemic reading). By contrast, when the modal base contains a higher percentage of veridical (facts, world knowledge, verified information etc.) propositions, then the expression with FUT morpheme *tha* expresses greater certainty, hence a temporal (predictive) reading.

6 This preliminary presentation for the status within the modal base I present here, solves the issue of the missing premise to which Giannakidou and Mari (2013a/b) ascribe the uncertainty of an epistemic future. It is not that we miss premises to base our evaluations. The facts and/or beliefs or incomplete knowledge (proportions of propositions) within the modal base determine the uncertainty an individual has (see Staraki 2014).

BEST represents this non-homogenous set of competing worlds within the modal base. For this set of competing worlds, some, all or great part of them becomes part of the quantificational domain of *tha*: the set(s) of BEST competing worlds. The size, as I assume, of the intersection of BEST, determines the interpretation of *tha*. The suggestion made here is novel, to the best of my knowledge, and greatly differs from the current accounts (Portner 1998, 2009; Condoravdi 2002; Mari 2009, 2013; Gianakidou and Mari 2013a/b, 2014, 2016), as it points to a way of modeling the various interpretations of *tha* more accurately.

3. The quantificational domain of *tha*

The size of the universal quantificational domain of *tha* depends on the reduction of the domain of those competing worlds that turn some *p* to false (see for a similar concept Staraki 2014, 2017). BEST determines through heuristic principles the size of the universal quantification domain by decreasing the set of $cw_{set} \in \cap f(w)$ (competing alternative worlds in the modal base), and increasing the set of $cw_{set} \cap p$ (possible true outcomes). The more the size of the intersection is being increased the more to an ideal match of a proposition to the truth a rational individual comes. The heuristic principles follow:

- (5) BEST⁷ is a function based on heuristic⁸ principles that determine the relative size of the intersection between the set(s) of competing worlds in the modal base $cw_x \in \cap f(w)$ satisfying the worlds in *p*:

7 BEST should not be confused with the operator BEST in Portner (1998, 2009) and definitely not with a type of ordering source in the strict sense. BEST, in this paper, is a function determining the size of the intersection of the modal base and the set of possible worlds. BEST, in other words, determines the size of the quantificational domain. It is the reduction of paths being open to the future and depending on the available data that a rational individual has. The reduction is to be considered to the effect that, *a priori* probabilities are selected to participate in the universal quantification. Besides, Portner (1998, 2009) defines BEST as that operator that picks up the unique best set of worlds that satisfies a deductively in manner reasoning: Given α , β and an inference rule we conclude that $\alpha \rightarrow \beta$. However, future reference involves an abductive kind of reasoning: Given β and an inference rule that says $\alpha \rightarrow \beta$, we can infer from $(\beta \wedge \text{rule}) \rightarrow \alpha$. In other words, in future reference there might be more than one and only one set of worlds satisfying the precondition. This is rightly captured by the notion of competing words within the modal base and BEST as defined here.

8 I use the term heuristic because the intersection does not contain deterministic results. In other words, the propositions we base our claims using a FUT [*p*] structure have no proof, often involve random facts, and sometimes, may not yield the optimal result which is the truth of a proposition. The heuristic principles in (i, ii) for BEST represent an educated guess that is thought to be close to the truth, and provide a map representing the associations among elements of sets (the range of the function BEST).

- i) $\text{Best-cw}_x = \{cw_x | \exists CW \subset \cap f(w) (p \notin \text{BEST} (\cap f(w)) \wedge p \in \text{BEST} (\cap f(w) \cup \{cw_x\}))\}$

Where Best-cw_x = the best competing world selected

CW = the set of competing worlds

- ii) Iff there are cw_i and cw_j which are consistent inferences to a proposition p then cw_i is at least as plausible as cw_j , $cw_i \leq_{\text{plausible}} cw_j$, iff $cw_i \subseteq cw_j$, and the most plausible competing world is that cw_i s.t. cw_j is true that $cw_j <_{\text{plausible}} cw_i$.

