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SEMANTIC AND PROSODIC PROCESSING OF THE NEGATIVE POLARITY

ITEMS IN GREEK


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ANASTASIOS CHATZIKONSTANTINOU


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for my father

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# ABSTRACT

This dissertation explores experimentally the properties of the Greek Negative Polarity Items (NPIs) and aims to shed light from different angles to the nature of NPI-hood. The first aspect we explore is the relation between NPI and prosody: based on Veloudis (1982) and Giannakidou (1998 et seq) we explore the distinction between emphatic and non-emphatic NPIs and analyze their relation to scalarity (Giannakidou and Yoon, 2016). In a production study we show that this distinction corresponds to a psycholinguistic reality and that intonation interacts with scalar reasoning. We continue our investigation by looking at the scope properties of the Greek emphatic NPIs. We present a perception study conducted on a group of 6-years-olds native speakers of Greek and show that the emphatic NPIs always take wide scope above negation (Giannakidou, 1998). This result gives us a different insight both on the relation between scope and prosody and to the possibility of prosodic prominence being an intrinsic property of the emphatic class. Finally, we explore two different modes of NPI licensing, semantic licensing vs. pragmatic licensing and through and Acceptability Judgment Task we see that participants' treat each mode differently. Overall, the present thesis contributes to our understanding of the NPI-hood by presenting an experimental investigation on different aspects of the Greek NPIs.

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# Chapter 1: TWO VARIANTS OF NEGATIVE POLARITY ITEMS

Negative polarity items are words that are sensitive to negation. This is illustrated in (1), where the NPI is licit due to the negation, and (2) that is ungrammatical due to the absence of negation:

(1) John didn't say anything.

(2) *John said anything.

The same phenomenon is observed in Greek and other languages, e.g.

(3) Dhen idha kanenan.

*neg saw.1 NPI-person*

"I didn't see anyone."

(4) *Idha kanenan.

saw  NPI-person

In (3) the NPI *κανέναν* is licensed by the sentential negation *δεν* and the sentence is grammatical. This however is not the case for (4) where the reason of the ungrammaticality is the absence of negation to license the NPI.

This dissertation explores experimentally different aspects of the Negative Polarity Items (NPIs) in Greek and advances the understanding of the nature of NPI-hood. We look at three features that have been argued to be integral parts of the Greek NPIs and the NPIs crosslinguistically:

- Intonation (Veloudis, 1982; Tsimpli and Roussou, 1996; Giannakidou, 1998; Giannakidou and Yoon, 2016)
- Scope (Giannakidou, 1998)
- Modes of NPI licensing (Zwarts, 1996; Giannakidou, 1998)

The contribution of this dissertation relies on the fact that the analysis operates on the interface between semantics/pragmatics and prosody and quantifies the results through experimentation. This thesis is one of the first attempts to unify experimentally the different aspects of the NPI-hood and sheds light to the role of NPIs in the bigger picture of the relation between semantics, prosody and syntax. The target language in this dissertation is Greek but the theoretical machinery we develop can be useful for English NPIs—in

particular, the distinction between emphatic and non-emphatic *any* (Krifka, 1995)— or the Spanish n-words (Giannakidou, 2006). Based on this, our findings can potentially explain NPI phenomena in these languages as well; this however is a direction for future research.

Looking closely to the NPI aspects we are interested in the link between this property and the Greek NPIs has been made since the early eighties by Veloudis (1982) and was taken further by Tsimpli and Rousou (1996) and Giannakidou (1998). The suggestion was that there are two NPI paradigms in Greek and, apart from their syntactic/semantic and distributional differences, they exhibit different prosodic profiles:

| kanenas / KANENAS | "anyone, anybody / anyone at all" |
|---|---|
| tipota / TIPOTA | "anything / anything at all" |
| puthena / PUTHENA | "anywhere / anywhere at all" |

The "emphatic" variant corresponds to the intensified English *any* whereas the "non-emphatic" to the bare *any, as indicated in the glosses.* By intensified *any*, following Giannakidou and Yoon, I intend to designate the so-called emphatic *any at all, any whatsoever.* By orthographic convention the "emphatic" is represented in upper case letters and the non-emphatic in lower case. Krifka (1995) makes a similar distinction regarding the English *any* and proposes a link between "special intonation" on the NPIs and their semantics.

