

**Internship Report
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**Techniques for the enrichment of ‘Ekfrasis’, the conceptually organized lexicon
of the Institute for Language and Speech Processing/R.C. “Athena”:
the verbs of the “medical” field.**

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This is an internship report. I did my internship with the Institute of Language and Speech Processing of “Athena”-Research and Innovation Center in Information, Communication and Knowledge Technologies (ILSP/R.C. “Athena”) in the framework of the **Interdisciplinary Interuniversity Postgraduate Course in Language Technologies, “Technoglossia VI”**.

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ILSP/R.C. “Athena” developed a conceptually organized electronic lexicon of Modern Greek called ‘Ekfrasis’. This was the first attempt of ILSP/R.C. “Athena” to update ‘Ekfrasis’ with detailed information about verbal properties. Here, I report on work that mostly explores how ‘Ekfrasis’ will be affected by a large amount of data.

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1. Introduction

Our inspiration was drawn from the Onomasticon by Th.Vostantzoglou and from the tool ‘Ekfrasis’ which was created from the Institute for Language and Speech Processing (ILSP).

Onomasticon or Antilexicon was first published in 1949 and was republished in 1962. In 1998 the second edition was reprinted along with an appendix of pictures. What differentiates Antilexicon from every other lexicon of Modern Greek is that it is conceptually organized following the model of Roget’s Thesaurus, meaning that the lexicon is divided in thematic fields, and in every field all the words semantically related with the field are presented. The novelty of Onomasticon in comparison with Roget’s Thesaurus is that it provides basic syntactic information about the verbs (Markantonatou and Fotopoulou 2007). Even though Onomasticon is one of a kind for Modern Greek, its language material reflects the use of the language in the 1960’s, since it hasn’t been edited since 1962. Given the fact that it is still in great use from people who write in Greek, there is the necessity for the renovation of its content.

‘Ekfrasis’ aimed to be a computing platform that would help everyone who writes in Greek to spot the word one needed in any given occasion (Markantonatou and Fotopoulou 2007). The platform would be supported by the ‘Ekfrasis’ lexicon that was developed by ILSP, using the Protégé ontology-editing tool (available from: <http://protege.stanford.edu/download/download.html>). This decision was based on the fact that Ontologies allow for the definition of relationships among the words that in a usual lexicon are often only implicit. . The description of these relationships supports the hierarchical organization of the lexical database and enhances the reliability of inferences (Markantonatou and Alexopoulou 2008). Words in Ekfrasis are organised according to their conceptual relations. In addition to the conceptual organization of words, morphosyntactic information is given for every word and the lexical relationships between the words are described. This work will contribute to the further development of Ekfrasis by investigating issues concerning the detailed encoding of words in a given field, here the medical one. In addition to the detailed encoding issue, methods for collecting information --words and their properties-- will be studied. .

In this paper we will first describe the method we use in order to collect data and the decisions we made in order to solve the problems we encountered within this procedure, as well as the ongoing discussion about linguistic data that are obtained from different sources. We also present our effort to verify statistically some of the assumptions made from corpus data (Section 2). Next we describe the method we used in order to create a semantically and syntactically annotated corpus along with the influences we had from efforts like FrameNet and from David Dowty’s work on thematic roles (Section 3). In what follows we present each verb as a separate case study and describe problems or phenomena that arose from the study of the data such as Habitual Use and Inalienable Possession with ‘χειρουργώ’ (‘to operate on’), the expression of time and the gradation with ‘τραυματίζω’ (‘to injure’). We also compare our annotation system with FrameNet’s system, but at this point of our work we do not attempt a unified approach (Section 4). We end this presentation by drawing conclusions and outlining our future work. We pay special attention to our future lexicographic work. In particular, we compare our findings and our conclusions with established printed lexica of Modern Greek in order to form a first opinion about the kind of information that will be encoded in Ekfrasis (Section 5).

2. Data Collection

In our effort to better understand the consequences of updating ‘Ekfrasis’ with detailed information about verbal properties, we paid special attention to the procedures of data collection and semantic annotation, in order to claim an empirically solid basis for our work. We worked with the verbs of the field ‘medicine’ in Onomasticon because there were already several “medical” nouns in ‘Ekfrasis’ and, because we hoped that we would encounter only few alternation phenomena---totally false hopes as we will soon explain.

We eventually drew data from three resources in our effort to exhaust all possible evidence for grammatical contexts for our medical verbs:

- a. Data from the Hellenic National Corpus (HNC)
- b. Data from the Web and,
- c. Data from questionnaire.

Below we describe how data collection procedures evolved.

2.1. Collecting data from HNC

The Hellenic National Corpus (<http://hnc.ilsp.gr>) is a balanced corpus of Modern Greek developed by the Institute for Language and Speech Processing that contains about 50 million words and is constantly updated. We used the HNC in order to search the words we were interested in as lemmas which means that all the forms of the verb paradigm in the corpus can be retrieved. HNC allows 2000 sentences at maximum to be retrieved for each lemma.

Retrieved sentences were further cleared by hand. We kept only the sentences in which the verb showed the meaning related to the medical field and in the case of ‘τραυματίζω’ the meaning ‘to injure’. We chose the verb ‘τραυματίζω’, although it does not belong to the medical field, because we intuitively supposed that its structures could be related with those of ‘χειρουργώ’ (“to operate on”) and we wanted to test this assumption. This was in fact a huge task, which required a lot of time because the particular sense of ‘τραυματίζω’ was proved to be used rather frequently. Our first classification attempts were based on the active and medio-passive morphology of the verb. We used this classification in order to describe the semasio-syntactic frames of each verb. In Table 1 below we give the number of sentences retrieved from HNC, the number of sentences where the verb had the medical sense (MSO), the number of sentences with the active form of the verb in the medical sense and the corresponding percentage of MSO and the number of sentences with the medio-passive form of the verb in the medical sense and the corresponding percentage of MSO:

Table 1. A picture of the data retrieved from HNC

Verb	Medical sense	HNC occurrences	Medical sense occurrences (MSO)	Active forms (medical sense)	% on MSO	Medio-passive forms (medical)	% on MSO
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						sense)	
‘χειρουργώ’	‘to operate on’	198	176	62	35%	114	65%
‘εγχειρίζω’	‘to operate on’	62	29	7	24%	22	76%
‘εξετάζω’	‘make a medical examination’	2000	36	36	100%	0	0%
‘τραυματίζω’	‘to injure’	2000	1306	214	16%	1092	84%
‘γιατρεύω’	‘to cure’, colloquial	115	44	30	68%	14	32%
‘θεραπεύω’	‘to cure’, formal	513	191	88	46%	103	54%

2.2. Collecting additional data from the web and with the use of questionnaires

All the steps described above provided us with a very good overview of the HNC data, namely: frequencies of structures, relations among structures that could be regarded as alternation phenomena and, what is very important, structures that were not encountered in the data from the HNC corpus. In fact, when we were done with the data from HNC and had the structures of the verbs enumerated, we realized, being native speakers that valid structures supported by the verbs were not included in the structures derived from the HNC. We then decided to check whether our intuitions were right and if these structures could be found in web-retrieved examples. We searched structures supported by the verb ‘χειρουργώ’ and some of our intuitions were in fact validated.

Still, however, there were structures that we assumed that existed, but they could not be found in either the HNC or the web. Once more, we decided to test our intuitions using a questionnaire containing the remaining structures of the verb ‘χειρουργώ’. To this end, we developed a questionnaire, divided in 5 sub-questionnaires with 2 sentences each, that we distributed to 75 native speakers of Greek aged between 14 and 62 years old. We paid a lot of attention to the design of the questionnaire, so that it wouldn’t mess up with the speaker’s intuitions. Therefore, each speaker was exposed only to two examples, each one describing a different structure. The texts were chosen to make sense on their own, all of them being very short narratives. To make sure that the speakers’ reactions would not be biased, we gave them no information about what we were checking with the questionnaires hoping that if there was something wrong with the structure of the verb, they would spot it intuitively. Actually, we were forced to make two rounds with the questionnaire, as will be explained below in the discussion of the responses received. Tables 12 to 15 indicate which structures of ‘χειρουργώ’ were found in the HNC and the web and which were checked with the questionnaire together with the responses received.

2.3. Description of the responses received with the questionnaires

We distributed the questionnaires to 75 speakers. We asked them whether they felt that there was something wrong with the sentences they would read. If everything seemed fine we did not ask for a comment. If something seemed wrong we asked them to explain. The question was so general because we wanted to let them comment the sentences in the way the participants chose in an absolutely unbiased manner. Gries (2012) notes that the most natural linguistic responses are produced when the subject produces natural and unconstrained responses to the questions. (1b) and (2b) are the responses to the one of the texts in the questionnaire. (1a) and (2a) are the sentences given in each case. It can be clearly seen that the responses are not biased at all.

(1) a. Το πρωί μετά το ψάρεμα πήγα κάτω στην αγορά. Περνώντας από το καφενείο συνάντησα το Σταθάτο, το γιατρό που όταν ήμουν στη Θεσσαλονίκη μου είχε χειρουργήσει το στομάχι για έλκος. Μου λέει κάτσε να δούμε αν κάναμε καλή δουλειά τότε. Και κατεβάσαμε κάμποσα τσίπουρα.

b. “Δε νομίζω ότι ένας σωστός και υπεύθυνος γιατρός, όσο καλή δουλειά και να έκανε, να πλακωνόταν στα τσίπουρα με έναν ασθενή που είχε πρόβλημα στο στομάχι”
‘I don’t think that a decent and responsible doctor, no matter how good he was at his job, would have many drinks with a patient who had a problem with his stomach’

(2) a. Είμαι ψόφιος. Το πρωί χειρουργήσα ένα στομάχι για καρκίνο. Μετά ένα άλλο στομάχι για έλκος. Οχτώ ώρες χειρουργείο στη σειρά. Νυστάζω!!

Έρχεται λοιπόν ο Βασίλης και μου λέει. Αδελφέ, καίγομαι. Αύριο έχω μια εγχείριση δύσκολη, ένα στομάχι. Με όσα μου συμβαίνουν δε θα τα βγάλω πέρα. Θα την αναλάβεις; Και ξέρεις ποιανού στομάχι ήταν αυτό; Του Πανουργιά. Τί να κάνω, το κατάπια. Και έτσι χειρουργήσα το στομάχι για καρκίνο παρακαλώ. Ακόμη κάνω το σταυρό μου που πήγαν όλα καλά.

b. “Μιλάει πολύ ωμά και άψυχα για πολύ σημαντικές διαδικασίες”
‘He speaks very roughly and uncompassionately for very important procedures’

We considered the answers which showed that the speaker had no comments regarding ‘χειρουργώ’ as positive answers. In most of the cases of positive answers the participants said that there was nothing to comment about the sentences and that everything seemed unproblematic. There were also answers that commented on the punctuation, whether the language was formal or not and if this form of the language was appropriate with the situation described such as the answers (1b) and (2b).

Negative answers showed clearly that the speaker rejected the structure of ‘χειρουργώ’ that existed in the sentence and in most of the cases he proposed an alternative structure (3).

(3) “Η ορθή σύνταξη θα ήταν «ο Καραγκούνης χειρουργήθηκε στο γόνατο για μηνίσκο από τον Παπανικολάου»” (The questionnaire contained the following

structure: Το γόνατο του Καραγκούνη χειρουργήθηκε για μηνίσκο από τον Παπανικολάου).

‘The right syntax should be “Karagkounis was operated on the knee for meniscus by Papanikolaou”. (The syntax of our sentence was: [[the knee-SUBJ Karagkounis-GEN] was operated-3SG for-P meniscus-PP].

For two of the sentences we decided to make a second round with the questionnaire, because at first we chose sentences that included another phenomenon of the Greek Language, and that drew the attention of the participants away from the structure of ‘χειρουργώ’ (4) and (5).

(4) Το καλοκαίρι που υπηρετούσα στο νοσοκομείο του Αργοστολιού μας έφεραν ένα κατάγμα της λεκάνης το οποίο δεν ήταν δυνατόν να χειρουργηθεί λόγω της γενικότερης κατάστασης της ασθενούς.

(5) Το καλοκαίρι που υπηρετούσα στο νοσοκομείο του Αργοστολιού μας έφεραν ένα κατάγμα στη λεκάνη το οποίο δεν ήταν δυνατόν να χειρουργηθεί λόγω της γενικότερης κατάστασης της ασθενούς.

All the 15 participants who were presented with these sentences commented on whether the body part, when defining an illness should be expressed with a genitive case or with a σε-PP. 47% (7/15) of the people asked said that they would prefer the genitive case, 33% (5/15) said that they prefer the σεPP and 20% (3/15) that it made no difference to them. These results were more or less expected. The reason why there is not an agreement among the speakers about which phrasal constituent is the right one is that in Modern Greek the genitive case has been replaced by other structures in many cases with no difference in the meaning, and this is one of those cases.

As described above, the answer to (4) and (5) did not allow us to detect whether the structures of ‘χειρουργώ’ described in the sentences were accepted by the speakers or not. This was due to the fact that our sentences were the same and the only thing that differentiated them was the genitive case or the σεPP after the body part. Since we gave them no clues about what we wanted them to comment, all the participants concluded that we wanted to check their preference between the genitive case and the σεPP. We actually wanted to see whether the phrasal constituents (6), (7) were acceptable in the subject position.

(6) [Subj-*Illness* + POSS-*Bodypart*] Verb

(7) [Subj-*Illness* + σε-PP- *Bodypart*] Verb

For those reasons we decided to proceed with a second round of questionnaires to check the particular structures of ‘χειρουργώ’ again (6) and (7). This time while our sentences contained exactly the same structures as before, they were completely different between them (8) and (9).

(8) Όταν η κάκωση κοίλων σπλάγγων χειρουργείται μετά παρέλευση δέκα ωρών δίνεται μια επιπλέον δόση, ενώ όταν χειρουργείται μετά παρέλευση δεκαώρου χορηγούνται αντιβιοτικά βάσει των αρχών αντιμετώπισης της περιτονίτιδας.

(9) Εάν ο καρκίνος στην ουρά του παγκρέατος χειρουργηθεί από έμπειρο χειρουργό και με τη μέθοδο της περιφερικής παγκρεατεκτομής, τα ποσοστά επιτυχίας είναι ικανοποιητικά.

The answers received from the same people, this time had nothing to do with the genitive case or the σεPP after a body part. In fact all of the speakers (15/15) accepted the structures of the verb that were included in this questionnaire (see Table 4).

2.4. The reliability of linguistic data obtained from different sources

This exercise fits well into the ongoing discussion about how reliable linguistic data can be obtained. Schütze (2011) presents the major benefits and drawbacks of the main sources from which linguistic data can be obtained. He argues that corpora provide data that can not be biased by the researcher in any way. Statistical analysis is also a positive aspect of the corpus if it is in electronic form. This allows researchers to verify their conclusions in a solid way. Also the study of corpus retrieved data can bring to light linguistic phenomena that otherwise might be missed. In our case this happened especially with the verb ‘τραυματίζω’. The large number of sentences that were retrieved from the HNC corpus allowed us to notice that the verb systematically prefers a gradation and that with the passive form of the verb there is an unusual way of expressing time (4.6.2. and 4.6.3.). The major disadvantage of corpus data is that sometimes not all phenomena are present. But if a phenomenon does not appear in the retrieved examples, it is hard to explain why this happens. Is it due to the fact that the phenomenon does not appear in the language or should one blame the nature of the corpus used? We decided to deal with this problem by using additional data from the web and from questionnaires as described in sections 2.1., 2.2. and 2.3.

On the other hand, nowadays web can be treated as a huge corpus. Its major advantage is that it tracks changes in the language with no delay. Also it contains linguistic material that can not be found anywhere else, since the users of the web may write in various ‘codes’. The critical disadvantage of assembling data from the web is that we can never know for sure who originally created the context, which his native language is and that search engines bring back results which reflect the most visited web pages and not all the pages available for the context of the query.

In comparison with data from corpora and the web, Schütze believes that judgment data, the data that are obtained from native speakers of the language with the use of questionnaires designed from the researchers, are superior for gathering information about ill-formed expressions in a language. Also they are the only way for gathering data from languages with a small number of speakers. Furthermore they can provide the researcher with immediate information about the phenomenon he is interested in. In our work this was exactly what happened with the series of adverbs that co-occur with ‘τραυματίζω’. We had a difficult time in deciding whether these adverbs formed multiword units with the verb with meanings different from the original verbal one or whether they simply imposed some gradation to meaning. We based the conclusion that the second option was the case on the responses of native speakers regarding the relationship of the verb with these adverbs (4.6.2). The major

disadvantage concerning judgment data is that in many cases the design of the question reflects the researcher's judgments as primary evidence and this affects the responses received from the participants. In our effort to avoid this situation, we designed our questionnaire by paying special attention to the paradigms included in our questionnaire and the question addressed to the informants, in order to make sure that we would receive unbiased responses (2.2. and 2.3).

Schütze concludes that a researcher should choose a method of data collection in relation to the phenomenon he wishes to study and that the best way of collecting data is the combination of all the above methods. If data collected with different methods show the same results, then these results are more valid. In our work we decided to study 'χειρουργώ' through all kinds of data, because we wanted to have a solid representation of the verb's structures and of the linguistic phenomena related to it, such as habitual use (4.1.3.) and inalienable possession (4.1.4.)

Certain linguists believe that corpora provide more reliable data especially in comparison with intuition-based approaches (Verlinde and Selva 2001). This certainly has to do with corpus size and constituency. HNC is a relatively medium corpus that represents only written language. The other source of "unbiased" data, namely the web failed to match native speakers' intuitions. In our opinion this happened because the web normally brings back the most visited texts that contain the words used in the query. We, however, did not want to check the most frequent structures of the verb that were also found in the corpus. Instead, we wanted to check the acceptability of the structures that we assumed that existed and were not found in the corpus.

In another study Schütze and Sprouse (2011) argue that judgment data can provide information that is not available in other kinds of data, and that they provide evidence about linguistic phenomena that occur rarely. Quite remarkably, our work has shown that an important amount of valid data can be missed if corpora and the web are used as the only sources.

On the other hand, there is evidence that data collected with questionnaires represent fairly well natural speakers' competence. Schütze and Sprouse divide the tasks designed for gathering judgment data in qualitative and quantitative ones. Qualitative tasks require non numerical answers such as the forced-choice task where the participant is asked to choose between two or more sentences which one is the most or less acceptable for him. Quantitative tasks require numerical answers such as the magnitude estimation where the participants are given a reference sentence whose acceptability value is defined and are asked to rate sentences in comparison with the given sentence. We believe, however, that both methods are not immune to the major problem of judgement data, namely being biased. The reason is that from our own experience we know that linguistic intuitions are blurred after exposition to more than 3 examples, especially if these examples resemble each other and are on the verge of acceptability. Further blurring often occurs if the speaker is asked to distinguish between two very similar structures.

Schütze and Sprouse also propose some rules for the design of judgment tasks. Firstly the participant should be informed which aspects of the sentence are not of interest to the researcher such as the possibility of the use of the sentence in real life. Before that the researcher has to make sure that the participant will not understand the question of the sentence.