In short, BEST determines what worlds will eventually participate in the universal quantification without imposing a total ordering over the set of cw_{set} in $\cap f(w)$.

The set of BEST worlds (the intersection of $\cap f(w)$ and p) varies in size. The size of the intersection $S(\cap f(w), p)$ plays a role in the analysis of future reference. The intuition behind this claim is that the size represents an estimate of how far an expression featuring a FUT morpheme like *tha* is from actually being true. In other words, the size is the formal representation of the number of associations between the propositions of the two sets ($\cap f(w)$ and p) that are considered to be true. A definition of the size of the intersection follows:

(6) Size of the Intersection

S is a measure which represents an estimate of the size of the intersection of the modal base $\cap f(w)$ and the set of possible worlds p . S ranges between $0 \leq S(\cap f(w), p) \leq 1$. The conditions regulating the size of the intersection are:

- (a) If $S(\cap f(w), p) = 0$ then the intersection is empty $\text{BEST} = 0$ and represents a non-actual state of affairs.
- (b) If $S(\cap f(w), p) = 1$ then the intersection is non-empty $\text{BEST} \neq \emptyset$ and represents an actual state of affairs.
- (c) If $S(\cap f(w), p)$ is between $0 \leq S(\cap f(w), p) \leq 1$ then the intersection is non-empty $\text{BEST} \neq \emptyset$ and represents a state of affairs with a degree of certainty being assigned to it.

The S increases from left ($\cap f(w)$, the modal base, to the right, the set of p because this way we can represent the approximation to truth (how far a proposition is from actually being true). Consider the following illustrations of estimates of the intersection's size.

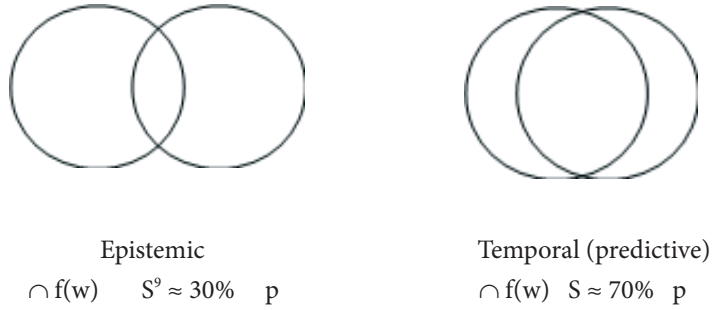


Figure 1 | Epistemic and predictive reading

The illustration in figure 1 highlights two different measures of the size $S(\cap f(w), p)$ of the intersection. The size $S(\cap f(w), p)$ of BEST includes a greater set of propositions in the temporal (predictive) reading. In this case, a *tha*[*p*] structure ideally approaches the truth of a proposition. The opposite picture is the epistemic reading. The intersection is a smaller universal quantificational domain, thus, leaving fewer options alive for a proposition of the form *tha*[*p*] to actually become true.

The degree of certainty (how close to the truth of a proposition) depends on the size S of the intersection. BEST, I propose, can be formally represented as a measurable intersection the size of which determines the interpretation of a proposition of the form *tha*[*p*] in Greek, as follows:

$$(7) \text{ BEST} = \cap_R^p S(\cap f(w), p)$$

- (7) states that BEST is the measurable intersection S of the competing worlds in the modal base $\cap f(w)$ and the possible worlds in p . The main advantage of the proposed approach is that it provides not only a comparative but a quantitative measure and enables a comparison of propositions within the modal base.

9 The illustrated percentages assigned to the S measure are provided in order to make sense of the degree of certainty in a more tangible and symbolic way. Further research is required to determine and predict the degree of (un)certainly in precise quantitative terms.

4. Conclusions

In this paper, I argued that the difference between a temporal and a modal reading of *tha* is due to a non-homogenous set of propositions (modal base) in which facts, beliefs and assumptions are in a proportional relation to the whole set of the propositions in the modal base. A measurable intersection BEST represents this non-homogenous set of worlds and derives the interpretation of *tha*.

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