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Giannakidou and Yoon (2016) suggest that the difference between the emphatic and non-emphatic variants of NPIs is one between a *scalar* and *a non-scalar* NPI. They suggest that *prosodic prominence* on the NPI is associated with their scalar interpretation. Under this assumption, our question is what motivates speakers to interpret a polarity sensitive expression like an NPI as a scalar term when it is associated with special intonation. And why, on the other hand, a neutrally uttered, or to be more accurate "without special intonation", NPI is associated with a non-scalar indefinite and referentially vague interpretation. The example below illustrates the question under discussion: the NPI *κανέναν* in this context is ambiguous between a scalar exhaustive at-all interpretation (a) and a non-scalar non exhaustive as in (b).

(5)     I Katerina dhen idhe kanenan.

        *the Maria not saw NPI*

        a. "Mary didn't see anyone *at all*."

        b. "Mary didn't see anyone."

The interpretation in (a) is the one expected to be associated with an emphatic realization of *κανέναν* whereas the one in (b) with a non-emphatic one. The difference here can also be seen in terms of intensity of the statement that is made: the emphatic makes a strong, intensified assertion whereas the non-emphatic makes a neutral negative contribution. As

Giannakidou and Yoon point out, the difference can be described in terms of "rhetorical force" as the two statements are truth conditionally equal.

In this context we aim to examine experimentally whether the two meanings are associated with specific intonational patterns and, if they are, what are these patterns. Doing this, we will provide empirical evidence about the prosodic – semantic profile of the Greek NPIs.

The second feature that we will examine is that of the scope properties of the Greek NPIs. Giannakidou (1998) argued that the emphatic NPIs are universal quantifiers that always take wide scope above negation.

(6)        Dhen anikse KANENA parathiro.

            *neg  open    NPI      window*

            "She didn't open any window at all."

The interpretation in (6), which is true of zero opened windows, is derived if we assume that the NPI-universal scopes over negation. Assuming that what triggers the inverse scope interpretation is the prosodic prominence on the NPI, the question that arises is whether intonation has the same effect on all universal quantifiers or if it is more of an indiosyncratic characteristic of the emphatic NPIs. The association between prosodic prominence and scope has been previously examined by Bolinger (1958), Jackendoff

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(1972), Buring (1997) and by Baltazani (2002) in Greek who claimed that for particular quantifiers (downward entailing) prosodic prominence seems to be associated with wide scope.

What we are asking in the NPI cases is whether the effect of intonation that generates inverse scope reading ($\forall$ > neg) applies equally to all quantifiers. The answer to this question will give us a deeper insight on the intonation of the NPIs and whether the special relation the emphatic has with prosody is the result of a general prosodic mechanism or if this is an idiosyncratic feature of this class.

The final aspect of the NPIs we are looking at is whether the relation between an NPI licenser and an NPI licensee is always the same in terms of "licensing strength". An early observation regarding the licensing of the NPIs has been the fact that they are not licensed only in negative and downward entailing contexts (Linebarger, 1980). In Greek this distributional difference is also reflected in the prosodic properties of the NPIs: non-emphatic NPIs have a wider distribution than their emphatic counterparts (Giannakidou, 1998). This is illustrated in the table below:

| Environments | Non-emphatic NPI | Emphatic NPI |
|---|---|---|
| Negation | OK | OK |
| *before* - clauses | OK | OK |

Table 1.1 Distribution of the emphatics and non-emphatics (Giannakidou, 1998)

| | | |
|---|---|---|
| *without* - clauses | OK | OK |
| Polar questions | OK | * |
| Conditionals | OK | * |
| Restriction of ∀ | OK | * |
| S-comparatives | OK | * |
| Superlatives | OK | * |
| Future particle | OK | * |
| Strong intentional verbs | OK | * |
| Modal verbs | OK | * |
| Imperatives | OK | * |
| Habituals | OK | * |
| DE DPs | OK | * |
| Negative verbs | OK | * |
| Generics | OK | * |
| NP comparatives | OK | * |
| Affirmative episodic sentences | OK | * |
| Weak intentional verbs | OK | * |
| Factive verbs | OK | * |

Table 1.1, continued

Looking at the table above it becomes obvious that the non-emphatics are licensed in non-veridical contexts like DE quantifiers as well as questions, modals and imperatives. These are non-veridical but non-negative contexts. For the purpose of this dissertation I do not consider such cases as focusing on the negative domain allows the exploration of the "licensing strength" we are interested in. For example, within the negative domain we have the distinction between the "prototypical" NPI licenser, the classical negation, and minimal negation which we set to show experimentally. Furthermore, the negative implicature derived from the emotive factives fall within the negative domain as well:

For example:

(7)    I am amazed that my friends have ever eaten sushi.