Our questionnaire presented users with a rather qualitative task of a different nature. We also decided not to use several sentences and ask our participants which one they prefer more but we presented each informant with just two examples. The structures in each sentence were clearly different from each other in order to make

sure that the informants would avoid comparing them. Furthermore, the structures were embedded in totally neutral contexts. We did not ask our participants whether the structures were grammatical. We simply asked what they thought about them. We received a variety of responses, a lot of which were of linguistic nature. For instance, in most of the cases where the speaker rejected the structure of the verb, he proposed an alternative structure which he probably considered a reference point for the verb's structure. This proved that our subjects did check the linguistic validity of the examples. A fact that further shows the validity of our method occurred by accident (see also Section 2.3 before): In the first round of the questionnaires we failed to meet our rule about totally different structures in the same questionnaire. And we received what we paid for: since our sentences were almost the same, all the participants compared the sentences between them---although they were not asked to perform this task and many of them were not linguists, they all concluded that this was the goal of the questionnaire. So, in order to check the acceptability of each independent sentence rather their relative acceptability when compared to each other, we were forced to check them with a second round of questionnaires with totally dissimilar sentences (2.3).

Certain linguists believe that when linguists participate in a judgment experiment their answers are always biased because their responses are affected by their personal theoretical viewpoints (Wasow and Arnold 2005). Others believe that linguists can provide responses more reliable from the non-expert participants (Fanselow 2007). Contrary to these Schütze and Spouse argue that there have been no studies establishing where these differences come from or showing that these differences seriously affect the result of the judgment tasks. We made sure that the number of the participants (75 different people in total) was capable of providing us with a very good idea for the acceptability of the structures. To this end, we addressed our questionnaires to a combination of linguists and non-linguists in order to by-pass any problems regarding the liability of the results due to the skills of the participants

Another very important advantage of judgment data is that we can perform statistical tests on their results in order to further validate them or interpret the variation across the participants, so, the statistical tests that we performed on some corpus data in the next section, could also be applied on judgment data.

2.5. Using statistics to verify assumptions that rely on corpus data

Gries (2012) notes that linguistic research based on corpora is a distributional science that is, linguistics explores the frequencies of occurrence or co-occurrence of linguistic elements and also the dispersion of linguistic items in corpora.

In our study based on corpus-retrieved examples, we developed certain frequency tables. Here, we use the R Programming Language to statistically verify certain assumptions we made drawing on these data. At this point it is important to note that these analyses only deal with the HNC data. Our aim was to investigate whether the results of a statistical analysis corroborated the quantitative conclusions one could draw from the frequency tables we constructed out of the HNC data. Well, they do not because the HNC is not large enough. On the bright side, however, the statistical analysis justifies the methodology we adopted as regards data collection and we ask the reader to recall that our methodological choices were made on the basis of our intuitions as native speakers.

R is a programming language that also provides an environment for statistical analysis and graphics. It is available as Free Software from: <http://cran.r-project.org/bin/windows/base/>.

Gries (2012) proposes a method for the statistical analysis of 2x2 frequency tables, in which one nominal or categorical variable is cross-tabulated with another nominal or categorical variable. It's his method that we follow here, and it is consisted of the following steps:

1. Data from a frequency table are entered into a matrix in R using the function *matrix*.
2. Row and column labels are added using the function *list*.
3. The function *addmargins* is used in order to check if the data had been successfully entered.
4. The resulting matrix is evaluated using the chi-square test if all variables are independent from each other, using the function *chisq.test*. This function returns nothing, but all the results are now saved in R in a new data structure which we call *x.test*, and will be used in order for the next steps to be computed. According to Gries, chi-square test consists of the following sub-tests:
 - a. The frequencies expected by chance are computed when there is no relationship between the variables, using the function *x.test\$exp*.
 - b. The difference is computed between the expected frequencies and the observed frequencies in the R matrix is statistically significant, by calling the overall result *x.test*.
 - c. If the difference in b is statistically significant, the cells in the frequencies table responsible for the effect obtained are identified with Pearson's Residuals using the function *x.test\$res*.
 - d. Finally, effect size is computed in order to see if the correlation between the phenomenon and the sample studied is strong enough. To this end the function *sqrt(x.test\$stat/sum(x))* is used.

2.5.1. Active and passive voice with the verbs studied

Naturally, in HNC some of the verbs appear more frequently in the active form, while others in the passive one. For example, while 'θεραπεύω' and 'γιατρεύω' are synonyms, 'θεραπεύω' appears more times with a passive form and 'γιατρεύω' with an active one. We used statistical methods to investigate the significance of these data.

The R matrix for our data is the following:

Table 2. The data in an R matrix

```
> x<-matrix(c(62,114,7,22,84,103,30,14,36,0,214,1092),ncol=6)
> attr(x,"dimnames")<-
list(Voice=c("Active","Passive"),Verb=c("χειρουργώ","εγχειρίζω","θεραπεύω","γιατρ
εύω","εξετάζω","τραυματίζω"))
> addmargins(x)
      Verb
Voice  χειρουργώ εγχειρίζω θεραπεύω γιατρεύω εξετάζω τραυματίζω Sum
```

Active	62	7	84	30	36	214	433
Passive	114	22	103	14	0	1092	1345
Sum	176	29	187	44	36	1306	1778

All observations are independent from each other and most of the expected frequencies are larger than 5 (Table 3). Therefore, we can use the chi-square test in order to evaluate the matrix in Table 2. The results of the chi-square test are divided in three parts. The first part contains the expected frequencies, that is, the frequencies that one should expect when there is no relationship between the variables (Table 3).

Table 3. Expected Frequencies

<pre>> x.test<-chisq.test(x,correct=FALSE)</pre>						
<pre>> x.test\$exp</pre>						
	Verb					
Voice	χειρουργώ	εγχειρίζω	θεραπεύω	γιατρεύω	εξετάζω	τραυματίζω
Active	42.86164	7.06243	45.54049	10.71541	8.767154	318.0529
Passive	133.13836	21.93757	141.45951	33.28459	27.232846	987.9471

Next, Table 2 is compared to Table 3. At this stage we want to check if the difference between the observed frequencies (Table 2) and the expected frequencies (Table 3) is statistically significant.

Table 4. χ^2 test

<pre>> x.test</pre>	
	Pearson's Chi-squared test
	data: x
	X-squared = 256.938, df = 5, p-value < 2.2e-16

p is much smaller than 0,05 therefore there is a highly significant correlation between the voice and each verb. However, this is a total result and it is not clear which of the cells are most responsible for this effect and how. To identify these cells we use Pearson residuals.

Table 5. Pearson residuals

<pre>x.test\$res</pre>						
	Verb					
Voice	χειρουργώ	εγχειρίζω	θεραπεύω	γιατρεύω	εξετάζω	τραυματίζω
Active	2.923279	-0.02349168	5.699081	5.891230	9.197371	-5.834510
Passive	-1.658644	0.01332898	-3.233610	-3.342634	-5.218510	3.310451

If Pearson residual in a cell is positive, then the observed frequency is bigger than the expected frequency in that cell. If it is negative the observed frequency is smaller than the expected frequency in that cell. Also, the more the Pearson residual deviates from 0, the stronger the effect. In our case the strongest effect is the preference of 'εξετάζω' for the active form. A result more or less expected since in the data from HNC, 'εξετάζω' (in the medical sense) was found in the active voice only (despite the fact that the passive form exists for this sense in the language). From

the study of the corpus-retrieved examples of ‘χειρουργώ’ and ‘θεραπεύω’ we found that both verbs prefer the passive form (sections 4.1. and 4.3). Pearson residual shows that both verbs have a bigger preference for the active form. In this case, our assumptions that drew on the frequencies observed in the corpus data were not verified.

The final step of this analysis is to compute an effect size in order to see whether the observed correlation is independent of the sample size. For this reason we use the phi-test (Φ -test) that returns results ranging between 0 and 1. 0 means no effect and 1 means perfect correlation between the sample and the phenomenon studied.

Table 6. Φ -test

```
> sqrt(x.test$stat/sum(x))
X-squared
0.3801441
```

In this case it seems that the correlation is not strong enough. It is closer to 0 than to 1. This means that if we examine the correlation of the active and passive voice with these verbs with a different sample, our results might be different.

2.5.2. The gradation with ‘τραυματίζω’

The corpus-retrieved examples of ‘τραυματίζω’ showed that the verb prefers specific adverbs in order to gradate its results (4.6.2). The data showed that both the active and the passive voice of the verb prefer gradation in almost the same percentage, and that in both voices the adverb most preferred is ‘σοβαρά’ and ‘ελαφρά’ follows.

We will now see if these assumptions can be verified statistically.

We first enter our data into a matrix in R.

Table 7. The gradation of ‘τραυματίζω’ in an R matrix

```
> x<-matrix(c(16,106,1,5,13,12,36,122,0,6,0,4,4,20,0,4,0,1,0,2),ncol=10)
> attr(x,"dimnames")<-list(Voice=c("τραυματίζω","τραυματίζομαι"),Adverb=c("ελαφρά",
"ελαφρότερα","θανάσιμα","σοβαρά","σοβαρότερα","σοβαρότατα","βαριά","βαρύτ
ατα","επιπόλαια","άσχημα"))
> addmargins(x)
```

	Adverb										
Voice	ελαφρά	ελαφρότερα	θανάσιμα	σοβαρά	σοβαρότερα	σοβαρότατα	βαριά	βαρύτατα	επιπόλαια	άσχημα	Sum
τραυματίζω	16	1	13	36	0	0	4	0	0	0	70
τραυματίζομαι	106	5	12	122	6	4	20	4	1	2	282
Sum	122	6	25	158	6	4	24	4	1	2	352

Next we perform the chi-square test. First, we compute the expected frequencies.

Table 8. Expected Frequencies

```

> x.test$exp
      Adverb
Voice      ελαφρά  ελαφρότερα  θανάσιμα  σοβαρά  σοβαρότερα  σοβαρότατα  βαριά  βαρύτατα  επιόλαια  άσχημα
τραυματίζω  24.26136  1.193182  4.971591  31.42045  1.193182  0.7954545  4.772727  0.7954545  0.1988636  0.3977273
τραυματίζομαι  97.73864  4.806818  20.028409  126.57955  4.806818  3.2045455  19.227273  3.2045455  0.8011364  1.6022727

```

The difference between the expected frequencies in Table 8 and the observed frequencies in Table 7 is found to be statistically significant.

Table 9. χ^2 test

```

> x.test

Pearson's Chi-squared test

data: x
X-squared = 24.9426, df = 9, p-value = 0.003035

```

In this case p is smaller than 0,05. This means that the correlation between the verb and the adverb that follows is significant. However, this is a total result and it is not clear which of the cells are most responsible for this effect and how. To identify these cells we use Pearson residuals.

Table 10. Pearson residuals

```

> x.test$res
      Adverb
Voice      ελαφρά  ελαφρότερα  θανάσιμα  σοβαρά  σοβαρότερα  σοβαρότατα  βαριά  βαρύτατα  επιόλαια
τραυματίζω -1.6772358 -0.17685321  3.600657  0.8169889 -1.0923286 -0.8918826 -0.3537064 -0.8918826 -0.4459413
άσχημα
-0.6306562
τραυματίζομαι  0.8356388  0.08811248 -1.793933 - 0.4070433  0.5442241  0.4443571  0.1762250  0.4443571  0.2221786
0.3142079

```

From the table above it seems that ‘τραυματίζω’ prefers ‘θανάσιμα’ in order to gradate its results while ‘τραυματίζομαι’ prefers ‘ελαφρά’ more than the other adverbs. Also in this case the results of the statistical test do not agree with our initial assumptions made from the data, where in terms of prima face frequencies none of the voices of the verb prefers ‘ελαφρά’ for its gradation.

We will now compute an effect size in order to see if these results would be valid in another sample of data.

Table 11. Φ -test

```

> sqrt(x.test$stat/sum(x))
X-squared
0.2661946

```

The result of the Φ -test is closer to 0 than to 1. This shows that our results in this case are valid only for the specific sample, and if the sample changes it is very likely that our results will change too.

The two cases studied here show us clearly that:

- if we base our conclusions only on the frequencies we find in the data from HNC, without verifying them statistically we can be misled easily
- the size of the corpus is not enough to ensure corpus independent results.

- HNC is the largest balanced corpus of Modern Greek available at the moment and a medium sized corpus by itself. Other corpora of Modern Greek are of smaller size or lack retrieval tools or both. It seems that the situation calls for a cooperative approach of the issue.

3. Annotation

Our next step was to come up with a notation for both a semantic and a grammatical tagging. We decided to combine those two types of annotation because our goal was to describe all the semasio-syntactic information of each verb studied. With the semantic annotation of our examples we wanted to define the participants of the event described by each verb, and with the grammatical annotation we wanted to describe the syntactic environment of the verb in a way that would make clear how each thematic role was represented in syntax. When the annotation was completed, we had a very good idea about the structures of each verb and we were able to enumerate the verb alternations to which each verb participated. In the case of ‘χειρουργώ’ we found that several of the alternative structures supported by the verb were related to the inalienable possession relations that hold between an Entity and a BodyPart as well as between a BodyPart and an Illness (or an Entity and an Illness). We will take up this discussion in section 4.1.4.

3.1. Semantic annotation of HNC data

In our effort to semantically annotate the corpus-retrieved examples our main references were FrameNet and the literature on thematic roles.

FrameNet is a corpus-based lexical database of English based on the Frame Semantics theory (Fillmore 1982). Each word evokes a frame which helps the understanding of its meaning. Verbs represent the event arguments and thematic roles represent the semantic relations between a predicate and its arguments. The participants in an event (Frame Elements) are divided in Core and Non Core elements. Core elements represent the thematic roles that are always present in a Frame even if they are not directly expressed. Non Core elements are secondary thematic roles and their appearance is optional. Annotated examples are given to illustrate both the semantic relations between a predicate and its arguments, and, the basic syntactic patterns in which each verb occurs.

In FrameNet the “Medical Interaction Scenario” has been defined as follows (https://framenet2.icsi.berkeley.edu/fnReports/data/frameIndex.xml?frame=Medical_interaction_scenario) and involves the following set of roles:

Definition of the Medical_Interaction_Scenario in FrameNet.

A **Patient** interacts with one or more **Medics** (doctors, nurses, and/or EMTs with a responsibility for the **Patient**'s health) so that the **Medics** can determine the health status of the **Patient** and maintain or restore the **Patient**'s health as necessary.

Usually, the **Patient** has an **Affliction**, a medical problem that motivates or necessitates their coming into the care of a **Medic**. At a minimum, the **Patient** has a single interaction with a **Medic**, but usually the **Patient** has a relationship with the **Medic** or group of medical professionals who either have responsibility for helping them with their specific **Affliction** or for their health in general. Medical interactions normally take place at a **Medical_center** (a hospital or doctor's office), but in cases

where the **Patient** suffers a sudden catastrophic **Affliction**, the **Patient** may be taken into the care of EMTs, who act as their **Medic** until reaching a medical center.

In some cases, the **Body_system** that has a problem is mentioned in place of the **Affliction**.

Her three **cardiac PATIENTS** take up all her time.

Our doctors *provide* the best **HEALTHCARE** on the planet.

Roles in the Medical interaction Scenario of FrameNet:

Core:

Affliction [aff] The particular disorder that the **Patient** is suffering from and the the **Medic** treats.

Medic [Prof] The medical professional who has responsibility for the care of the **Patient**

Patient [] The person who is under the care of a **Medic** or other form of medical professional.

Non-Core:

Body_system [bod] The part of the **Patient**'s body that is being treated.

Medical_center [pla] The place visited by the **Patient** and where the **Medic** works.

FrameNet defines participants in an event in a case-based manner. This allows for greater precision and clarity. On the other hand, drawing generalisations becomes a hard task.

Dowty's work (1991) on thematic roles can be interpreted as an effort to draw generalisations over case-based definitions of thematic roles. He defines thematic roles as clusters of entailments about the role of entities in an event. Two main clusters are formed, which he calls "Proto-Roles", the "Proto-Agent" and the "Proto-Patient". Each Proto-Role is a cluster of different entailments, characteristics which are considered to be semantically independent. The Proto-Agent cluster consists of the following characteristics: Volition, Sentience/Perception, Causation, Movement, and Independent Existence. The Proto-Patient cluster consists of the following characteristics: Change of State, Incremental Theme¹, Causally Affected, Stationary relative to another participant, and Existence not independent of event. Each Proto-Role can entail one or more of those characteristics. Dowty also argues that in the cases of predicates with grammatical Subject and Object, Proto-Roles define argument selection. Proto-Agent is the Subject and Proto-Patient the Direct Object.

A problem with Dowty's approach is how the role of the other participants, beyond the ones engaged in the Proto-Roles, is described. Because it is the case that

¹ Dowty (1991) proposes a new role category which he calls Incremental Theme and distinguishes from the traditional semantic role Theme. While Theme denotes a change of state, Incremental Theme denotes a definite change of state which happens in stages. e.g. write a letter, build a house.

some of the non-protorole elements may coexist with the protorole ones or may play the role of the protorole ones (10):

(10) [Οι γιατροί]:Proto-Agent χειρουργήσαν [τον Σαμαρά]: Proto-Patient [στο μάτι]: BodyPart

Actually, BodyPart above is related to the same Proto-Patient entailments (Change of State) as the Entity part of which is the BodyPart. However, the verb prefers the Entity as a Proto-Patient and direct object. And actually, this preference outnumbers—but does not eliminate-- in terms of frequency of occurrence the other option (11):

(11) [Οι γιατροί]:Proto-Agent χειρουργήσαν [το μάτι του Σαμαρά]: BodyPart in the role of Proto-Patient with ex-ProtoPatient expressed as a Possessor on BodyPart

Our approach was closer to that of FrameNet because we wanted to draw the detailed picture at this stage of our work. It often turned out to be a method of trial and error mainly because we did not want to adhere to FrameNet in our effort to be as objective as possible to the Greek data.

One of the most characteristic cases of trial and error characterisation of event participants was the case of [cause] and [illness]. In the beginning, anything that had to do with what caused the action described by the verb was annotated as [cause] (12), (13) and (14):

(12) Όμως, δεν είναι πλήρως γνωστός ούτε ο μηχανισμός με τον οποίο η ασπιρίνη [μέσο/όργανο] θεραπεύει τον πονοκέφαλο [αίτιο] ή κατεβάζει τον πυρετό ή γιατί ο αμιάντος προκαλεί καρκίνο.

‘However, the mechanism via which aspirin [medium/instrument] cures headache [cause] or reduces fever is not fully understood nor why asbestos is a cause of cancer.’

(13) Ο Καταλανός [πάσχων] χειρουργήθηκε για αφαίρεση αιμορροΐδων [αίτιο].

‘The Catalan [entity] was operated on for hemmoroides [cause]’

(14) Έκρηξη βόμβας [αίτιο] στα χέρια του καθηγητή Σάκη Καραγιώργα, τραυματίζει τον ίδιο [πάσχων] κι οδηγεί στην εξάρθρωση της ΔΑ (14/7).

‘A bomb explosion [cause] right in the hands of Professor Sakis Karagiorgas leaves him [entity] injured and leads to the breaking up of DA (14/7)’

However, while annotating sentences with ‘τραυματίζω’ it became clear to us that the original [cause] should be split into [cause] and [illness]. As a result the above examples were eventually notated as follows (15), (16) and (17):

(15) Όμως, δεν είναι πλήρως γνωστός ούτε ο μηχανισμός με τον οποίο η ασπιρίνη [μέσο/όργανο] θεραπεύει τον πονοκέφαλο [πάθηση] ή κατεβάζει τον πυρετό ή γιατί ο αμιάντος προκαλεί καρκίνο.

‘However, the mechanism via which aspirin [medium/instrument] cures headache [illness] or reduces fever is not fully understood nor why asbestos is a cause of cancer.’