The context with the emotive factive is not downward entailing however *ever* is licit. The same is observed in Greek, with the NPI being licit, perhaps not as felicitously as *ever.*

(8)    Meno ekpliktos pu I fili efaghan pote sushi.

     *stay    amazed  that the friends ate ever  sushi*

According to Giannakidou (2006), in those cases the NPI is licensed by a negative implicature of the type "I did not expect that …." that may be inferred by (8). Our question here is whether there is a qualitative difference between such environments and more "protypical" NPI licensers like negation in terms of their strength of licensing. Our goal will be to find empirical evidence of whether native speakers treat differently sentences that contain the same NPI but under different licensers. Giannakidou (2006) suggests that there two modes of licensing, one that operates on the semantic level, classifying negation, and the other on the pragmatic level, classifying emotive factives among other licensers. Based on this suggestion, we are exploring further the licensing properties of the NPI licensers and ask whether the two suggested modes of licensing correspond to a different psycholinguistic reality. In other words, our aim is to reveal whether speaker's treatment – and in our case this will be reflected on acceptability judgments – is different for semantics and pragmatic licensing.

The structure of the rest of the dissertation goes as follows: in Chapter 2 I present Giannakidou's (1998 et seq) framework on Negative Polarity which will serve as the theoretical basis of the experimental work in this dissertation. I describe the main mechanics of the theory starting from the distinction between the two NPI variants in Greek: the emphatic and the non-emphatic. This is a distinction based on the prosodic profile of the NPIs and it provides the background for our Experiment 1. Other differences (distributional, syntactic, semantic) between the two variants are discussed which show that the two are in fact different lexical entries.  Finally, I present Giannakidou and Yoon

(2016) treatment of the emphatics as scalar and exhaustive items and the non-emphatics as non-scalar and non-exhaustive.

Chapter 3 is a review of previous approaches on the interaction between meaning and prosody. As we are investigating the relation between prosody and the meaning of the NPIs, this chapter gives an overview of previous approaches on the interface between prosody and semantics/pragmatics. It starts with Bolinger (1958) and his Accents A, B, C that constitute one of the first systematic approaches on the identification and interpretation of specific tunes. In the similar line of thought Gusenhoven (1983) and Pierrehumbert and Hirschberg (1990) frameworks provide interpretations where the speaker's attitude plays a central role. Jackendoff (1972), Rooth (1985), Buring (1997) take a more semantic and technical approach building on the presuppositions and explain other phenomena like scope disambiguation which we will see in Experiment 3. The review closes with Ward and Hirschberg (1985) and C. Lee (2010) who give a scalar perspective to the interpretation of specific tunes. The chapter closes with a brief overview of the Greek phonetics/phonology.

Chapter 4 is an experimental investigation of relation between (non)scalar NPIs and intonation. We put under test Giannakidou and Yoon (2016) hypothesis that the scalar NPI is associated with prosodic prominence whereas the non-emphatic is not. I present a production study (Experiment 1 conducted on native speakers of Greek which investigates the acoustic correlates of the scalar and the non-scalar NPI). A second study (Experiment 2) is conducted on the same population this time testing the acoustic correlates of an NPI in focus and not-in focus. Comparing the results from the two studies we are comparing

the prosodic profiles between a (non)scalar NPI and a (non)focused NPI, both prosodically prominent items in Greek.

In Chapter 5 I present a production study (Experiment 3) that explores the scope properties of the NPIs. The study is conducted on 6-years-old native speakers of Greek and has a developmental perspective as well. In this study we testing Giannakidou (1998) proposal that the emphatic NPIs are universal quantifiers that always take wide scope above negation. For this purpose, we are using a Truth Value Judgment Task to investigate whether children systematically show a preference in this interpretation. This experimental setup gives us also the opportunity to test children's competence on using prosodic cues to resolve quantifier scope ambiguities. Finally, the results allow us re-consider current theories that favor children's preference on overt syntax (Isomorphism).

Chapter 6 explores two different modes of licensing NPIs in Greek, licensing and rescuing and provides evidence that the two are qualitative different. The distinction is based on Giannakidou (1998, 2006) suggestion that licensing operates on the semantic level whereas rescuing is a secondary mechanism of licensing NPIs that operates on the pragmatic level. We present a study (Experiment 4) where through an Acceptability Judgment Task our aim is to see whether native speakers of Greek respond differently to the two modes of licensing. We also build on Zwarts-Giannakidou hypothesis and make a further distinction within the group of semantic licensers based on negativity (classical negation vs minimal negation). The results of this study draw a hierarchy of licensers depicting a scale of "licensing strength".