(16) Ο Καταλανός [πάσχων] χειρουργήθηκε για αφαίρεση αιμορροΐδων [πάθηση].

‘The Catalan [entity] was operated on for hemorrhoids [illness]’

(17) Έκρηξη βόμβας [αίτιο] στα χέρια του καθηγητή Σάκη Καραγιώργα, τραυματίζει τον ίδιο [πάσχων] κι οδηγεί στην εξάρθρωση της ΔΑ (14/7).

‘A bomb explosion [cause] right in the hands of Professor Sakis Karagiorgas leaves him [entity] injured and leads to the breaking up of DA (14/7).’

Eventually, we ended up with the following tags for the semantic annotation, each one coloured differently in order to be easier recognisable in the text:

- [agent] = [δράστης]: who carries out the action described by the verb.
- [entity] = [πάσχων]: who or what undergoes the effect of the action described by the verb
- [cause] = [αίτιο]: who or what causes the action described by the verb
- [illness] = [πάθηση]: the illness that causes the action of the verb
- [bodypart] = [σημείο]: the specific body part that undergoes the effect of the action described by the verb.
- [medium/instrument] = [μέσο/όργανο]: the instrument or the mean with which the action described by the verb is performed
- [the reason why] = [αιτία]: the reason why the action described by the verb is performed
- [manner] = [τρόπος]: the way that the action described by the verb is performed. Whenever it is necessary because of the verb’s meaning, [manner] was further divided in [instrument] = [όργανο]: the instrument with which the action described by the verb is performed, and [intentionality] = [τρόπος προθετικότητας]: describes the intention of the agent who carries out the action described by the verb.
- [time] = [χρόνος]: when the action described by the verb took place. Whenever necessary by the verb’s meaning, [time] was further divided in [fact] = [γεγονός]: the specific fact where the action described by the verb was performed, and [complex time] = [σύνθετος χρόνος]: not only the specific fact, but the exact time within the fact that the action described by the verb is performed.
- [place] = [τόπος]: where the action described by the verb is performed.
- [result] = [αποτέλεσμα]: the result of the action described by the verb
- [purpose] = [σκοπός]: the purpose of the action described by the verb.
- [MS: meant subject] = [EY: εννοούμενο υποκείμενο] followed by its thematic role.
- [MO: meant object] = [EA: εννοούμενο αντικείμενο] followed by its thematic role

In comparison with Dowty’s theory, our approach was much more detailed, because our primary goal when we started studying the corpus-retrieved examples was to depict the structures of the verbs and describe any verb alternations that would

be identified. We also considered the verb to be the centre of the event but we decided to present thematic roles more analytically, because we wanted to define clearly the participants of every event in order to have a solid representation of the verb alternations. The weakness of Dowty's proposal is that it doesn't provide a way to describe the participants of the event when they don't entail the characteristics of Proto-Roles. Our approach can adequately describe cases where the syntactic role of a Proto-Role is held by another thematic role which is not included in the clusters of entailments of the Proto-Roles (see (10) and (11)). Also Dowty's theory, syntactically speaking, can only describe verbs with two arguments. Proto-Agent syntactically denotes the Subject and Proto-Patient the Direct Object. When the Subject or the Object are not independent constituents but phrasal constituents which are consisted of more than one lexical units that denote different thematic roles, Dowty's theory cannot describe all the participants of the event. This would narrow the verb structures only in the structures containing Subject-Verb-Object and would not allow us to describe verb alternations explicitly. By applying this categorization of thematic roles different structures will be considered to be the same (18) and (19).

(18) Μίλησε και με τους γιατρούς που θα [EY: γιατροί = [Proto-Agent]]
χειρουργήσουν τον πατέρα του [Proto-Patient]
'He spoke with the doctors that will [MS:the doctors=[Proto-Agent] operate
on his father [Proto-Patient]'

(19) Ο ίδιος [Proto-Agent] είχε χειρουργήσει τη μύτη του Φρόντ [Proto-
Patient]
'the same one [Proto-Agent] had operated on Freud's nose [Proto-Patient]'

Our method makes clear that examples (20) and (21) represent different verb alternations deriving from different structures.

(20) Μίλησε και με τους γιατρούς που θα [EY: γιατροί = [δράστης]]
χειρουργήσουν τον πατέρα του [πάσχων]
'He spoke with the doctors that will [MS:the doctors=[agent] operate on his
father [entity]'

(21) Ο ίδιος [δράστης] είχε χειρουργήσει τη μύτη [σημείο] του Φρόντ
[πάσχων]
'The same one [agent] had operated on Freud's [entity] nose [bodypart]'

Our approach is closer to FrameNet. We used corpus-retrieved examples as well, but we enriched them with data from the web and questionnaires, because the corpus we had at our disposal was medium-sized and contained texts only from the written form of the language. We also considered the verb to be the core of the event and at first we described the thematic roles of all the lexical units related to the verb. After the semantic annotation we used a syntactic annotation that helped us distinguish the arguments from the adjuncts. We kept annotating the adjuncts even though they did not affect the structures of the verbs, because we thought that they could systematically reveal patterns of each verb's behaviour. This helped us notice some interesting phenomena concerning verbs in relation to their adjuncts such as the expression of time with the verb 'τραυματίζω' which will be presented in section 4.6.3..

Even though most of the verbs we studied belonged to the medical field we did not start our work by designing a frame that could apply to all the verbs but we worked independently on each verb. Then for ‘χειρουργώ’ we described the event of a medical operation (4.2.2.) drawing on the examples from all the resources (corpus, web, questionnaires). In this way, we were able to identify the entities that participate in the medical operation event in Modern Greek following FrameNet. At the moment, the remaining verbs have been studied with corpus-retrieved examples but we intend to apply to them the method we adopted for ‘χειρουργώ’. In section 4 we give a description of the event that every verb describes and its participants and we compare our system of annotation with FrameNet but we do not yet attempt a unified approach of the two systems.

3.2. Grammatical annotation

In addition to the semantic annotation, we adopted a type of grammatical annotation that is closer to the way ‘Ekfrasis’ classifies syntactic frames at the moment. The aim was to list and study the semantic and syntactic contexts of the verb. It turned out that the procedure was critical in order to distinguish the structures supported by the verbs studied.

For every syntactic constituent of the verb we annotated not only its grammatical function but also its correspondent thematic role that we have found from our previous task of semantic annotation. So in the end of this procedure we had a very clear picture of how each thematic role is presented in syntax. (22) presents a semantically annotated sentence and (23) the grammatical annotation of the same sentence.

(22) Ο ίδιος [δράστης] είχε χειρουργήσει τη μύτη [σημείο] του Φρόιντ δύο φορές, την πρώτη στη Βιέννη το 1895.
‘The same one had operated on Freud’s nose twice, the first time in Vienna in 1985’

(23) ΟΦον [δράστης] + Ρήμα + ΟΦατ [σημείο]
NPnom [agent] + Verb + NPacc [bodypart]

In FrameNet the syntactic realization of each Frame Element is presented in the annotated examples along with tables that present the syntactic patterns of each lexical unit. This type of annotation is very close to the one we used in order to establish the relationship between semantic and syntactic arguments and the realization of thematic roles in syntax. Exemplifying our method’s results we mention the case of the passive form of ‘χειρουργώ’ where the Bodypart, when it does not realized syntactically as the Subject, is expressed with a PP introduced with the preposition σε. In this case, the PP has a locative sense, since σε-PPs in Modern Greek is the most common way of expressing place, literally or figuratively speaking. It shows ‘where’ the operation was located, the part of the body that was operated and not for example the reason why the operation took place or the goal of the operation.

(24) Ο Αλεξούδης χειρουργήθηκε χθες με επιτυχία στο γόνατο [σημείο],σε-PP
‘Yesterday Alexoudis was successfully operated on the knee’

4. Case studies

Our aim is to enrich ‘Ekfrasis’, the conceptual lexicon of ILSP that is encoded as a lexical ontology (Markantonatou and Alexopoulou 2008). We set off by putting two questions to ourselves. The first one is “how will ‘Ekfrasis’ be affected by a large amount of data”? The second one is “how empirical data will be annotated and stored in order to be extensively reused”? We knew that both these questions would draw on painstaking work on empirical data and on sound theoretical work and that these two activities were not completely independent of each other.

First things being first, we starting by collecting data from the HNC. We selected verbs from the medical field. Each verb is considered a separate case study. Here, we will present 6 case studies. We organized the data according to morphological form (active versus passive) and according to semasio-syntactic properties of the environments they occurred. For each verb one or more tables are given presenting the structures it supports annotated with semantic information. The frequency of occurrence is given for the HNC structures (obviously because frequencies make sense only for the examples retrieved from the HNC). The source of each one of the structures (that is, whether the HNC, the web or a questionnaire) is also indicated. Texts exemplifying each of the corresponding structures are given.

So, it is clear that annotation of the verb environment for semantic and syntactic properties was one of our main concerns. We intend to align ourselves with important international efforts in this domain, more particularly with FrameNet. At this point, however, we have not copied the FrameNet approach. Rather, we preferred to investigate different approaches drawing on FrameNet, the literature on thematic roles and our own experience. At the moment, we use a mixed notation. Subj in Modern Greek is typically an NP in the nominative case. Obj is typically an NP in the accusative case. A POSS is typically an NP in genitive case that is attached to another NP. We use *italics* to give semantic information as explained in Section 3.1. The labels used range over terms retrieved from the literature on thematic roles up to everyday notions. In brackets ([]) we put phrasal formations that are independent constituents. We do not want to commit ourselves to a syntactic function for these constituents (as we do with SUBJ / OBJ) but we clearly consider these constituents to be arguments of the verbal predicate. Working in a trial and error manner, we have grouped our verbs into sets that materialize different types of event, very much in a FrameNet fashion. In the sections that follow, we discuss the relations between our groups and the corresponding FrameNet ones. We also compare our annotations with the FrameNet ones. However, we will not attempt a unified approach to this question at the moment, leaving it for immediate future work.

The study of these 6 cases revealed a wealth of semasio-syntactic phenomena: Undefined object omission, Inalienable possession, Gradation and, Discourse Phenomena related to argument structure properties. In what follows we describe these phenomena when they occur. In a separate section we discuss the phenomenon of inalienable position that is responsible for several of the alternative structures that are supported by the Greek medical verbs ‘χειρουργώ’/‘εγχειρίζω’. However, we do not attempt a theoretical treatment of the phenomena, leaving that too for immediate future work.

In fact, the existence of these phenomena has affected our methodology for data collection. As we have explained earlier and as we will discuss in Section 2.2, we were forced to search beyond the HNC for data when we realized that the corpus did not satisfy all our intuitions as native speakers. So, we were forced to use the web and the questionnaire method and develop our own methodology.

4.1. The verb ‘χειρουργώ’.

HNC returned 176 occurrences of ‘χειρουργώ’, of which 62 featured the active form of the verb and 114 the passive one. Table 12 illustrates the active structures in the HNC and the web, Table 13 the active structures in the questionnaire. Table 14 illustrates the passive structures in the HNC and the web, Table 15 the passive structures in the questionnaire. Passive constructions outnumbered the active ones by nearly 100% in the HNC. We also used a questionnaire, as explained in sections 2.2. and 2.3. to collect native speakers’ intuitions.

Table 12. Active structures of ‘χειρουργώ’ found in HNC and the web

A	Structure (active forms of ‘χειρουργώ’)	Source	% (HNC)	Usage example
A1	Subj-Agent Verb Obj-Entity	HNC	41/62 66,2%	Στην καριέρα μου, έτυχε παλιά να χειρουργήσω μερικούς από τους πιο στενούς μου φίλους και δεν ήταν, θυμάμαι, μια πολύ ευχάριστη εμπειρία.
A2	Subj-Agent Verb Obj-Entity σε-PP-Bodypart	web		Για το Βέλγιο αναχώρησε τη Δευτέρα (7/11) ο Μιχάλης Σηφάκης, προκειμένου να συναντήσει τον γιατρό που τον χειροούργησε στο γόνατο
A3	Subj-Agent Verb Obj-Entity για-PP-Illness	HNC	1/62 1,6%	Ένα παιδάκι που χειρουργούμε για συγγενή καρδιοπάθεια, π.χ. για Τετραλογία Fallot (συχνή κυανωτική καρδιοπάθεια), μένει στην εντατική τρεις και τέσσερις ημέρες και στο νοσοκομείο δύο εβδομάδες
A4	Subj-Agent Verb Obj-Entity [για-PP-Illness+ POSS- Bodypart]	Web		Ο Αλλάχ και μόνο ο Αλλάχ γνωρίζει πότε θα πεθάνω», είπε χθες ο τούρκος Πρωθυπουργός Ταγίπ Ερντογάν, αναφερόμενος στον σάλο που έχει προκληθεί στη χώρα του έπειτα από τις αποκαλύψεις των μηνυμάτων της Stratfor, σε ένα από τα οποία ο γιατρός που τον χειροούργησε για καρκίνο του παχέος εντέρου φέρεται να λέει ότι του έχουν μείνει μόνο δύο χρόνια ζωής.
A5	Subj-Agent Dative-Entity Verb Obj-Bodypart	Web		Ο 27χρονος διεθνής τερματοφύλακας του Άρη βρίσκεται, ήδη, στην Αμβέρσα και εξετάστηκε εκ νέου από τον καθηγητή-γιατρό που του χειροούργησε το αριστερό γόνατο.
A6	Subj-Agent Verb [Obj-Bodypart +POSS-Entity]	HNC	2/62 3,2%	Ο ίδιος είχε χειρουργήσει τη μύτη του Φρόιντ δύο φορές, την πρώτη στη Βιέννη το 1895.
A7	Subj-Agent Verb Obj-Bodypart	HNC	1/62 1,6%	Διότι βεβαίως δεν μπορεί ο νευροχειρουργός που χειρουργεί δέκα ή δώδεκα ώρες να αμείβεται το ίδιο με το γενικό χειρουργό στο Νοσοκομείο Καρπενησίου που [ΕΥ: ο γενικός χειρουργός]

				χειρουργεί μόνο σκωληκοειδίτιδα.
A8	Subj-Agent Verb Obj- <i>Illness</i>	Web		Υπάρχει μια ομάδα εξειδικευμένων χειρουργών που μπορεί να χειρουργήσει όγκους κοντά στο σφιγκτήρα χωρίς να
A9	Subj-Agent Verb [Obj- <i>Illness</i> +POSS-Entity]	Web		Ποιος χειρούργησε το λίπωμα της Μενεγάκη
A10	Subj-Agent Verb	HNC	17/62 27,4%	Ενώ αυτός που χειρουργεί δεν μπορεί να χειρουργεί εν τη απουσία του και αυτός που δικηγورεί στα ακροατήρια δεν μπορεί να δικηγورεί εν τη απουσία του.

Table 13. Active structures of ‘χειρουργώ’ in the questionnaire

A	Structure (active forms of ‘χειρουργώ’)	Source	%	Usage example
A11	Subj-Agent Verb Obj- Entity σε-PP- <i>Bodypart</i> για-PP- <i>Illness</i>	QUE	15/15 100%	Πρέπει να δώσουμε στους γονείς να καταλάβουν ότι σε αυτό το νοσοκομείο η πρακτική είναι η εξής: ένα παιδάκι που χειρουργούμε στον εγκέφαλο για καρκίνο μένει στην εντατική μία εβδομάδα και στο νοσοκομείο δύο επιπλέον εβδομάδες το λιγότερο
A12	Subj-Agent Verb Obj- Entity [για-PP- <i>Illness</i> + σε-PP- <i>Bodypart</i>]	QUE	15/15 100%	Η βασική μας αρχή είναι ότι οι ασθενείς τους οποίους χειρουργούμε για καρκίνο στον πνεύμονα μένουν στην απομόνωση τουλάχιστον μία εβδομάδα γιατί είναι πολύ επιρρεπείς στις μηκυτιάσεις
A13	Subj-Agent Dative- Entity Verb Obj- <i>Bodypart</i> για-PP- <i>Illness</i>	QUE	14/15 93%	Το πρωί, μετά το ψάρεμα πήγα κάτω στην αγορά. Περνώντας από το καφενείο συνάντησα τον Σταθάτο, τον γιατρό που όταν ήμουν στη Θεσσαλονίκη μου είχε χειρουργήσει το στομάχι για έλκος. Μου λέει κάτσε να δούμε αν κάναμε καλή δουλειά τότε. Και κατεβάσαμε κάμποσα τσίπουρα.
A14	Subj-Agent Dative- Entity Verb Obj- <i>Illness</i>	QUE	15/15 100%	Το πιστεύεις ή όχι, η γιαγιά μας είναι καλύτερα. Με τα πολλά, της χειρούργησε το κατάγμα ο Νικολακάκης. Πώς τα κατάφερε ο άτιμος και τον πήρε η γιαγιά με το καλό και έκανε ό,τι της έλεγε. Περδίκι η γιαγιά σου λέω, ούτε λάμες ούτε τίποτε.
A15	Subj-Agent Verb Obj- <i>Bodypart</i> για-PP- <i>Illness</i>	QUE	Να το δούμε γιατί είναι η περίπτ ωση της μετων υμίας	Είμαι νόφιος. Το πρωί χειρούργησα ένα στομάχι για καρκίνο. Μετά καπάκι ένα άλλο στομάχι για έλκος. Οχτώ ώρες χειρουργείο στη σειρά. Νυστάζω!! Έρχεται, λοιπόν, ο Βασίλης και μου λέει. Αδελφέ, καιγόμαι. Αύριο έχω μια εγχείριση δύσκολη, ένα στομάχι. Με όσα μου συμβαίνουν δεν θα τα βγάλω πέρα. Θα την αναλάβεις? Και ξέρεις ποιανού στομάχι ήταν αυτό? Του Πανουργιά. Τί να κάνω, το κατάπια. Και έτσι χειρούργησα το στομάχι για καρκίνο παρακαλώ. Ακόμη κάνω στο σταυρό μου που πήγαν όλα καλά.
A16	Subj-Agent Verb [Obj- <i>Bodypart</i> +POSS- Entity] για-PP- <i>Illness</i>	HNC	14/15 93%	Πιάστηκε καλά ο Αργύρης. Τώρα τελευταία χειρούργησε το μάτι του Ωνάση για καταρράκτη. Ένα κότερο έβγαλε από αυτό.

Table 14. Passive structures of ‘χειρουργώ’ found in HNC and the web

P	Structure (passive forms of ‘χειρουργώ’)	Source	% (HNC)	Usage example
P1	Subj-Entity Verb από-PP-Agent	HNC	14/114 12,2%	<i>Η κυρία Ζιρέ, γυναίκα ενός αστυνομικού, είχε χειρουργηθεί παλαιότερα από τον Μπεργκ και όταν υποτροπίασε, μετά τον θάνατο του γιατρού της, απευθύνθηκε στον Λοσερέ.</i>
P2	Subj-Entity Verb	HNC	77/114 67,5%	<i>Σήμερα χειρουργείται ο Μιχάλης Αλβέρτης (ρήξη χιαστί συνδέσμων),</i>
P3	Subj- Entity Verb για/από-PP-Illness	HNC	2/114 1,8%	<i>Ο Καταλανός χειρουργήθηκε για αφαίρεση αιμορροΐδων...</i> <i>Μεγαλύτερη ανάγκη γυαλιών ηλίου έχουν τα άτομα που έχουν [EY: τα άτομα] χειρουργηθεί από καταρράκτη ή εμφανίζουν παθήσεις του ματιού (επιπεφυκίτιδα, φωτοφοβία κ.α.).</i>
P4	Subj- Entity Verb [για-PP-Illness+σε-PP-Bodypart]	HNC	1/114 0,9%	<i>Ο Ανρί Ματίς ήταν 71 ετών όταν, το 1941, χειρουργήθηκε για καρκίνο στο στομάχι.</i>
P5	Subj- Entity Verb [για-PP-Illness+POSS-Bodypart]	web		<i>...ασθενείς που έχουν ήδη χειρουργηθεί για καρκίνο παχέος εντέρου ή για πολύποδες του παχέος εντέρου, πρέπει να υποβάλλονται σε περιοδικό έλεγχο</i>
P6	Subj- Entity Verb (από-PP-Agent) σε-PP-Bodypart	HNC	14/114 12,3%	<i>Χειρουργήθηκε στους πνεύμονες ο Ζεκερίδης!</i>
P7	Subj- Bodypart Verb για-PP-Illness	HNC	1/114 0,9%	<i>Οφθαλμός που χειρουργήθηκε για καταρράκτη, μία ημέρα μετά την επέμβαση</i>
P8	[Subj-Illness+POSS Bodypart] Verb	HNC	1/114 0,9%	<i>Πρωτοποριακή μέθοδος, που άρχισε να εφαρμόζεται και στη χώρα μας, πετυχαίνει συγκόλληση καταγμάτων των μακρών οστών, τα οποία (ενν:κατάγματα των μακρών οστών) έχουν χειρουργηθεί επανειλημμένως χωρίς αποτέλεσμα, σώζοντας τον ασθενή ακόμη και από μόνιμη αναπηρία.</i>
P9	Subj-Illness Verb	HNC	4/114 3,5%	<i>Η μέθοδος αυτή καταργεί την κλασική επέμβαση που γινόταν με τη χρήση νυστεριού και δίνει τη δυνατότητα να χειρουργείται το γλαύκωμα</i>

Table 15. Passive structures of ‘χειρουργώ’ in the questionnaire

A	Structure (passive forms of ‘χειρουργώ’)	Source	%	Usage example
P10	Subj- Entity Verb (από-PP-Agent) σε-PP-Bodypart για-PP-Illness	QUE	15/15 100%	<i>Πήγα να δω τη Γιώτα που ήταν στο νοσοκομείο. Αλλά ο κόσμος είναι μικρός. Στο διπλανό κρεβάτι ήταν ο Βασίλης που είχε χειρουργηθεί στο πόδι για ρήξη του χιαστού.</i>
P11	[Subj- Bodypart +POSS-	QUE	9/15	<i>Το γόνατο του Καραγκούνη χειρουργήθηκε για μηνίσκο</i>

	<i>Entity</i>] Verb για-PP- <i>Illness</i> (από-PP- <i>Agent</i>)		60%	από τον Παπανικολάου. Με τις φυσικοθεραπείες και δεν ξέρω γω τί, το μαλλί πήγε κανα 50άρι χιλιάδες. Πάντως τώρα είναι εντάξει.
P12	[Subj- <i>Illness</i> +POSS- <i>Bodypart</i>] Verb	QUE	15/15 100%	Όταν η κάκωση κοίλων σπλάγχων χειρουργείται μετά παρέλευση δέκα ωρών δίνεται μια επιπλέον δόση, ενώ όταν χειρουργείται μετά παρέλευση δεκαώρου χορηγούνται αντιβιοτικά βάσει των αρχών αντιμετώπισης της περιτονίτιδας.
P13	[Subj- <i>Illness</i> + σε-PP- <i>Bodypart</i>] Verb	QUE	15/15 100%	Εάν ο καρκίνος στην ουρά του παγκρέατος χειρουργηθεί από έμπειρο χειρουργό και με τη μέθοδο της περιφερικής παγκρεατεκτομής, τα ποσοστά επιτυχίας είναι ικανοποιητικά.

4.1.2. Observations

From the examples with an active form of ‘χειρουργώ’ retrieved from the HNC where:

1. 73% of the examples feature a transitive verb.
2. In the active form of the verb the Subject is always an *Agent*.
3. With 93% of the transitive structures (68% of the total active structures) the *Entity* and with 7% (5% of the total structures) the *Bodypart* feature as the Direct Object.
4. The remaining 27% of the active structures retrieved from the HNC contain an objectless verb.
5. With 1,6% the *Illness* is expressed with a PP introduced with the preposition ‘για’ which expresses the reason why the act of medical operation took place.

From the web we retrieved examples where:

1. The *Bodypart* may occur as the Direct Object but it can also be expressed with a PP introduced with the preposition ‘σε’, meaning that it is interpreted as a locative.
2. The *Illness* may occur as the Direct Object but it can also be expressed with a PP introduced with the preposition ‘για’

From the examples in the questionnaire where:

1. The Direct Object features the *Entity*, the *Bodypart* or the *Illness*.
2. When they are not Objects the *Bodypart* and the *Illness* are given in PPs introduced as described before.

From the examples with a passive form of ‘χειρουργώ’ retrieved from the HNC where:

1. The Subject features the *Entity*, the *Illness* and the *Bodypart*. In the HNC data the Subject is the *Entity* at 95% of the examples, the *Illness* at 3% and the *Bodypart* at 2%. The fact that the *Entity* is the main Subject of the passive voice shows that there is a canonical relation between passive and active voice, where in most of the cases the *Entity* is the main Object.

2. The *Agent* is given at 25% of the cases in a PP introduced with the preposition ‘από’, which is the most common way of expressing the agent in the passive voice in Modern Greek.
3. When they are not Subjects the *Illness* and the *Bodypart* are expressed in PPs in the same way as in the active voice.
4. The same observations concerning the subject and the expression of the *Agent*, the *Illness* and the *Bodypart* can be made from the web-retrieved data and the data from the questionnaire.

The variety of structures available with the verb ‘χειρουργώ’ is to some extent due to the phenomenon of inalienable possession. We will take up the issues concerning this variety of structures in sections 4.1.3. and 4.1.4.

4.1.3. Habitual use with ‘χειρουργώ’

Out of the 62 occurrences of the active form of ‘χειρουργώ’ retrieved from the HNC, 17 (27% of the total structures) feature an objectless verb. 11 of them (17% of the total structures or 63% of the total objectless structures) are characterized by a -Perfective viewpoint Aspect. Tsimpli and Papadopoulou (2006) argue about the interaction of Perfectivity and null or overt objects with Greek activity verbs. As with many other languages (Goldberg 2005), in Modern Greek lack of object of a transitive verb is very often related to non telic, habitual interpretations and this is verified in our data.

(25) Θα λέγατε ποτέ, γιατί μόνο γιατροί χειρουργούν; -Perfective
 ‘Would you ever ask why only doctors operate?’

The remaining 6 (10% of the total structures) objectless examples feature +Perfective viewpoint Aspect and they are all in subordinate clauses inserted with ‘να’. Mozer (2009) argues that Perfectivity entails telicity because usually +Perfective facts are conceived as instant facts while their internal structure is ignored. Habitual use also entails telicity and this is why it is connected not only with the -Perfective viewpoint Aspect but also with the +Perfective one. This is what differentiates Continuous from Habitual. Continuous is only connected with the -Perfective Aspect (26).

(26) Όταν φτάσαμε σπίτι του ο Φάνης κλάδευε την κληματαριά. (Mozer 2009:66)
 ‘When we arrived at his place Phanis was pruning the bower.

On the other hand +Habitual entails both sides: the telic one and the atelic one. Its atelic side can be justified only by the repetition of the event. This regularity allows the series of facts to be seen as the whole fact, which, in turn, prevents the facts to be seen as a series of telic events, as events that are completed one by one in order to form the main event. But even in this case the telicity of the events exists although it is ignored and this is the main difference between Continuous and Habitual. What differentiates Habitual from Continuous is the regularity in the repetition of the event. This regularity allows -Perfective to express Habitual use as a

series of telic events (27). Contrary to this, when the repetition does not entail regularity –Perfective Aspect makes the sentence ungrammatical (28).

(27) Το καλοκαίρι ο Πέτρος έπινε/*ήπιε κάθε μεσημέρι ούζο μαζί με τον Τέλη
(Mozer 2009:68)
'Every noon this summer Petros would drink/*drank ouzo with Telis'.

(28) Το καλοκαίρι ο Πέτρος *έπινε/ήπιε δέκα φορές ούζο μαζί με τον Τέλη.
(Mozer 2009:68)
'This summer Petros would drink/drank ouzo with Telis ten times'.

Mozer also notes that when there is telicity the phrasal complement is necessarily telic and its telicity is defined by the telicity of the main verb. This means that the main verb is mainly +Perfective. -Perfective is also allowed but in this case it is interpreted as habitual use. As far as our data are concerned we have 6 objectless examples with 'χειρουργώ' where the verb is found in subordinate clauses inserted with 'να'. In all the cases the main verb's aspect is –Perfective and this means that the complements aspect can be interpreted as habitual use (29).

(29) Έχουμε τρεις νευροχειρουργούς, οι οποίοι κάθονται γιατί δεν έχουν
-Perfective εργαλεία να χειρουργήσουν.
'We have three neurosurgeons who are sitting because they don't have tools in order to operate.'

In a nutshell, it seems that in general we can relate the omission of the object in a transitive verb with habitual use.

4.1.4. Inalienable Possession with 'χειρουργώ'.

Inalienable Possession plays an important role for the variety of ways that the different semantic arguments of χειρουργώ are expressed in the syntax.

With active forms of 'χειρουργώ', usually the *Entity* is the Direct Object of the verb (30). However, there are some cases where the Object is the *Bodypart* (more often) (31) or the *Illness* (rarely) (32). These are three different ways of expressing Inalienable Possession in different structures. The *Bodypart* and the *Illness* can be used as Direct Objects without the presence of the *Entity* because, due to the inalienable possession relation between each one of them and the *Entity*, the Possessor can be easily predicted. The fact that this happens mostly with the *Bodypart* shows that there is a stronger relationship between the *Entity* and the *Bodypart*. Likewise, when the *Entity* is the Direct Object, one can easily predict that the patient (*Entity*) is operated on a specific part of his/her body (*Bodypart*) for some reason (*Illness*). From these, we can conclude that for 'χειρουργώ' we have the chain: OPERATE-SOMEONE-ON A SPECIFIC BODY PART-BECAUSE OF AN ILLNESS. Below we will see how the members of this chain can coexist in different ways producing different structures.

(30) έχει χειρουργήσει 32 ασθενείς-Obj-Entity
'he/she has operated on 32 patients'

(31) χειρουργεί μόνο σκωληκοειδίτιδα-Obj-Bodypart
'he/she only operates on appendix'

(32) μπορεί να χειρουργήσει όγκους-Obj-Illness
'he/she can operate on tumors'

It is this inalienable possession relation that causes the coexistences below where the members of the 'χειρουργώ' chain coexist as independent verbal arguments in the following ways:

- *Entity-Bodypart*:

a. The *Entity* is denoted by the Direct Object and the *Bodypart* is expressed with a PP with the preposition 'σε'.

(33) προκειμένου να συναντήσει τον γιατρό που τον χειρούργησε στο γόνατο
[him-OBJ operate-1PL_i in-P the knee]
'in order to meet the doctor who_i operated him on the knee'

b. The *Entity* is denoted with a clitic in the genitive case (that has absorbed certain functions of the dative of Ancient Greek that has no independent morphological manifestation in Modern Greek) and the *Bodypart* is denoted with the Direct Object.

(34) του χειρούργησε το αριστερό γόνατο
[him-DAT_j operated-3SG_i the left knee-OBJ]
'he/she_i operated on his_j left knee'

- *Entity-Illness*

a. The *Entity* is denoted by the Direct Object and the *Illness* is expressed with a PP introduced with the preposition 'για'.

(35) ένα παιδάκι που χειρουργούμε για συγγενή καρδιοπάθεια
[a little child-OBJ_j that_j operate-1PL_i for-P heart condition-PP]
'a little child_j; who_j we_i operate for a heart condition'

b. The *Entity* is denoted with a clitic in the dative genitive case as before (34) and the *Illness* with the Direct Object.

(36) της χειρούργησε το κάταγμα
[her-DAT_j operated-3SG_i the fracture-OBJ]
'he/she_i operated on her_j fracture'

- *Bodypart-Illness*: The *Bodypart* is denoted with the Direct Object and the *Illness* is expressed with a PP introduced with the preposition 'για'.

(37) χειρούργησα το στομάχι για καρκίνο
[operate-1SG_i the stomach-OBJ for-P cancer]
'I_i operated on the stomach for cancer'

-Entity-Bodypart-Illness

a. The *Entity* is denoted with the Direct Object, the *Bodypart* is expressed with a PP introduced with the preposition ‘σε’ and the *Illness* is expressed with a PP introduced with the preposition ‘για’.

(38) ένα παιδάκι που χειρουργούμε στον εγκέφαλο για καρκίνο
[a little child-OBJ; that_j operate-1PL_i in-P the brain-PP for-P cancer-PP]
‘a little child who_j we_i operate on the brain for cancer’

b. The *Entity* is denoted with a clitic in the dative genitive case as before (34), the *Bodypart* with the Direct Object and the *Illness* is expressed with a PP introduced with the preposition ‘για’.

(39) μου είχε χειρουργήσει το στομάχι για έλκος
[me-DAT_j had operated-3SG_i the stomach-OBJ for-P ulcer-PP]
‘he/she_i had operated on my_j stomach for ulcer’

There are also cases where the members of ‘χειρουργώ’ chain coexist in phrasal formations that are independent constituents:

- Entity-[Illness-Bodypart]

a. The *Entity* is denoted with the Direct Object and the verb is followed by a PP consisted of a PP introduced with the preposition ‘για’ which denotes the *Illness* and another PP introduced with the preposition ‘σε’ which denotes the *Bodypart*.

(40) ασθενείς τους οποίους χειρουργούμε για καρκίνο στον πνεύμονα.
[patients-OBJ; the_j who_j operate-1PL [for-P cancer in-P the lung-PP]]
‘patients_j who_j we_i operate for lung cancer’

b. The *Entity* is denoted with the Direct Object and the verb is followed by a PP consisted of a PP introduced with the preposition ‘για’ which denotes the *Illness* and a genitive case which denotes the *Bodypart*.

(41) τον χειρούργησε για καρκίνο του παχέος εντέρου
[him-OBJ_j operate-3SG_i [for-P cancer-PP lower intestine-GEN]]
‘he/she_i operated on him for lower’s intestine cancer’

- [*Bodypart-Entity*]: The Direct Object is denoted with an NP consisted of an NP in accusative case which denotes the *Bodypart* and an NP in genitive case which denotes the *Entity*.

(42) είχε χειρουργήσει τη μύτη του Φρόιντ
[had operated-3SG_i [the nose-OBJ Freud-GEN]]
‘Freud was operated on the nose from him/her_i’

- [*Bodypart-Entity*]-*Illness*: The Direct Object is denoted with an NP consisting of an NP in the accusative case that denotes the *Bodypart* and an NP in the genitive case that denotes the *Entity*. A PP introduced with the preposition ‘για’ denotes the *Illness*.

(43) χειρούργησε το μάτι του Ωνάση για καταρράκτη
[operated-1SG_i [the eye-*OBJ* Onasis-*GEN*] for-P cataract-PP
‘Onasis was operated on the eye for cataract from him/her_i.’

- [*Illness-Entity*]: The Direct Object is denoted with an NP consisting of an NP in the accusative case that denotes the *Illness* and an NP in the genitive case that denotes the *Entity*.

(44) Ποιος χειρούργησε το λίπωμα της Μενεγάκη;
[who-SUBJ operated [the lipoma-*OBJ* Menegaki-*GEN*]]
‘Who operated on the lipoma of Menegaki?’

The verb shows the canonical relation between the active and the passive voice. The Subject of the passive verb is mainly the *Entity* but in some cases it can be the *Bodypart* or the *Illness*. The same chain is valid for the passive voice of the verb ‘χειρουργώ’: SOMEONE-IS OPERATED-ON A SPECIFIC BODY PART-BECAUSE OF AN ILLNESS-BY AN AGENT.

The members of the chain coexist as independent verbal arguments in the following ways:

- *Entity-Illness*: The *Entity* is denoted with the Subject and the *Illness* with a PP introduced with the preposition ‘για’ or the preposition ‘από’.

(45) Ο Καταλανός χειρουργήθηκε για αφαίρεση αιμορροΐδων
[the Catalan-SUBJ was operated for-P removal-PP piles-*GEN*]
‘The Catalan was operated for the removal of piles.’

- *Entity-Bodypart*: The *Entity* is denoted with the Subject and the *Bodypart* with a PP introduced with the preposition ‘σε’.

(46) Χειρουργήθηκε στους πνεύμονες ο Ζεκερίδης.
[was operated in-P the lungs-PP Zekeridis-SUBJ]
‘Zekeridis was operated on the lungs.’

- *Bodypart-Illness*: The *Bodypart* is denoted with the Subject and the *Illness* with a PP introduced with the preposition ‘για’.

(47) Οφθαλμός που χειρουργήθηκε για καταρράκτη
[eye-SUBJ_i that_i was operated-3SG_i for-P cataract-PP]
‘An eye_i which_i was operated for cataract’

- *Entity-Bodypart-Illness*: The *Entity* is denoted with the Subject, the *Bodypart* with a PP introduced with the preposition ‘σε’ and the *Illness* is expressed with a PP introduced with the preposition ‘για’.

(48) *Ο Βασίλης είχε χειρουργηθεί στο πόδι για ρήξη του χιαστού.*
 [Vasilis-SUBJ was operated-3SG in-P the foot-PP for-P crutiate-PP rupture-GEN]
 ‘Vasilis was operated on foot for crutiate rupture.’

There are also cases where the members of ‘χειρουργούμαι’ chain coexist in phrasal formations that are independent constituents:

-Entity-[Illness-Bodypart]

a. The *Entity* is denoted with the Subject and the verb is followed by a PP introduced by the preposition ‘για’ that takes as complement an NP that denotes the *Illness* and is modified by a second PP introduced with the preposition ‘σε’ that denotes the *Bodypart*.

(49) *χειρουργήθηκε για καρκίνο στο στομάχι*
 [was operated-3SG_i for-P cancer-PP in-P the stomach-PP]
 ‘he/she_i was operated for stomach cancer

b. The *Entity* is denoted with the Subject and the verb is followed by a PP consisting of a PP introduced with the preposition ‘για’ that takes as a complement an NP that denotes the *Illness* and an NP in genitive case denoting the *Bodypart*.

(50) *ασθενείς έχουν χειρουργηθεί για καρκίνο του παχέος εντέρου.*
 [patients-SUBJ have been operated-3SG [for-P cancer-PP lower intestine-GEN]]
 ‘patients have been operated for cancer in the lower intestine.’

- *[Bodypart-Entity]-Illness*: The Subject expressed with an NP consisted of an NP in the nominative case which denotes the *Bodypart* and an NP in the genitive case which denotes the *Entity*. The *Illness* is expressed with a PP introduced with the preposition ‘για’.

(51) *Το γόνατο του Καραγκούννη χειρουργήθηκε για μηνίσκο*
 [[the knee-SUBJ Karagkounis-GEN] was operated-3SG for-P meniscus-PP]
 ‘Karagkounis was operated on the knee for meniscus.’

- [Illness-Bodypart]:

a. The Subject is expressed with an NP consisted of an NP in the nominative case which denotes the *Illness* and an NP in the genitive case which denotes the *Bodypart*.