# Chapter 2: NEGATIVE POLARITY ITEMS IN GREEK: INTONATION, SCOPE AND LICENSING CONDITIONS

As mentioned earlier, Giannakidou (1998 et seq) suggests that in Greek there are two Negative Polarity Items (NPIs) paradigms, namely the "emphatic" and the "non-emphatic", that exhibit different accentual realizations. The treatment of the Greek NPIs as emphatics and non-emphatics dates back to Veloudis (1982) and is based on distributional, syntactic and semantic differences between the two paradigms that were associated with different semantic interpretations. The examples below show the two Greek NPI variants (upper case letters denote "emphatic" intonation) and their corresponding English translation.

kanenas / KANENAS                 "anyone, anybody / anybody at all"

tipota / TIPOTA                    "anything/anything at all"

pote / POTE                        "ever/never"

puthena / PUTHENA                  "anywhere/anywhere at all"

katholou / KATHOLOU                "at all/not at all"

Giannakidou's proposal amounts to saying that there are two prosodically distinct NPI items in Greek corresponding to separate lexical items each with different semantic and

syntactic properties. Both variants are similar to their *n-word* counterparts in Spanish or Italian:


(9)        Gianni *(non) ha visto niente.

*John     not have seen n-thing*

"John didn't see anything."


(10)       Juan *(no) ha visto a nadie.

*John not have seen n-person*

"John hasn't seen anyone."


The structures in (9) and (10) are also known as negative concord (more than one occurrences of negation are interpreted once) and in Greek only the emphatic participates in such structures. As Giannakidou (1998, 2006) argues, despite the fact that the Greek emphatics create structures like negative concord, they are not inherently negative. The observation comes from the elided part in the case of fragment answers that have been used as an argument of the negativity of the n-words. In these cases, negativity is still present in the elided material:

(11)      – Pjos irthe;

"Who came?"

– KANENAS <s>dhen irthe</s>

*n-person     not arrived*

"Nobody came."

In an earlier approach (Giannakidou, 1998, 2000) describes the difference between the emphatic and the non-emphatic as one between a universal quantifier and an existential quantifier. In a more recent approach, Giannakidou and Yoon (2016) approach the Greek NPIs as a distinction between a scalar (emphatic) and a non-scalar (non-emphatic variant).

While in Greek this difference is signaled in prosody, in English the *scalar* vs *non-scalar* difference is lexicalized. This becomes obvious in the translations in (12) and (13) that correspond to Greek sentences containing an "emphatic" and a "non-emphatic" NPI respectively:

(12)     O Yannis den idhe KANENAN.

*the John not saw NPI*

"John didn't see ANYbody *at all.*" / "John saw nobody at all."

(13)     O Yannis den idhe kanenan.

*the John not saw NPI*

"John didn't see anybody."

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In (12), the "emphatic" is translated as "ANYbody *at all"* where the *at-all* addition triggers the intensification of the statement. In Greek, the intensification is triggered by the emphatic intonation on the NPI (KANENAS). On the other hand, in (13) the non-emphatic NPI does not convey this extra rhetorical force and it corresponds to "anybody", which is non-scalar.

One initial and quite robust lexical difference between the two Greek NPI variants is reflected in their distribution: the emphatics exhibit narrow distribution licensed only under negation whereas the "non-emphatics" exhibit broad distribution. Despite their label as "negative" due to previous approaches that focused on NPI licensing mainly under negation (Klima (1964), Baker (1970), Linebarger (1980; 1987), following Giannakidou's observation it was established that the so called NPIs are also attested in non-negative environments.

(14)   You may take any cookie.                    (modal)

(15)   Did you eat anything?                        (question)

(16)   I am surprised he saw any French movies      (emotive factive)

(17)   Close any door!                              (imperative)

In (14) *any* is licensed under a modal, (15) is an interrogative, in (16) it is the emotive factive verb that licenses the NPI and (17) is an imperative. Approaches that based the licensing of the NPIs on Downward Entailingness (Ladusaw, 1979) did not capture the fact that the NPIs are licit in the above environments. Baker's and Linebarger's last resort, that the NPIs in non-negative environments are licensed by negative implicatures, did not provide a sufficient solution. As Giannakidou (1998) points "many affective environments cannot be characterized as negative, many others do not give rise to a negative implicature, and finally some environments may give rise to a negative implicature but will not sanction PIs".