(52) *Όταν η κάκωση κοίλων σπλάχνων χειρουργείται...*
 [[the injury-SUBJ intestine-GEN] is operated-3SG]
 ‘When the injury of the intestine is operated on...’

b. The Subject is expressed with an NP consisting of an NP in the nominative case which denotes the *Illness* and a PP consisting of a PP introduced with the preposition ‘σε’ that takes as a complement an NP that denotes the *Bodypart*.

(53) Εάν ο καρκίνος στην ουρά του παγκρέατος χειρουργηθεί...
 [[the cancer-SUBJ [in-P the tail-PP pancreas-GEN]] is operated-3SG]
 ‘If the cancer on the tail of the pancreas is operated on...’

We have not yet thoroughly studied the phenomenon, but from the examples above, it seems clear that the Entity is denoted in almost all the structures with Inalienable Possession. It seems that the phenomenon has a close relationship with the semantic need of the verb to express the Entity as the main participant of the event. On the other hand its synonym ‘εγχειρίζω’ seems to have the same tendency, but the fact that HNC gave us only a small number of examples does not allow us to make this claim with certainty. We intend to evaluate our intuition with questionnaires addressed to native speakers of Modern Greek.

In our immediate future work, we will further investigate the relations between the various syntactic environments supported by ‘χειρουργώ’ and ‘εγχειρίζω’ and will check whether the phenomenon generalizes over other verbs of Modern Greek. We plan to start our investigations from verbs that entail contact such as kiss, touch and fondle.

There have been studies that aim to show that some languages have a special way to express the Inalienable Possession constructions. Many of these studies build on the idea that different Inalienable Possession constructions are related with different degrees of affectedness between the Possessor (Entity) and the Possessee (Patterson 2011 and Lee-Schoenfeld 2010). In other studies Inalienable possession is correlated with a semantic change in the context of the predicate that shows that this kind of Possession has a special way of being expressed in certain languages, which differentiates it from other kinds of possession. Schrock (2007) argues that Inalienable Possession in Swahili is expressed with a special semantic role which is given to the Direct Object. He calls it the Affectee and he argues that it is syntactically present because in some way it is notably affected by the action performed upon the patient.

4.2. The verb ‘εγχειρίζω’.

HNC returned 29 occurrences of ‘εγχειρίζω’, of which 7 (about the 1/4 of the examples) featured the active form of the verb and 22 (about the 3/4 of the examples) the passive one. Table 16 illustrates the active structures in the HNC and Table 6 the passive ones.

Table 16. Active structures of ‘εγχειρίζω’ found in HNC

A	Structure (active forms of ‘εγχειρίζω’)	Source	% (HNC)	Usage example
A1	Subj-Agent Verb Obj-Entity	HNC	6/7 85,7%	Μου είπαν πως τη Δευτέρα θα μ’ [ΕΥ:οι χειρουργοί] εγχειρίσουν
A2	Subj-Agent Verb Obj-Bodypart	HNC	1/7 14,3%	Δεν ήταν ο προστάτης του, αυτόν θα τον [ΕΥ:αυτός] εγχειρίζε μόλις τον φώναζε ο χειρουργός [χρόνος].

Table 17. Passive structures of ‘εγχειρίζω’ found in HNC

P	Structure (passive)	Source	%	Usage example
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	forms of ‘εγχειρίζω’		(HNC)	
P1	Subj-Entity Verb (apo-PP-Agent) σε-PP-Bodypart	HNC	7/22 31,8%	ο Σέρβος αμυντικός θα εγχειριστεί την Πέμπτη στο γόνατο από τον αθλητίατρο της ΠΑΕ κ. Στέργιο Καρακίτσο.
P2	Subj-Entity Verb (από-PP-Agent) [σε-PP-Bodypart+POSS-Entity]	HNC	1/22 4,6%	Στην Αθήνα βρίσκεται από χθες το μεσημέρι ο Μαρτσέλο Νικόλα, που σήμερα μπαίνει στο χειρουργείο του νοσοκομείου Υγεία για να [ΕΥ: ο Μαρτσέλο Νικόλα] εγχειριστεί στο πληγωμένο πόδι του .
P3	Subj-Entity Verb	HNC	14/22 63,6%	Θυμάμαι μια φορά που την περίμεναν τηλεοράσεις και ήρθε η γυναίκα του σοφέρ της να της πει ότι το παιδάκι τους θα εγχειριζόταν και τους παράτησε όλους για να ασχοληθεί μαζί της.

4.2.1. Observations

In the HNC data the active form of the verb ‘εγχειρίζω’ seems to be 100% transitive. On 86% of the cases, the Direct Object is the *Entity* and on 14% the *Bodypart*. The Subject is always the *Agent*. In the passive voice the Subject is always an *Entity*.

Although ‘χειρουργώ’ and ‘εγχειρίζω’ are synonyms, in the HNC ‘χειρουργώ’ occurs far frequently than ‘εγχειρίζω’. This could be an indication that users prefer ‘χειρουργώ’ rather than its more formal synonym ‘εγχειρίζω’, but the data are too little for someone to conclude this with certainty.

Given the fact that ‘χειρουργώ’ and ‘εγχειρίζω’ have the same meaning, and all the structures of ‘εγχειρίζω’ also appear with ‘χειρουργώ’, we plan to check the verb’s structures in the same way as we did with ‘χειρουργώ’.

4.2.2. The event of a medical operation

Having presented in detail the semasio-syntactic behavior of the two verbs used for ‘operate on’ in Modern Greek, we would like to check our results with the event of medical operation of FrameNet.

The general medical interaction scenario given in FrameNet is (1): (https://framenet2.icsi.berkeley.edu/fnReports/data/frameIndex.xml?frame=Medical_interaction_scenario) while no specific scenario for the verb “operate on” is given.

(1) A **Patient** interacts with one or more **Medics** (doctors, nurses, and/or EMTs with a responsibility for the **Patient**'s health) so that the **Medics** can determine the health status of the **Patient** and maintain or restore the **Patient**'s health as necessary.

Usually, the **Patient** has an **Affliction**, a medical problem that motivates or necessitates their coming into the care of a **Medic**. At a minimum, the **Patient** has a single interaction with a **Medic**, but usually the **Patient** has a relationship

with the **Medic** or group of medical professionals who either have responsibility for helping them with their specific **Affliction** or for their health in general. Medical interactions normally take place at a **Medical_center** (a hospital or doctor's office), but in cases where the **Patient** suffers a sudden catastrophic **Affliction**, the **Patient** may be taken into the care of EMTs, who act as their **Medic** until reaching a medical center.

In some cases, the **Body_system** that has a problem is mentioned in place of the **Affliction**.

The medical operation event scenario as it emerges from the study of our data is (2):

(2) An **agent (volitional)** operates on a **patient (an entity)** on some **part of its body** because of some **illness** in some specified **manner** at some specified **place** and **time**.

Following the FrameNet practice we have highlighted the concrete and abstract entities that have been encountered in the Modern Greek description of the medical operation event. We can immediately see that FrameNet does not include time in the description of the event. Next we compare the other roles. The following table presents the roles of the two description/annotation systems and their relations.

Table 18. The Entities of the medical operation event

FrameNet	‘χειρουργώ’	R (FrameNet,Greek Medical Operation event)
Medic	Agent	Hyponymy
Patient	Entity	Hyponymy
Body System	Part of one’s body	Hyperonymy
Affliction	Illness	Hyperonymy
Medical Center	Place	Hyponymy

The values of the relation R in the Table above indicate some basic differences in the two strategies of naming participants in an event. FrameNet consistently names participants with respect to their role in the particular event, so it has used labels like ‘medics’ and ‘patient’, the latter with the everyday meaning rather than the linguistic one. We have used notions like ‘Agent’ and ‘Patient’ both in a Dowty (1991) like fashion. The Table as it stands could be the fragment of an ontology where Agent would be the mother of a set of daughters, Medics being one of them. The hyponymy relation in this case is due to the fact that the FrameNet uses event specific roles while we adopted a Dowty like approach. At the moment, we see no reason to adopt the FrameNet approach. The Patient-Entity relation is again a hyponymy relation but this time Entity is a notion that perhaps contrasts the Dowty system. Thus, if an Entity exists independently of the event as our verbs entail here, there is reason to consider it a Proto-Agent rather than a Proto-Patient in Dowty’s system. However, in our data the Entity consistently surfaces as a direct object and a typical Patient. On the other hand, the Affliction-Illness is a hyperonymy relation and is due to the fact that FrameNet draws on a larger inventory of verbs than we do. In the overall, several issues arise from role labeling between our work and FrameNet and will be treated in the next phase of our work.

An interesting issue emerging from the work so far is which strategy of labeling event participants is preferable or how the results of different labeling strategies can be merged.

As is often the case, the syntactic realization of conceptualization (2) is done with a variety of structures that seldom realize all the above components as arguments or adjuncts of the verbal head.

4.3. The verb ‘θεραπεύω’.

HNC returned 187 occurrences of ‘θεραπεύω’, of which 84 featured the active form of the verb and 103 the passive one. Table 19 illustrates the active structures in the HNC and Table 20 the passive ones.

Table 19. Active structures of ‘θεραπεύω’ found in HNC

A	Structure (active forms of ‘θεραπεύω’)	Source	% (HNC)	Usage example
A1	Subj-Mean/Instrument Verb Obj-Illness	HNC	23/84 27,4%	Μεγάλη είναι η φήμη των βλαστοκυττάρων για την ικανότητά τους να γιατρεύουν και έτσι δημιουργούν ελπίδες ότι κάποτε θα μπορούν να [EY: τα βλαστοκύτταρα] θεραπεύουν τη νόσο του Πάρκινσον, τραύματα στη σπονδυλική στήλη και διάφορα είδη παθήσεων.
A2	Subj-Mean/Instrument Verb Obj-Entity	HNC	5/84 5,9%	Σήμερα, πιστεύεται ότι τα ανασυνδυασμένα γενετικά κύτταρα υπερτερούν κατά πολύ των ελαττωματικών κυττάρων και τελικά τα αντικαθιστούν, δηλαδή ουσιαστικά [EY:τα ανασυνδυασμένα κύτταρα] θεραπεύουν τον ασθενή.
A3	Subj-Mean/Instrument Verb Obj-Bodypart	HNC	2/84 2,4%	Μουσική που θεραπεύει το σώμα μουσική που θεραπεύει την ψυχή.
A4	Subj-Mean/Instrument Verb	HNC	5/84 5,9%	Απομακρύνει τα εωζινοφιλα κύτταρα από την κυκλοφορία του αίματος προς το χαλαρό συνδετικό ιστό και έτσι μειώνει την αλλεργική αντίδραση προκαλώντας ανακούφιση σε αναφυλακτικές αντιδράσεις, χωρίς όμως να [EY:αυτός-ή-ό] θεραπεύει.
A5	Subj-Agent Verb Obj-Illness	HNC	18/84 21,4%	Οι γιατροί απλώς έπρεπε να βρουν ποιο μικρόβιο ήταν υπεύθυνο για την ασθένεια, να το σκοτώσουν και να [EY: οι γιατροί] θεραπεύσουν έτσι τη νόσο.
A6	Subj-Agent Verb Obj-Illness με-PP-Mean/Instrument	HNC	1/84 1,2%	Οι γιατροί τον καιρό εκείνο θέραπευαν την υδρωπικία με εφίδρωση σε μερικές πιο ήπιες περιπτώσεις.
A7	Subj-Agent Verb Obj-	HNC	18/84	Αφού τέλειωσε τις σπουδές του, άρχισε να πηγαίνει

	<i>Entity</i>		21,4%	από τόπο σε τόπο και να [EY: αυτός] <i>θεραπεύει τους αρρώστους.</i>
A8	Subj-Agent Verb Obj-Entity με-PP-Mean/Instrument	HNC	2/84 2,4%	<i>Με την έγκαιρη διάγνωση και ειδική αγωγή μπορεί να [EY:εμείς] θεραπεύσουμε το 70-75% των περιστατικών.</i>
A9	Subj-Agent Verb Obj-Entity από-PP-Illness	HNC	2/84 2,4%	Παρά τις έντονες αντιδράσεις των γονιών της, τους 6 μήνες που έμεινε εκεί βρέθηκε να οργανώνει φαρμακεία, να εμβολιάζει παιδιά και να [EY: αυτή] <i>θεραπεύει ασθενείς από χολέρα σε καταυλισμούς.</i>
A10	Subj-Agent Verb Obj-Entity από-PP-Illness με-PP-Mean/Instrument	HNC	2/84 2,4%	Ο Ασκληπιός, σύμφωνα με την παράδοση, απέκτησε τις πρώτες του ιατρικές γνώσεις κοντά στον Κένταυρο Χείρωνα μετείχε στην αργοναυτική εκστρατεία και [EY: ο Ασκληπιός] <i>θεράπευε τους αργοναύτες από ποικίλα νοσήματα όχι μόνο με φάρμακα, βότανα, έμπλαστρα, χειρουργικές επεμβάσεις, αλλά και με επωδές.</i>
A11	Subj-Agent Verb Obj-Bodypart	HNC	2/84 2,4%	<i>Όπως δεν πρέπει να επιχειρεί κανείς να [EY: κανείς] θεραπεύσει τους οφθαλμούς χωρίς να θεραπεύσει το κεφάλι, ούτε το κεφάλι χωρίς το σώμα, έτσι ούτε το σώμα χωρίς την ψυχή</i>
A12	Subj-Agent Verb [Obj-Bodypart+POSS-Entity]	HNC	1/84 1,2%	<i>Ο Carl Merril θέρáπευσε εργαστηριακά κύτταρα ατόμων πασχόντων από γαλακτοζαιμία.</i>
A13	Subj-Agent Verb	HNC	3/84 3,6%	Θεωρούσαν μάλιστα πως ο ίδιος έστελνε την επιδημία και ο ίδιος μετά την απόδιωχνε, όπως δείχνει και η παρετυμολογία Απόλλων, ο απολύων, ο απολούων δηλαδή που καθαρίζει και [EY:ο απολούων] <i>θεραπεύει.</i>

Table 20. Passive structures of ‘θεραπεύω’ found in HNC

P	Structure (passive forms of ‘θεραπεύω’)	Source	% (HNC)	Usage example
P1	Subj-Illness Verb με-PP-Mean/Instrument	HNC	11/103 10,7%	<i>Οι ιώσεις, για παράδειγμα, δεν θεραπεύονται με αντιβιοτικά.</i>
P2	[Subj-Illness+POSS-Bodypart] Verb με-PP-Mean/Instrument	HNC	2/103 1,9%	(ΑΠΕ-Ρόιτερ) Τα περισσότερα έλκη του πεπτικού συστήματος μπορούν πλέον να [EY: τα περισσότερα έλκη του πεπτικού συστήματος] <i>θεραπευτούν με χορήγηση αντιβιοτικών, αλλά μόλις το ένα τρίτο των Αμερικανών ιατρών τα χορηγεί.</i>
P3	Subj- Illness Verb	HNC	34/103 33%	Αναφέρθηκε ότι 15 ενέσεις του φαρμάκου αρκούν για να <i>θεραπευτεί ο ιός</i> και ότι οι παρενέργειες είναι ελάχιστες;

P4	Subj-Entity Verb με/από-PP-Mean/Instrument	HNC	11/103 10,7%	Όσον αφορά τη Μεσογειακή Αναιμία με την οποία γεννιούνται πλέον χάρις στον προγεννητικό έλεγχο μόνο 15 παιδιά το χρόνο στη χώρα μας, έχουν θεραπευθεί ως τώρα στη Μονάδα του Αγία Σοφία με μεταμόσχευση 14. Όλος ο πληθυσμός δεν μπορεί να ελεγχθεί για αυτά τα γονίδια, αλλά εάν υποθέσουμε ότι όλοι θα ελέγχονταν, όλοι δε θα μπορούσαν να [EY:όλοι] θεραπευτούν από αυτά τα γονίδια .
P5	Subj-Entity Verb για/από-PP-Illness	HNC	7/103 6,8%	Μεταξύ άλλων -και μια «ανάσα» από το 2000- ανακάλυψαν ασθενή που έπαιρνε φάρμακα για επιληψία, ενώ έπρεπε να [EY:ασθενής] θεραπεύεται για σοβαρή Πάρκινσον , καθώς και άλλον που επί δύο χρόνια έκανε θεραπεία πίνοντας τα ούρα του! Σήμερα, μας ενημέρωσε ο κ. Γραφάκος, έχουμε 8 περιπτώσεις από 15 που εξετάστηκαν, ώστε να θεραπευθούν τα παιδιά αυτά από μεσογειακή αναιμία.
P6	[Subj-Entity+με-PP-Illness+POSS-Bodypart] Verb	HNC	1/103 1%	Σήμερα, ανέφερε χαρακτηριστικά, όλο και περισσότερες γυναίκες με καρκίνο του μαστού τελικά θεραπεύονται
P7	Subj-Entity Verb	HNC	34/103 33%	«Ο Ρομάριο θεραπεύτηκε και θα παίζει στο παγκόσμιο κύπελλο» ανακοίνωσε ο Μότα στην εφημερίδα «Ο Ντία».
P8	Subj-Entity Verb από-PP-Agent	HNC	1/103 1%	Εδώ, λένε οι Θασίτες, από το 18ο αι. έρχονται και θεραπεύονται από τον γιατρό Αγ. Παντελεήμονα πλήθη πιστών.
P9	Subj-Bodypart Verb	HNC	2/103 1,9%	Οι ψυχολογικοί παράγοντες, κατέληξαν οι ειδικοί, συμβάλλουν στη γένεση των νοσημάτων και η δεύτερη ότι για να θεραπευτεί ένα μέρος του σώματος, πρέπει η θεραπευτική φροντίδα να ασκηθεί στο σύνολο του οργανισμού.

4.3.1. Observations

Active form of 'θεραπεύω':

1. The Subject features the Agent (58,4%) or the Mean/Instrument (41,6%)
2. 91% features a transitive verb.

3. The Direct Object is mainly the *Illness* (50%) but also the *Entity* (34,5%) and the *Bodypart* (6%).
4. 9,5% of the structures feature an objectless verb.
5. Whenever the Mean/Instrument is not the Subject it is expressed with a PP introduced with the preposition ‘με’, which is the main way of expressing the mean in Modern Greek.

Passive form of ‘θεραπεύω’:

1. In the passive voice in 52,5% of the cases the Subject is the *Entity*, in 45,6% the *Illness* and in 1,9% the *Bodypart*. The fact that the Subject of the passive voice corresponds to the Direct Object of the active voice shows that there is a canonical relation between the two voices.

4.4. The verb ‘γιατρεύω’.

HNC returned 44 occurrences of ‘γιατρεύω’, of which 30 featured the active form of the verb and 14 the passive one. Table 21 illustrates the active structures in the HNC and Table 22 the passive ones.

Table 21. Active structures of ‘γιατρεύω’ found in HNC

A	Structure (active forms of ‘γιατρεύω’)	Source	% (HNC)	Usage example
A1	Subj-Mean/Instrument Verb Obj-Illness	HNC	5/30 16,7%	<i>Ο γαλακτίτης γιάτρευε τις πληγές, ο μαγνητίτης τους πόνους των αρθρικών και ο γαγάτης διευκόλυσε τον τοκετό.</i>
A2	Subj-Mean/Instrument Verb Obj-Entity	HNC	2/30 6,7%	<i>Χθες ήταν η δεύτερη φορά που φέρετρα έκαναν την εμφάνισή τους στο νοσοκομείο, παρά το ότι φτιάχτηκε για να [EY: το νοσοκομείο] γιατρεύει τον κόσμο</i>
A3	Subj-Mean/Instrument Verb [Obj- Bodypart+POSS-Entity]	HNC	1/30 3,3%	<i>Ο Χελάντερ, όμως, ήξερε ότι ούτε το νοσοκομείο ούτε η ινσουλίνη θα μπορούσαν να [EY: ούτε το νοσοκομείο ούτε η ινσουλίνη] γιατρέψουν το πόδι του, αν ξανάνοιγε σαν κραυγή από κόκκινους ιστούς και άρρωστη σάρκα.</i>
A4	Subj-Mean/Instrument Verb	HNC	3/30 10%	<i>Μεγάλη είναι η φήμη των βλαστοκυττάρων για την ικανότητά τους να [EY: τα βλαστοκύτταρα =] γιατρεύουν και έτσι δημιουργούν ελπίδες ότι κάποτε θα μπορούν να θεραπεύουν τη νόσο του Πάρκινσον, τραύματα στη σπονδυλική στήλη και διάφορα είδη παθήσεων.</i>
A5	Subj-Agent Verb Obj- Illness	HNC	4/30 13,4%	<i>Είναι σαν να παίρνεις ασπιρίνη για να [EY: εσύ] γιατρέψεις ένα βαθύ πονόδοντο</i>

A6	Subj-Agent Verb Obj- <i>Illness</i> με-PP- <i>Mean/Instrument</i>	HNC	1/30 3,3%	Είχε μάλιστα πάντα κρεμασμένο στο λαιμό του κείνο το νόμισμα των πέντε σεντς κι έλεγε πως τάχα του το 'χε φορέσει ο Ξαποδώ με τα ίδια του τα χέρια και μαζί τού χάρισε και τη δύναμη να [EY: αυτός] <i>γιατρεύει μ' αυτό όλες τις αρρώστιες</i> και να καλεί τις μάγισσες και τ' αγερικά όποτε του 'κανε κέφι.
A7	Subj-Agent Verb Obj- <i>Entity</i>	HNC	10/30 33,3%	Το μεγάλο όνειρο της ζωής της είναι να γίνει παιδίατρος, για να [EY: αυτή] <i>γιατρέψει τα παιδιά του πολέμου που ζουν στη χώρα της</i> .
A8	Subj-Agent Verb Obj- <i>Entity</i> με-PP- <i>Mean/Instrument</i>	HNC	1/30 3,3%	<i>Ένας θεραπευτής γιατρεύει με την πίστη του τον γιο ενός πολιτικού που πάσχει από λευχαιμία</i> .
A9	Subj-Agent Verb Obj- <i>Entity</i> από-PP- <i>Illness</i>	HNC	1/30 3,3%	Η εκκλησία που βλέπουμε σήμερα είναι η αναστήλωση εκείνης που κήκε στη μεγάλη πυρκαγιά του 1917 και εκείνη πάλι ήταν η αναστήλωση της παλαιοχριστιανικής βασιλικής που ανέγειρε στη θέση του παρεκκλησιού, που είχε χτιστεί αρχικά πάνω στον τάφο του Άγιου, ο Λεόντιος, έπαρχος του Ιλλυρικού στις αρχές του πέμπτου αιώνα, όταν ο Άγιος τον <i>γιάτρεψε από μια ανίατη ασθένεια</i> .
A10	Subj-Agent Verb	HNC	2/30 6,7%	Αν και στην ισλαμική παράδοση θεωρείται δεδομένο ότι ο Θεός είναι αυτός που [EY: ο Θεός] <i>γιατρεύει</i> (Κοράνιο, 10:57, 17:82, 41:44 και χαντίθ, Μπουχαρί, 7:071:638,639, Μουσλίμ, 26:5434), στον ισλαμικό κόσμο, μεταξύ 9ου και 13ου αιώνα μ.Χ. και στο πλαίσιο γενικότερης ανόδου των επιστημών υπάρχει σημαντική καλλιέργεια και ανάπτυξη της Ιατρικής ως επιστήμης, με όρους που (μεταγενέστερα) αντιλαμβάνεται και χρησιμοποιεί ο σύγχρονος δυτικός πολιτισμός.

Table 22. Passive structures of 'γιατρέω' found in HNC

P	Structure (passive forms of 'γιατρέω')	Source	% (HNC)	Usage example
P1	Subj- <i>Illness</i> Verb με-PP- <i>Mean/Instrument</i>	HNC	1/14 7,1%	<i>Με τα σφιχτά παπούτσια δε γιατρεύονται τα κρυσπαγήματα , μόνο χειροτερεύουν</i>
P2	[Subj- <i>Illness</i> +σε-PP- <i>Bodypart</i> +POSS- <i>Entity</i>] Verb	HNC	1/14 7,1%	<i>Δεκαπέντε μέρες που 'καναν να γιατρευτούν οι πληγές στα χέρια της Κατίνας, η Χρύσα φρόντιζε τα παιδιά, κι η κυρα-Ελένη περιποιόταν την κατσίκα.</i>
P3	Subj- <i>Entity</i> Verb από- PP- <i>Illness</i>	HNC	2/14 14,3%	<i>Το δικό του είναι να γίνει ένα θαύμα και να γιατρευτεί η σύζυγός του από τη μερική παραλυσία που έπαθε - λόγω αιμορραγίας στον εγκέφαλο - πέρυσι.</i>

P4	Subj- <i>Entity</i> Verb	HNC	9/14 64,3%	Για 53 ασθενείς του μεγάλου κρατικού νοσοκομείου στο Βερολίνο, το "Σαριτέ", το κομπιούτερ με την ονομασία "RIYADH" έχει αποφανθεί ότι δεν έχουν ελπίδες να [EY: οι 53 ασθενείς] γιατρευτούν.
P5	[Subj- <i>Bodypart</i> +POSS <i>Entity</i>] Verb	HNC	1/14 7,1%	Ο πισινός του είχε γιατρευτεί στο μεταξύ, πλην τον είχε φασκιωμένο επί ένα έτος.

4.4.1. Observations

Active form of 'γιατρεύω':

1. The Subject features the *Agent* (63,3%) or the *Mean/Instrument* (36,7%)
2. 91% features a transitive verb.
3. The Direct Object is mainly the *Entity* (46,6%) but also the *Illness* (33,4%) and the *Bodypart* (3,3%).
4. 16,7% of the structures feature an objectless verb.
5. Whenever the *Mean/Instrument* is not the Subject it is expressed with a PP introduced with the preposition 'με', which is the main way of expressing the mean in Modern Greek.

Passive form of 'γιατρεύω':

1. In the passive voice in 52,5% of the cases the Subject is the *Entity*, in 45,6% the *Illness* and in 1,9% the *Bodypart*. The fact that the Subject of the passive voice corresponds with the Direct Object of the active voice shows that there is a canonical relation between the two voices.

Although 'γιατρεύω' and 'θεραπεύω' are synonyms, 'θεραπεύω' in the HNC is more frequent than 'γιατρεύω' especially in the passive voice where the examples with 'θεραπεύω' are almost 10 times more than those of 'γιατρεύω'. In the active voice 'θεραπεύω' has 3 times as many examples as 'γιατρεύω'. This could be an indication that native speakers of Greek prefer the somehow formal 'θεραπεύω' rather than the less formal 'γιατρεύω' with the written form of the language. In the active voice the two verbs support almost the same number of structures, but in the passive voice 'θεραπεύω' supports twice as much of the structures of 'γιατρεύω'.

4.4.2. The event of 'Cure' as described in FrameNet and in Vostantzoglou.

The frame of 'Cure' given in FrameNet is <https://framenet2.icsi.berkeley.edu/fnReports/data/frameIndex.xml?frame=Cure>

(1) Cure Frame

(1) This frame deals with a **Healer** treating and curing an **Affliction** (the injuries, disease, or pain) of the **Patient**, sometimes also mentioning the use of a particular **Treatment** or **Medication**. This frame differs from **Medical_intervention** in that this frame deals only with cases in which the **Patient** is cured of the **Affliction**, not just treated for the **Affliction**.

This frame makes clear that it is about successful cure and not about the treatment of a patient for an affliction (in which case it is not known whether the patient will be cured). The procedure of treatment of a disease is described in the **Medical Intervention Frame** (2) (https://framenet2.icsi.berkeley.edu/fnReports/data/frameIndex.xml?frame=Medical_intervention) where the verb 'cure' is not for the time included in the annotated examples.

(2) Medical Intervention Frame

Procedural or Medicine based **Interventions** are used on a **Patient** to attempt to alleviate a **Medical_condition**. These interventions can have a **Frequency_of_success** as well as **Side_effects**. This frame differs from **Cure** in that this frame deals only with attempts to alleviate a **Medical_condition**, whereas **Cure** deals with situations in which the **Affliction** or **Medical_condition** has been cured.

It seems then that in FrameNet the frame of 'cure' includes only the cases of successful cure.

On the other hand Vostantzoglou lists the verb 'θεραπεύω' ('to cure'/formal) in two different lexical fields: in 703.Αννάρωσις (recuperation) and in 707.Νοσηλεία (hospitalization). It seems that Vostantzoglou also distinguishes two different senses of the verb in the same way FrameNet does: the one sense entails that the patient no longer suffers of this disease while the other is about the procedure of treatment whose results are uncertain. As far as 'γιατρεύω' ('to cure'/colloquial) is concerned Vostantzoglou lists it only in the recuperation lexical field. This means that as far as he is concerned 'γιατρεύω' has only the sense of 'cure a disease' and it is not used for the procedure of treatment.

In both the above cases it seems that 'θεραπεύω' has two distinguished meanings which are related to the result of the action. When the result is successful the verb has a different meaning from the case where the result is unknown. Its synonym 'γιατρεύω', as described in Vostantzoglou, is only used when the cure is successful.

In the examples retrieved from the HNC 'θεραπεύω' never has a sense related with the procedure of treatment. It seems that in Modern Greek 'θεραπεύω' is used only when the procedure of treatment is successfully completed and the patient is cured from a disease. In this case 'θεραπεύω' and 'γιατρεύω' are synonyms. As far as Vostantzoglou's classification of the verb 'θεραπεύω' is concerned, this could be an example about how much attention should be paid in an effort of renovating its content. Also, in a conceptually organized lexicon like 'Ekfrasis' cases like this should be treated with great attention, since it can be used as the base for a translative lexicon. In this case 'θεραπεύω' and 'γιατρεύω' can both be translated with the verb 'cure' as described in the 'Cure Frame' (1).

As we did before, we have highlighted the concrete and abstract entities that have been encountered in the Modern Greek description of the 'Cure event' following

the FrameNet practice, as we did with ‘χειρουργώ’ (section 4.2.2.). The following table presents the roles of the two description/annotation systems and their relations.

Table 23. The Entities of cure event

FrameNet	‘θεραπεύω/γιατρεύω’	R (FrameNet,Greek Cure event)
Healer	Agent	Hyponymy
Patient	Entity	Hyponymy
Body_Part	Part of one’s body	They are the same
Affliction	Illness	Hyperonymy
Treatment/Medication	Medium/Instrument	Hyponymy

The values of the relation R in the table above indicate the same differences in the two strategies of naming participants in an event as described in the case of ‘χειρουργώ’.

4.5. The verb ‘εξετάζω’

HNC returned 36 occurrences of the medical sense of ‘εξετάζω’, all featuring the active form of the verb. Table 24 illustrates the active structures in the HNC.

Table 24. Active structures of ‘εξετάζω’ found in HNC

A	Structure (active forms of ‘εξετάζω’)	Source	% (HNC)	Usage example
A1	Subj-Agent Verb Obj-Entity	HNC	24/36 66,6%	<i>Ο γιατρός θα εξετάζει τον ασθενή και θα αποφασίζει αν χρειάζεται περαιτέρω διερεύνηση προκειμένου να τον στείλει σε γιατρό με συγκεκριμένη ειδικότητα ή για διαγνωστικές εξετάσεις.</i>
A2	Subj-Agent Verb Obj-Bodypart	HNC	2/36 5,6%	<i>Η καρδιά του τρωκτικού άρχισε να χτυπά σκορπίζοντας ρίγη συγκίνησης στους παρευρισκόμενους, οι οποίοι ελπίζουν ότι θα μπορέσουν να κρατούν ζωντανό για μια περίοδο και ένα ανθρώπινο όργανο, οπότε να έχουν το χρόνο να το [EY:οι γιατροί] εξετάζουν προκειμένου να εξασφαλίζουν ότι αυτό θα ταιριάζει απόλυτα στο λήπτη.</i>
A3	Subj-Agent Verb [Obj-Bodypart +POSS-Entity]	HNC	6/36 16,6%	<i>Ο γιατρός σας θα εξετάζει τακτικά το αίμα σας [σημείο] για να ανιχνεύσει οποιαδήποτε ανωμαλία στα επίπεδα του σακχάρου στο αίμα, ή των λιπιδίων [σκοπός].</i>
A4	Subj-Agent Verb Obj-Illness	HNC	2/36 5,6%	<i>Για το λόγο αυτό, θα πρέπει να καθιερώσουν αποτελεσματική παρακολούθηση, να εξοικειώσουν τους ιατρούς με τα σύνδρομα τα οποία πρέπει να [EY:οι γιατροί] εξετάζουν, να διαδίδουν κατευθυντήριες γραμμές για τη διαχείριση των</i>

				κρουσμάτων και να καθιερώσουν αποτελεσματικές διευθετήσεις για την άμεση γνωστοποίηση στις αρχές που είναι αρμόδιες για τη συλλογή και την αξιολόγηση επιδημιολογικών πληροφοριών και για το συντονισμό της ανταπόκρισης της δημόσιας υγείας.
A5	Subj-Agent Verb	HNC	2/36 5,6%	Ο γιατρός από τη Σαντορίνη έρχεται, [EY: ο γιατρός από τη Σαντορίνη] εξετάζει δύο - τρεις ημέρες, φεύγει και εκ περιτροπής ο άλλος έρχεται ύστερα από δεκαπέντε ημέρες

4.5.1. Observations

Of the 2000 occurrences (that is the maximum number of examples provided by HNC for a search) of the verb ‘εξετάζω’ only 36 were related to the medical field and all of them features the active voice of the verb. As native speakers we think that this is peculiar, because the use of the verb in the passive voice seems rather normal to us. Given that intuition, our future work with ‘εξετάζω’ will first focus on clearing this matter, using web-retrieved examples and questionnaires, and then on the correlation of the verb’s structures with the structures of the other verbs related to medical events that are studied here.

As far as the examples retrieved from the HNC are concerned:

1. The Subject always denotes the *Agent*.
2. The Object is mainly the *Entity* (67%) but also the *Bodypart* (22%) and the *Illness* (6%).
3. About 5% of the structures feature an objectless verb.

4.6. The verb ‘τραυματίζω’

HNC returned 1306 occurrences of ‘τραυματίζω’, of which 214 featured the active form of the verb and 1092 the passive one. Table 25 illustrates the active structures in the HNC, Table 26 the passive ones.

Table 25. Active structures of ‘τραυματίζω’ found in HNC

A	Structure (active forms of ‘τραυματίζω’)	Source	% (HNC)	Usage example
A1	Subj-Agent Verb Obj-Entity	HNC	158/214 73,8%	Οι αστυνομικοί τραυμάτισαν έναν ρεπόρτερ και τρεις εικονολήπτες.
A2	Subj-Entity Verb [Obj-Bodypart+POSS-Entity] από-PP-Cause	HNC	1/214 0,5%	Σύμφωνα επίσης με όσα διέρρευσαν από στρατιωτικούς κύκλους στην Αθήνα, ο έφεδρος αξιωματικός είχε τραυματίσει το χέρι του από τα χτυπήματα καράτε κατά του Ρωμιόπουλου.

A3	Subj-Agent Verb Obj-Entity σε-PP-Bodypart	HNC	11/214 5,1%	Ο συνοδηγός σημάδεψε τον Σπάθα από απόσταση μικρότερη των τριών μέτρων και τον [EY: ο συνοδηγός] τραυμάτισε στα πόδια, στο δεξιά μηρό και τη δεξιά κνήμη.
A4	Subj-Agent Verb	HNC	3/214 1,4%	Και τώρα, αφού άρπαξε το πιστόλι, σκότωσε και [EY:αυτός-ή] τραυμάτισε, κατόρθωσε να πείσει μόνο τον εαυτό του ότι έλυσε το πρόβλημα που είχε με τους μετανάστες.
A5	Subj-Cause Verb Obj-Entity	HNC	33/214 15,4%	Τα θραύσματα τραυμάτισαν πολίτες και σε απόσταση πεντακοσίων μέτρων περνούσαν πάνω από τα κεφάλια δημοσιογράφων, αστυνομικών και στρατιωτών.
A6	Subj-Cause Verb Obj-Entity σε-PP-Bodypart	HNC	8/214 3,8%	Μετά την πρόσφατη απόπειρα κατά της ζωής του (μια έκρηξη σε παγιδευμένο με εκρηκτικά αυτοκίνητο τον τραυμάτισε ελαφρά στο πρόσωπο ενώ πήγαινε στο κοινοβούλιο της χώρας του τον περασμένο Αύγουστο), η γερμανική κυβέρνηση του δώρισε μια τεθωρακισμένη Μερτσέντες.

Table 26. Passive structures of ‘τραυματίζω’ found in HNC

P	Structure (passive forms of ‘τραυματίζω’)	Source	% (HNC)	Usage example
P1	Subj-Entity Verb	HNC	834/1092 76,3%	Οι Ιταλοί απάντησαν, με αποτέλεσμα να τραυματιστεί ένα επιβάτης και να συλληφθούν άλλοι δύο.
P2	Subj-Entity Verb από-PP-Agent	HNC	4/1092 0,4%	Χθες μάλιστα μια μαθήτρια τραυματίστηκε ελαφρά από οδηγό αυτοκινήτου, που προσπάθησε να περάσει μπλόκο των μαθητών στο Παλαιό Ψυχικό.
P3	Subj-Entity Verb σε-PP-Bodypart	HNC	78/1092 7,1%	Ο Νταντόν τραυματίστηκε στο πρόσωπο.
P4	Subj-Entity Verb σε-PP-Bodypart από-PP-Agent	HNC	1/1092 0,1%	Στη συνέχεια, ο κατηγορούμενος τραυματίστηκε στο πόδι από δεκάδες αγανακτισμένους οπαδούς, οι οποίοι τον χτυπούσαν με κάθε τρόπο.
P5	Subj-Entity Verb από-PP-Cause	HNC	150/1092 13,8%	Από την έκρηξη δεν τραυματίστηκε κανείς.
P6	Subj-Entity Verb σε-PP-Bodypart από-PP-Cause	HNC	19/1092 1,7%	Από πέτρα, που εκσφενδόνισε άγνωστος από το χώρο των διαδηλωτών, τραυματίστηκε στο κεφάλι δημοσιογράφος τηλεοπτικού καναλιού.
P7	Subj-Bodypart Verb	HNC	4/1092 0,4%	Εάν ο μυελός των οστών τραυματισθεί ή καταστραφεί μετά τη γέννηση, το ήπαρ και η σπλήνα επαναρχίζουν την αιμοποίηση.
P8	Subj- [Bodypart+POSS-	HNC	1/1092	Αν δηλαδή το παιδί πάθει ασφυξία ή τραυματισθεί

	<i>Entity</i>] Verb		0,1%	το κεφάλι του, αν είναι πρόωρο, αν το βάρος του είναι μικρό κλπ.
P9	Subj- [<i>Bodypart</i> + <i>POSS-Entity</i>] Verb από-PP- <i>Cause</i>	HNC	1/1092 0,1%	Οι Περιστεριώτες έδειχναν το μπανταρισμένο αφτί του Κορωνιού και μιλούσαν για πέντε ράμματα που τοποθετήθηκαν σ' αυτό, που [EY: το μπανταρισμένο αφτί του Κορωνιού] τραυματίστηκε από κέρμα, ενώ οι άνθρωποι του Άρη αμφισβητούσαν όλα αυτά και τόνιζαν ότι κάνουν θέατρο, για να δημιουργήσουν εχθρική ατμόσφαιρα στη ρεβάνς.

4.6.1. Observations

In the HNC data, with the active form of the verb 'τραυματίζω' :

1. The Subject denotes mainly the *Agent* (81%) and less often the *Cause* (19%).
2. 98,5% of the examples feature the transitive form of the verb. The direct object denotes the *Entity* (98%) and rarely the *Bodypart* (0,5%).
3. In the 1,5% of the cases the verb is objectless.
4. In 9% of the transitive structures the object, which in this case denotes the *Entity*, is followed by a PP inserted with the preposition 'σε' showing the *Bodypart*. This means that in this case *Bodypart* takes a locative interpretation.
5. Except for being denoted by the Subject, *Cause* is also expressed in the 0,5% of the examples with a PP introduced with the preposition 'από', that is one of the most common ways of expressing the cause in Modern Greek.

With the passive form of the verb:

1. The Subject mainly denotes the *Entity* (98,5%) and less often the *Bodypart* (0,5%). The *Agent* is expressed in 0,5% of the examples with a PP inserted with the preposition 'από'.
2. In the 15,5% of the cases the *Cause* is expressed with a PP inserted with the preposition 'από'.

Our future work with 'τραυματίζω' will be to develop questionnaires in order to see if there are structures that didn't appear in HNC and make the correlations with the other verbs studied here.

In sections 4.6.2. and 4.6.3 we describe phenomena particular to the verb 'τραυματίζω'.

4.6.2. The gradation of the verb 'τραυματίζω'.

On our first attempts to annotate the sentences of 'τραυματίζω' we noticed that in several cases the active and the passive form of the verb were accompanied by the adverb 'θανάσιμα'. At first we wondered if 'τραυματίζω θανάσιμα' means 'kill' and

‘τραυματίζομαι θανάσιμα’ means ‘die’. This would mean that in those cases the verb has a different meaning from the one we were studying (=injure someone) and they should be excluded from this study. The first indication that this was not true was given to us by the data itself. There were cases where the verb was given in contradiction with the verb ‘σκοτώνω’ (‘to kill’) (54).

(54) Οι άλλοι στρατιώτες άνοιξαν τότε πυρ ευρισκόμενοι σε αυτοάμυνα και ο Ντρελιάτσκα τραυματίστηκε θανάσιμα, ενώ σκοτώθηκε ο οδηγός του.
 ‘The other soldiers then opened fire being in self –defense and Dreliaska was fatally injured, while his driver was killed.’

The second indication that the data gave us was that there are other adverbs, for example ‘ελαφρά’ (55) or ‘σοβαρά’ (56), that they seem to modify the verb in the same way as ‘θανάσιμα’. Therefore the adverb ‘θανάσιμα’ does not form a multiword lexeme with ‘τραυματίζω’ and the meaning of the verb is not affected.

(55) Τον σημάδεψε στο κεφάλι και τον τραυμάτισε ελαφρά.
 ‘He aimed at his head and injured him lightly.’

(56) Ο ένας από του τρεις όμως πυροβόλησε τρεις φορές εναντίον του και ο αστυνομικός τραυματίστηκε σοβαρά .
 ‘But one out of three shot three times against him and the policeman was severely injured.’

Next, we checked with the web and asked native speakers if what was shown in the data could be verified. The web- retrieved examples showed that ‘τραυματίζω’ is quite often accompanied by certain adverbs and that the adverb ‘θανάσιμα’ doesn’t change the meaning of the verb. Five native speakers were asked to give information about the pairs ‘τραυματίζω θανάσιμα’ – ‘σκοτώνω’ and ‘τραυματίζω θανάσιμα’- ‘τραυματίζω ελαφρά’. All of them said that ‘τραυματίζω θανάσιμα’-‘τραυματίζω ελαφρά’ are opposites. On the other hand, ‘τραυματίζω θανάσιμα’-‘σκοτώνω’ are not synonyms. Rather, if someone is badly injured, death is not entailed nor is death entailed immediately after the injury. However, in the case of ‘σκοτώνω’ death is immediate. So we concluded that we have to treat ‘θανάσιμα’ exactly as the rest of the adverbs found near ‘τραυματίζω’.

But there was more to this adverb story. The HNC data shows that ‘τραυματίζω’ is often followed by an adverb that imposes a gradation to the effect of the injury event. In the active form of the verb gradation occurred in 70 cases out of 214 (33%) and in the passive form in 282 cases out of 1092 (26%). At Table 27 the adverbs that are used to gradate ‘τραυματίζω’ and their frequency of appearance in the examples are given. Both the forms of the verb prefer ‘σοβαρά’ almost at the same percentage and ‘ελαφρά’ follows. A lexicographer should pay attention to these results, perhaps after a verification with other corpora (see the discussion in Section 2.5.).

Table 27. Adverbs gradating ‘τραυματίζω’

Adverb	Active Form %	Passive form %
‘ελαφρά’	16/70 22,8%	106/282 37,6%

‘ελαφρότερα’	1/70 1,4%	5/282 1,8%
‘θανάσιμα’	13/70 18,6%	12/282 4,3%
‘σοβαρά’	36/70 51,4%	122/282 43,2%
‘σοβαρότερα’	0	6/282 2,1%
‘σοβαρότατα’	0	4/282 1,4%
‘βαριά’	4/70 5,8%	20/282 7,1%
‘βαρύτατα’	0	4/282 1,4%
‘επιπόλαια’	0	1/282 0,4%
‘άσχημα’	0	2/282 0,7%

4.6.3. Time expressions with the verb ‘τραυματίζω’.

In the active form of the verb ‘τραυματίζω’ time expressions are used in 10 out of 214 examples (4,7%) in order to define the injury in the axis of time (present, past, future) in regard with the time of the speaker.

(57) *Προχθές το βράδυ* τραυμάτισε το παιδί του ...
‘The night before yesterday he injured his child...’

Things are quite different with the passive form. Time expressions are used in 35% (377 out of 1092) of the HNC examples. We distinguished three kinds of time expressions defining ‘τραυματίζομαι’:

a. *time*: the definition of time in the axis of time (present, past, future) in regard with the time of the speaker. This time expression appeared in 80 out of 377 cases (21%).

(58) Δύο πυροσβέστες τραυματίστηκαν *χθες από μεγάλη φωτιά*...
‘Two firemen were injured yesterday from a big fire...’

b. *fact*: The fact in which the injury happened. In this case time is not defined in the axis of time. In order to have this information the time of the fact must be defined. This time expression appeared in 188 out of 377 cases (50%).

(59) *Κατά το δυστύχημα* βρήκαν το θάνατο έξι επιβάτες και τραυματίστηκαν 118.
‘During the accident six passengers died and 118 were injured.’

c. *complex time*: The combination of the two time expressions above. The fact in which the injury happened is placed in the axis of time. This time expression appeared in 109 out of 377 cases (29%).

(60) *Πέρυσι το Σεπτέμβριο, 4 παρατηρητές των Ηνωμένων Εθνών είχαν τραυματιστεί όταν ένοπλοι άνοιξαν πυρ εναντίον λεωφορείου που τους μετέφερε στο Σουχούμι.*

‘Last September, 4 UN observers were injured, when armed men opened fire at the bus that was carrying them at Souxoumi.’

From the percentages of the appearance of time expressions in the passive voice of the verb ‘τραυματίζω’, it looks like the fact of the injury is mainly dated in anaphora with another fact in which the injury took place.

4.6.4. The event of ‘injure’ in FrameNet

The general Cause_Harm scenario given in FrameNet is (1) (https://framenet2.icsi.berkeley.edu/fnReports/data/frameIndex.xml?frame=Cause_harm).

(1) Cause Harm frame

The words in this frame describe situations in which an **Agent** or a **Cause** injures a **Victim**. The **Body_part** of the **Victim** which is most directly affected may also be mentioned in the place of the **Victim**. In such cases, the **Victim** is often indicated as a genitive modifier of the **Body_part**, in which case the **Victim** FE is indicated on a second FE layer.

The verb ‘to injure’ is listed in this frame and its frame elements given in FrameNet along with their syntactic realization are (2) (<https://framenet2.icsi.berkeley.edu/fnReports/data/lu/lu2330.xml?mode=lexentry>)

(2) **Frame elements:** **Agent**, **Body_part**, **Cause**, **Containing_event**, **Means**, **Place**, **Time**, **Victim**.

The frame elements of ‘to injure’ that do not appear in the Cause_Harm Scenario (**Containing_event**, **Means**, **Place**, **Time**) are considered to be non-core elements, which means that their appearance in the verb’s semantic environment is optional.

Also the verb ‘to injure’ is listed in the Experience_Bodily_Harm scenario which is given in FrameNet as (3) (https://framenet2.icsi.berkeley.edu/fnReports/data/frameIndex.xml?frame=Experience_bodily_harm&banner=)

(3) Experience Bodily Harm frame

An **Experiencer** is involved in a bodily injury to a **Body_part**. (In some cases, no **Body_part** need be indicated.) Often an **Injuring_entity** on which the **Experiencer** injures themselves is mentioned.

The frame elements given for the verb ‘to injure’ in this case are (4) (<https://framenet2.icsi.berkeley.edu/fnReports/data/lu/lu6893.xml?mode=lexentry>).

(4) **Frame elements:** Body part, Containing_event, Experiencer, Injuring_entity, Iterations, Manner, Place, Severity, Time.

The frame elements of ‘to injure’ that do not appear in the Experience_Bodily_Harm scenario (Containing_event, Iterations, Manner, Place, Severity, Time) are considered to be non-core elements, which means that their appearance in the verb’s semantic environment is optional.

These make clear that a semantic distinction is adopted for the verb ‘to injure’ in FrameNet. In the first case (1) the focus is on the causative nature of the event and the verb is used in situations where the cause of the injuring event is other than the Victim. In the second case (3) the verb focuses on the experiential nature of the event and the predicate denotes an experience of the Subject-Experiencer. The object in this case, if it is present is either the reflexive pronoun (myself) or a body part, obviously belonging to the Experiencer. The Experiencer may or may not be the cause of the event.

Vostantzoglou on the other hand classifies the verb ‘τραυματίζω’ in the lexical field 701.Τραύμα (injury). He does not adopt this kind of distinction for the verb.

In our work we also did not consider that the verb has two different semantic environments. In the corpora, we did not find any examples in which ‘τραυματίζω’ is followed by a reflexive pronoun. On the other hand a quick query on the internet showed that this structure also exists in Modern Greek (61).

(61) Πήγε για κυνήγι και τραυμάτισε τον εαυτό του.
‘He went hunting and he injured himself’

The fact that we do not find a reflexive pronoun following ‘τραυματίζω’ in the corpus-retrieved examples could be due to the fact that in Modern Greek there is the verb ‘αυτοτραυματίζομαι’ which has the meaning ‘injure myself’ (62).

(62) 16χρονη αυτοτραυματίστηκε με καραμπίνα στο λαιμό
‘A 16 year old injured herself on the neck with a carbine’

We also did not find examples that have the meaning that someone had caused an injury to himself. This of course does not mean that the particular meaning of the verb is not used in Modern Greek. In fact there are examples retrieved from the web that imply that the Experiencer is the Cause of the injuring event (63).

(63) Πήγε για πεζοπορία και τραυμάτισε το πόδι της.
‘She went hiking and she injured her leg.’

Alexiadou and Anagnostopoulou (2009) argue that in Modern Greek there are verbs which form anticausatives with the non active voice. In these verbs the passive and the anticausative structure are not morphologically distinct. Passive voice allows a PP introduced with the preposition ‘από’ to combine with an animate DP. The interpretation of this PP is necessarily agentive and intentionality is entailed (64.c). The anticausative structure allows PPs which express the cause but not the agent-PP

(64.b.). Certain verbs have an active form for both the agentive and the anticausative interpretation (eg. the verb σπάω ‘break’).

(64) Causative

a. Ο Γιάννης κατέστρεψε το χειρόγραφο.

[the john-nom destroyed-**Act** the manuscript-acc]

‘John destroyed the manuscript’ (Alexiadou and Anagnostopoulou 2009:5)

Anticausative

b. Το χειρόγραφο καταστράφηκε με τη δυνατή φωτιά

[the manuscript-nom destroyed-**Nact** with the strong fire]

‘The manuscript was destroyed from the strong fire.’ (Alexiadou and Anagnostopoulou 2009:5)

Passive

c. Το χειρόγραφο καταστράφηκε από το Γιάννη

[the manuscript destroyed-**Nact** from the John]

‘The manuscript was destroyed from John.’ (Alexiadou and Anagnostopoulou 2009:5)

In our case ‘τραυματίζω’ (‘to injure’) acts like ‘καταστρέφω’ (‘to destroy’)
(64). The causative structure is expressed with the active morphology of ‘τραυματίζω’
(65) and (66).

(65) Οι αστυνομικοί τραυμάτισαν έναν ρεπόρτερ και τρεις εικονολήπτες.

[the policemen-NOM injured-ACT one reporter-ACC and three cameramen-ACC]

‘The policemen injured one reporter and three cameramen.’

(66) ...μια μεγάλη έκρηξη τραυμάτισε επτά άτομα

[a big explosion-NOM injured-ACT seven people-ACC]

‘... a big explosion injured seven people’

The passive morphology with ‘τραυματίζω’ allows both the passive and the anticausative structure. Passive structure allows an agent-PP (67) while anticausative structure allows a cause-PP (68).

(67) Χθες μια μαθήτρια τραυματίστηκε ελαφρά από οδηγό αυτοκινήτου...

[yesterday a student-NOM was injured-NACT slightly from a car driver-AGENT-PP]

‘Yesterday a student was slightly injured from a car driver...’

(68) Από την έκρηξη δεν τραυματίστηκε κανείς.

[from the explosion-CAUSE-PP was injured-NACT nobody-NOM]

‘Nobody was injured from the explosion’

In FrameNet on the other hand, when the SUBJ and the OBJ of the verb ‘to injure’ are related with the Body Part relationship, which is related to the Inalienable Possession, then the verb’s semantic environment is described with the Experience

Bodily Harm Frame. This Body Part relationship in Modern Greek is expressed with both the active (69) and the passive voice (70) of the verb.

(69) Πήγε για πεζοπορία και τραυμάτισε το πόδι της.
[went hiking and injured-ACT-3SG_i the leg-BODYPART her_i]
'She_i went hiking and injured her_i leg.'

(70) Ο Α. Κωνσταντίνου τραυματίστηκε στο πόδι
[A.Konstantinou-NOM was injured-NACT on-P the leg-BODYPART-PP]
'A. Konsantinou was injured on the leg'

Also this Body part relationship is expressed in Modern Greek with the passive voice of 'τραυματίζω' combined with the prefix 'αυτό' ('self-') forming the verb 'αυτοτραυματίζομαι' (71).

(71) 16χρονη αυτοτραυματίστηκε με караμπίνα στο λαιμό.
[16 year old self-injured-NACT with a carbine on-P the neck-BODYPART-PP]
'A 16 year old injured herself on the neck with a carbine'

It is in our future interest to check how these changes between the active and the passive form occur and if these changes correlate with Alexiadou's and Anagnosopoulou's analysis. For now we just report these alternations and do not yet attempt to draw a frame for the verb 'τραυματίζω' in Modern Greek.

5. Conclusions and future work

Our work started with an effort to collect data from the HNC in order to study the verbs we were interested in and describe their semasio-syntactic properties. As mentioned in section 2.2. the data retrieved from the HNC, even though they gave us a very good idea of ‘χειρουργώ’ structures, they left us with the impression that certain valid structures of the verb were missing from the structures derived from the HNC. This impression led us to the use of the web and the design of questionnaires in order to test our intuitions, which were finally validated. So, to the ongoing discussion about the kind of data that should support linguistic research, we would like to contribute our piece of evidence, namely that certainly corpora are a very important tool that linguists have at their disposal, but the data retrieved from them may not be enough. This of course has a lot to do with the size of the corpus and its level of balance. In our case, even though HNC is the biggest corpus for Modern Greek in addition to being relatively well balanced, our study showed that there is the need for validating its data with data from other corpora of Modern Greek such as the Corpus of Greek Texts (CGT). Certainly things would be better if the HNC was updated with more texts. This conclusion is corroborated by the statistical analysis of some of the frequency tables that were derived from the HNC data (2.5.).

Out of the material we collected from the HNC, we developed a semantically and syntactically annotated corpus (3.1 and 3.2) which would allow us to describe explicitly the structures supported by each verb and its semantic environment. Of course, our ultimate goal is to encode detailed semantic and syntactic lexical information in Ekfrasis. The comparison of our method of semantic annotation against FrameNet showed that different annotation systems provide us with different results (4.2.2., 4.4.2., and 4.6.4.). At the next phase of our work we intent to study how these two systems of annotation can be merged.

The study of these 6 verbs revealed several verb alternation phenomena in addition to discourse phenomena related to argument structure and gradation phenomena. With the verb ‘χειρουργώ’ (‘operate on’), a straightforward activity verb (Levin 2000, Mozer 2009) we verified that in an important amount of structures with the active form of the verb the omission of the object can be related with the habitual use of the verb (4.1.3). Another very interesting phenomenon that is correlated with the variety of syntactic frameworks supported by the verb ‘χειρουργώ’ is Inalienable Possession. As a first impression we can say that this phenomenon is due to the semantic need of the verb to express the Entity as the main participant of the event, but we have not yet thoroughly studied the phenomenon (4.1.4.). In our immediate future work, we intend to further study the relations between the various structures supported by ‘χειρουργώ’ and check whether the phenomenon generalizes over other verbs of Modern Greek, starting with the verbs that somehow entail the sense of bodily contact, such as ‘φιλώ’ (‘kiss’), ‘αγγίζω-ακουμπώ’ (‘touch’) and ‘χαιδεύω’ (‘fondle’) or verbs that use an extension of the Inalienable Possession alternation such as ‘ράβω’ (‘sew’) or ‘μπαλώνω’ (‘mend’). We also intend to check whether ‘τραυματίζω’ (‘to injure’) supports structures that are related with the Inalienable Possession with a questionnaire in order to validate our native speaker intuitions as regards the relation between the Greek verbs ‘τραυματίζω/τραυματίζομαι/αυτοτραυματίζομαι’ and the English verb ‘to injure’ as it is classified in FrameNet (4.6.4.).

Actually, the comparison of the verbs ‘θεραπεύω’ (‘to cure’/colloquial) and its more formal synonym ‘γιατρεύω’ (‘to cure’/formal) with their conceptualization on FramenNet and on Onomasticon (4.4.2.) showed us that someone must be very careful with the decisions he will make in regard with the conceptualization of a sense in a lexicon like ‘Ekfrasis’ which not only will contain all the necessary information that the user needs for a specific word, but also can be used as the base for a translative lexicon.

As far as ‘τραυματίζω’ is concerned, its study through the HNC data provided us with a very good picture on the verb’s discourse environment and especially as regards the expression of time (4.6.3). It also made us aware that the verb often requires certain adverbs for its gradation. Information like the above poses the question of the informational content of a lexicon ‘Ekfrasis’. We believe that this type of information, that can only be obtained through the study of a large amount of data, should be included in ‘Ekfrasis’ if a complete description of both the syntactic and the semantic verbal properties is at stake.

5.1. Some remarks concerning lexicographic work in ‘Ekfrasis’ in comparison with printed lexica of Modern Greek.

Each of the verbs studied so far, gave us many syntactic structures. This immediately brings up the question which of those structures could be considered in an effort of updating ‘Ekfrasis’ with detailed verbal properties.

Below we will see how ‘χειρουργώ’ is described in two established printed dictionaries of Modern Greek, namely, the Λεξικό της Κοινής Νεοελληνικής, 1998 (1) and (3) and the Λεξικό της Νέας Ελληνικής Γλώσσας, 2004 (2) and (4).

(1) **χειρουργώ** [xirurǵó] -**ούμαι** [P10.9](#) : κάνω χειρουργική επέμβαση, κάνω εγχείρηση· εγχειρίζω: *Ο γιατρός χειρούργησε τον τραυματία. Θα χειρουργηθεί για να του αφαιρέσουν τη χολή. Ο χειρουργημένος ασθενής και ως ουσ. ο χειρουργημένος.* [λόγ. < αρχ. χειρουργῶ]

(2) **χειρουργώ** ρ.μτβ. [αρχ.] {χειρουργείς...| χειρούργ-ησα, -ούμαι. -ήθηκα, -ημένος} πραγματοποιώ χειρουργική επέμβαση: ~ τραυματία/ασθενή || σε ποιο νοσοκομείο χειρουργήθηκε ο πατέρας σου;

(1) and (2) give a short definition of the verb. (1) also gives one example with the active form of the verb and one with the passive form and (2) only an example with the passive form. These examples in fact represent the structures that were found to be the most frequent ones in the data from HNC. But what happens with the rest of the structures? In a typed lexicon there are restrictions of space. If a lexicon of this type included all the possible structures of every verb it would become huge and difficult to be used. On the other hand, native speakers tend to look up lexica for usages that are not common (de Schryver, Joffe, D., Joffe, P. and Hilewaert 2006). For instance, users could worry whether they could use the verb ‘χειρουργώ’ with the body-part as an object and the illness as a prepositional complement.

Also (2) describes ‘χειρουργώ’ only as a transitive verb, while our work with HNC data showed that an important percentage (30%) of the structures are objectless and they can be related to habitual use (4.1.3.). These simple observations show that

in printed lexica a lot of important information is necessarily left out because of space issues. In an electronic lexicon like 'Ekfrasis' these restrictions do not exist. We can include all the structures of the verb and give examples for every structure, so that the user will have a full picture of the verb. For example a full description of 'χειρουργώ' in 'Ekfrasis' would include all the verb alternations and the case of inalienable possession with examples for each structure giving the user a complete picture about the use of the verb in Modern Greek. Furthermore, Ekfrasis could possibly include information about the tendency of 'χειρουργώ' to be used without an object.

Furthermore, printed dictionaries do not give any information about other semantic requirements of verbs. . For instance, 'τραυματίζω' in 33% of its active forms and 26% of its passive forms was modified with particular adverbs that gradated the denoted event. Electronic lexicons like 'Ekfrasis' would enable us to describe this phenomenon explicitly and list the adverbs that are used in order to gradate 'τραυματίζω'. In the printed lexica mentioned above, these adverbs are just mentioned in the exemplifying sentences of the verb, but there is not an explicit reference to their semantic relation with the verb (3) and (4) (only the meaning 'to injure' is included).

(3) **τραυματίζω** [travmatízo] **-ομαι** [P2.1](#) : **1.** προξενώ σωματικό τραύμα: *Τον τραυμάτισαν με μαχαίρι / με όπλο. Τον τραυμάτισε χειροβομβίδα / αυτοκίνητο. Τραυματίστηκε ελαφρά / βαριά / θανάσιμα σε τροχαίο. Τραυματισμένο παιδί / ζώο, πληγωμένο.*

(4) **τραυματίζω** ρ.μτβ. [αρχ.] {τραυμάτισ-α, -τηκα, -μένος} **1.** προκαλώ σε (κάποιον) τραύμα (σωματικό ή ψυχικό): ~ *θανάσιμα / στο πόδι* ΣΥΝ. λαβώνω, πληγώνω.

From the above it gets clear that an electronic lexicon like 'Ekfrasis' would allow us to give detailed morphosyntactic information about the verbs and help the user to shape a full idea of how the verb he is looking for is used in Modern Greek.

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Appendix 1: The questionnaires used in order to check the structures with ‘χειρουργώ’.

Questionnaire 1

A10. Πρέπει να δώσουμε στους γονείς να καταλάβουν ότι σε αυτό το νοσοκομείο η πρακτική είναι η εξής: ένα παιδάκι που χειρουργούμε στον εγκέφαλο για καρκίνο μένει στην εντατική μία εβδομάδα και στο νοσοκομείο δύο επιπλέον εβδομάδες το λιγότερο

A12. Το πρωί, μετά το ψάρεμα πήγα κάτω στην αγορά. Περνώντας από το καφενείο συνάντησα τον Σταθάτο, τον γιατρό που όταν ήμουν στη Θεσσαλονίκη μου είχε χειρουργήσει το στομάχι για έλκος. Μου λέει κάτσε να δούμε αν κάναμε καλή δουλειά τότε. Και κατεβάσαμε κάμποσα τσίπουρα.

Questionnaire 2

A11. Η βασική μας αρχή είναι ότι οι ασθενείς τους οποίους χειρουργούμε για καρκίνο στον πνεύμονα μένουν στην απομόνωση τουλάχιστον μία εβδομάδα γιατί είναι πολύ επιρρεπείς στις μηκυτιάσεις

A13. Το πιστεύεις ή όχι, η γιαγιά μας είναι καλύτερα. Με τα πολλά, της χειρουργήσε το κάταγμα ο Νικολακάκης. Πώς τα κατάφερε ο άτιμος και τον πήρε η γιαγιά με το καλό και έκανε ό,τι της έλεγε. Περδίκη η γιαγιά σου λέω, ούτε λάμες ούτε τίποτε.

Questionnaire 3

A14. Είμαι ψόφιος. Το πρωί χειρουργήσα ένα στομάχι για καρκίνο. Μετά καπάκι ένα άλλο στομάχι για έλκος. Οχτώ ώρες χειρουργείο στη σειρά. Νυστάζω!! Έρχεται, λοιπόν, ο Βασίλης και μου λέει. Αδελφέ, καίγομαι. Αύριο έχω μια εγχείριση δύσκολη, ένα στομάχι. Με όσα μου συμβαίνουν δεν θα τα βγάλω πέρα. Θα την αναλάβεις? Και ξέρεις ποιανού στομάχι ήταν αυτό? Του Πανουργιά. Τί να κάνω, το κατάρπια. Και έτσι χειρουργήσα το στομάχι για καρκίνο παρακαλώ. Ακόμη κάνω στο σταυρό μου που πήγαν όλα καλά.

A15. Πιάστηκε καλά ο Αργύρης. Τώρα τελευταία χειρουργήσε το μάτι του Ωνάση για καταρράκτη. Ένα κότερο έβγαλε από αυτό.

Questionnaire 4

P10. Πήγα να δω τη Γιώτα που ήταν στο νοσοκομείο. Αλλά ο κόσμος είναι μικρός. Στο διπλανό κρεβάτι ήταν ο Βασίλης που είχε χειρουργηθεί στο πόδι για ρήξη του χιαστού.

P11. Το γόνατο του Καραγκούνη χειρουργήθηκε για μηνίσκο από τον Παπανικολάου. Με τις φυσικοθεραπείες και δεν ξέρω γω τί, το μαλλί πήγε κανα 50άρι χιλιάδες. Πάντως τώρα είναι εντάξει.

Questionnaire 5 (first round)

P12. Τό καλοκαίρι που υπηρετούσα στο νοσοκομείο του Αργοστολιού μας έφεραν ένα κάταγμα της λεκάνης το οποίο δεν ήταν δυνατόν να χειρουργηθεί λόγω της γενικότερης κατάστασης της ασθενούς. Καλέσαμε ελικόπτερο.

P13. Τό καλοκαίρι που υπηρετούσα στο νοσοκομείο του Αργοστολιού μας έφεραν ένα κάταγμα στη λεκάνη το οποίο δεν ήταν δυνατόν να χειρουργηθεί λόγω της γενικότερης κατάστασης της ασθενούς. Καλέσαμε ελικόπτερο.

Questionnaire 5 (second round)

P12. Όταν η κάκωση κοίλων σπλάγγων χειρουργείται μετά παρέλευση δέκα ωρών δίνεται μια επιπλέον δόση, ενώ όταν χειρουργείται μετά παρέλευση δεκαώρου χορηγούνται αντιβιοτικά βάσει των αρχών αντιμετώπισης της περιτονίτιδας.

P13. Εάν ο καρκίνος στην ουρά του παγκρέατος χειρουργηθεί από έμπειρο χειρουργό και με τη μέθοδο της περιφερικής παγκρεατεκτομής, τα ποσοστά επιτυχίας είναι ικανοποιητικά.

Appendix 2: Sample of the annotated sentences:

ΠΑΡΑΔΕΙΓΜΑ	ΣΗΜΑΣΙΟΛΟΓΙΚΟ ΠΕΡΙΒΑΛΛΟΝ	ΣΥΝΤΑΚΤΙΚΟ ΠΕΡΙΒΑΛΛΟΝ
Με χειρουργήσαν την επομένη στο Γουδί	Με [πάσχων] χειρουργήσαν [ΕΥ: οι χειρουργοί = [δράστης]] την επομένη [χρόνος] στο Γουδί [τόπος]	Ρήμα + ΟΦαιτ [πάσχων] + ΟΦαιτ [χρόνος] + ΠΦ [τόπος] [ΕΥ: οι χειρουργοί = [δράστης]] Όρισμα = ΟΦαιτ [πάσχων] Προσδιορισμός = ΟΦαιτ [χρόνος] Προσδιορισμός = ΠΦ [τόπος]
Ρήξη του προσθίου χιαστού έσω πλαγίου συνδέσμου, είπαν οι γιατροί και ο ορθοπεδικός Αργύρης Μήτσου που τον χειρούργησε το πρωί.	Ρήξη του προσθίου χιαστού έσω πλαγίου συνδέσμου, είπαν οι γιατροί και ο ορθοπεδικός Αργύρης Μήτσου που τον [πάσχων] [ΕΥ: ο ορθοπεδικός = [δράστης]] χειρούργησε το πρωί.	Ρήμα + ΟΦαιτ [πάσχων] [ΕΥ: ο ορθοπεδικός = [δράστης]] Όρισμα = ΟΦαιτ [πάσχων]
Διότι βεβαίως δεν μπορεί ο νευροχειρουργός που χειρουργεί δέκα ή δώδεκα ώρες να αμείβεται το ίδιο με το γενικό χειρουργό στο Νοσοκομείο Καρπενησίου που χειρουργεί μόνο σκωληκοειδίτιδα.	Διότι βεβαίως δεν μπορεί ο νευροχειρουργός που χειρουργεί δέκα ή δώδεκα ώρες να αμείβεται το ίδιο με το γενικό χειρουργό στο Νοσοκομείο Καρπενησίου που [ΕΥ: ο γενικός χειρουργός = [δράστης]] χειρουργεί μόνο σκωληκοειδίτιδα [σημείο].	Ρήμα + ΟΦαιτ [σημείο] [ΕΥ: ο γενικός χειρουργός = [δράστης]] Όρισμα = ΟΦαιτ [σημείο]
Αν μου ζητήσετε να σας χειρουργήσει φυσικός, θα συζητήσω και την πρότασή σας.	Αν μου ζητήσετε να σας [πάσχων] χειρουργήσει φυσικός [δράστης], θα συζητήσω και την πρότασή σας.	ΟΦον [δράστης] + Ρήμα + ΟΦαιτ [πάσχων] Όρισμα = ΟΦον [δράστης] Όρισμα = ΟΦαιτ [πάσχων]
Ο κ. Σουκάκος δεν κατεβαίνει γιατί δεν μπορεί να χειρουργήσει, διότι δεν υπάρχουν νοσηλεύτριες	Ο κ. Σουκάκος δεν κατεβαίνει γιατί δεν μπορεί να [ΕΥ: ο κ. Σουκάκος = [δράστης]] χειρουργήσει, διότι δεν υπάρχουν νοσηλεύτριες [αιτία]	Ρήμα + ΔΕΥΤ.ΠΡ [αιτία] [ΕΥ: ο κ.Σουκάκος = [δράστης]] Προσδιορισμός = ΔΕΥΤ.ΠΡ [αιτία]

Έχουμε τρεις νευροχειρουργούς, οι οποίοι κάθονται γιατί δεν έχουν εργαλεία να χειρουργήσουν.	Έχουμε τρεις νευροχειρουργούς, οι οποίοι κάθονται γιατί δεν έχουν εργαλεία να [EY: οι νευροχειρουργοί = [δράστης]] χειρουργήσουν.	Ρήμα [EY: οι νευροχειρουργοί = [δράστης]]
Ενώ αυτός που χειρουργεί δεν μπορεί να χειρουργεί εν τη απουσία του και αυτός που δικηγορεύει στα ακροατήρια δεν μπορεί να δικηγορεύει εν τη απουσία του.	Ενώ αυτός που [EY: αυτός = [δράστης]] χειρουργεί δεν μπορεί να χειρουργεί εν τη απουσία του και αυτός που δικηγορεύει στα ακροατήρια δεν μπορεί να δικηγορεύει εν τη απουσία του.	Ρήμα [EY: αυτός = [δράστης]]

Κατά τη διάρκεια των επεισοδίων, τρεις αστυνομικοί και δύο πολίτες τραυματίστηκαν, ενώ προκλήθηκαν σοβαρές ζημιές σε αυτοκίνητα, προθήκες καταστημάτων και στον εξοπλισμό των Σχολών τις οποίες είχαν καταλάβει οι γνωστοί "άγνωστοι".	Κατά τη διάρκεια των επεισοδίων [χρόνος], τρεις αστυνομικοί και δύο πολίτες [πάσχων] τραυματίστηκαν, ενώ προκλήθηκαν σοβαρές ζημιές σε αυτοκίνητα, προθήκες καταστημάτων και στον εξοπλισμό των Σχολών τις οποίες είχαν καταλάβει οι γνωστοί "άγνωστοι".	Οφον [πάσχων] + Ρήμα + ΠΦ [γεγονός] Όρισμα = Οφον [πάσχων] Προσδιορισμός = ΠΦ [γεγονός]
Όπως ανακοινώθηκε από την Αστυνομία, οι αστυνομικοί που τραυματίστηκαν στα επεισόδια είναι οι Ν. Κονάνος, Β. Βαμβακινός και Π. Βαβάτσικος που μεταφέρθηκαν στο 401 στρατιωτικό νοσοκομείο, ενώ οι πολίτες οι Α. Κωνσταντίνου, 48 χρονών και Ν. Νταμπούρα, 26 χρονών που μεταφέρθηκαν στο Γενικό Κρατικό Αθηνών.	Όπως ανακοινώθηκε από την Αστυνομία, οι αστυνομικοί που [EY: οι αστυνομικοί = [πάσχων]] τραυματίστηκαν στα επεισόδια [γεγονός] είναι οι Ν. Κονάνος, Β. Βαμβακινός και Π. Βαβάτσικος που μεταφέρθηκαν στο 401 στρατιωτικό νοσοκομείο, ενώ οι πολίτες οι Α. Κωνσταντίνου, 48 χρονών και Ν. Νταμπούρα, 26 χρονών που μεταφέρθηκαν στο Γενικό Κρατικό Αθηνών.	Ρήμα + ΠΦ [γεγονός] [EY: οι αστυνομικοί = [πάσχων]] Προσδιορισμός = ΠΦ [γεγονός]
Ο Α. Κωνσταντίνου τραυματίστηκε στο πόδι, ενώ η Ν. Νταμπούρα στο πρόσωπο.	Ο Α. Κωνσταντίνου [πάσχων] τραυματίστηκε στο πόδι [σημείο], ενώ η Ν. Νταμπούρα στο πρόσωπο.	Οφον [πάσχων] + Ρήμα + ΠΦ [σημείο] Όρισμα = Οφον [πάσχων] Όρισμα = +ΠΦ [σημείο]
Νεκροί είναι οι Κ.	Νεκροί είναι οι Κ.	Οφον [πάσχων] + Ρήμα

<p>Καλαϊδόπουλος, 37 ετών και Παύλος Τσακιρίδης, 35 ετών, που είχαν έλθει στη χώρα μας από την πρώην Σοβιετική Ένωση, ενώ σοβαρά τραυματίστηκαν ο 33χρονος Γ. Αναστασιάδης και ο 46χρονος εργοδηγός Γ. Δανηλίδης.</p>	<p>Καλαϊδόπουλος, 37 ετών και Παύλος Τσακιρίδης, 35 ετών, που είχαν έλθει στη χώρα μας από την πρώην Σοβιετική Ένωση, ενώ σοβαρά τραυματίστηκαν ο 33χρονος Γ. Αναστασιάδης και ο 46χρονος εργοδηγός Γ. Δανηλίδης [πάσχων].</p>	<p>Όρισμα = ΟΦον [πάσχων]</p>
<p>Γιόφκος, σε μια πτώση του τραυματίστηκε στο αφτί, μετεφέρθη στο νοσοκομείο και επέστρεψε εντός της ημέρας στο αεροπλάνο του έτοιμος για νέα πτώση στην εστία της φωτιάς.</p>	<p>Γιόφκος, σε μια πτώση του [γεγονός] [ΕΥ: ο Γιόφκος = [πάσχων]] τραυματίστηκε στο αφτί [σημείο], μετεφέρθη στο νοσοκομείο και επέστρεψε εντός της ημέρας στο αεροπλάνο του έτοιμος για νέα πτώση στην εστία της φωτιάς.</p>	<p>Ρήμα + ΠΦ [σημείο] + ΠΦ [γεγονός] [ΕΥ: ο Γιόφκος = [πάσχων]] Όρισμα = +ΠΦ [σημείο] Προσδιορισμός = ΠΦ [γεγονός]</p>
<p>Λίγο μετά την αναχώρηση του από του Μαξίμου τραυματίστηκε άσχημα στο δεξιό του μάτι, το οποίο καλύπτει τώρα πίσω από μια τεράστια γάζα!</p>	<p>Λίγο μετά την αναχώρηση του από του Μαξίμου [χρόνος] [ΕΥ: αυτός = [πάσχων]] τραυματίστηκε άσχημα στο δεξιό του μάτι [σημείο], το οποίο καλύπτει τώρα πίσω από μια τεράστια γάζα!</p>	<p>Ρήμα + ΠΦ [σημείο] + ΕΠΙΡ.ΦΡ[χρόνος] [ΕΥ: αυτός = [πάσχων]] Όρισμα = ΠΦ [σημείο] Προσδιορισμός = ΕΠΙΡ.ΦΡ [χρόνος]</p>
<p>Τέσσερις ακόμα τραυματίστηκαν από ανταλλαγή πυροβολισμών.</p>	<p>Τέσσερις [πάσχων] ακόμα τραυματίστηκαν από ανταλλαγή πυροβολισμών [αίτιο].</p>	<p>ΟΦον [πάσχων] + Ρήμα + ΠΦ [αίτιο] Όρισμα = ΟΦον [πάσχων] Όρισμα = ΠΦ [αίτιο]</p>