In Greek as well we see NPI occurrences in non-negative environments, but crucially, it is only the non-emphatics that are licit in these contexts:

(18)    Pare kanena/*KANENA vivlio.                                (imperative)

take NPI-neuter/NPI-neuter book

"Take some book or other." / *"Take any book whatsoever/at all."

(19)    Prepi na agorasume kanena/*KANENA vivlio                    (modal)

must subjunctive buy NPI-neuter/NPI-neuter book.

"We have to buy book some book or other." / *"We have to buy any book at all."

(20)    Synithos perno kanena*KANENA kafe to mesimeri    (habitual)

usually buy.1 NPI-neut/NPI-neut coffee at noon.

"Usually I take a coffee at noon." / *"Usually I take any coffee at all."

One can see that in these examples the non-emphatic is non-scalar. In all cases, the NPI with the noun it combines with makes a vague anti-specific statement e.g. the command or request expressed with the imperative does not concern any specific book. Obviously the sentence refers to a set of books but it does not pick up a specific member of the set. In other words and as Giannakidou and Yoon (2016) put it, this is an expression of *referentially vagueness*. Additionally, the bizarre interpretations with *at all*, corroborate the non-scalar nature of the non-emphatic in these environments. It would be hard to argue that at any point a notion of scale is triggered in any of the above examples. When someone utters the habitual, she doesn't point to the minimal point of a scale of coffees (e.g. one coffee) and denies all higher values (two coffees, three coffees).

## 2.1    Syntactic differences

Apart from their distributional differences, the two NPI paradigms exhibit systematically different syntactic behavior. Below I describe three instances where the two NPIs differ in syntactic terms (based on Giannakidou, 1998, 2000). The description is mostly a

presentation of the main arguments and no further description of the analysis is provided as this is not the main focus of the present dissertation.

*(i) Locality*

An important difference concerns locality: the non-emphatic can be licensed long-distance in complement clauses by negation in the matrix clause. This is not however the case for the emphatic as sentence (21) shows:

(21)    I Maria den ipe oti idhe kanenan/*KANENAN.

        *the Mary said that not saw anybody/*nobody*

        "Mary said she didn't see anyone."

In fact, the non-emphatic can be licensed even deeper in the structure as long as it is c-commanded by its licenser.

(22)    Den pistevo oti i Maria eipe oti den eide kanenan/*KANENAN.

        *neg believe.1 that the Mary said.3 that neg  saw.3 NPI-person/NPI-person*

        "I don't believe that Mary said that she didn't see anyone."

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The emphatic on the other hand does not exhibit this freedom as it needs to be clause bounded by its licenser.

(ii) *Licensing in Islands*

Licensing in islands is another instance where the two NPI variants differ syntactically. More specifically, the non-emphatic, but not the emphatic can be licensed in a syntactic island when the matrix clause contains negation. As the example below shows, the non-emphatic is licit in a relative clause while the emphatic is ungrammatical in this position:

(23)    Den egrapsa stihus pu stohevan kanenan/*KANENAN.

    *not wrote.1 verses that targeted.3 NPI.person/NPI.person*

    "I didn't write verses that targeted anyone."

(iii) *Fragment answers*

Finally, the emphatic, but not the non-emphatic is licit in fragment answers like (124):

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(24)    -What did you eat?

TIPOTA/*tipota.

"Nothing / *Anything."

The difference is illustrated also in English as well where, as mentioned in the beginning, the difference between the emphatic and the non-emphatic is lexical:

(24')    "Nothing/*Anything."

Giannakidou (2000) suggests that the NPIs in these cases are remnants of an elliptical structure and suggests that these structures are normally accented and therefore the presence of a non-emphatic item is not felicitous.

In light of the distributional and syntactic differences, it should be evident that in Greek the two NPI variants are distinct. In what follows, I will first start with a brief presentation of Giannakidou (*non)veridicality theory* about NPI licensing and then describe the way Giannakidou & Yoon (2016) approach this phenomenon and the special role that prosody plays in their framework. This will serve as the theoretical basis for the experiments presented in the next sections.

## 2.2    NPIs and focus

In light of these assumptions, it should be stressed that prosodic prominence on the NPIs should not be considered as an instance of *focus* in an Information Structure perspective. Focus is typically associated with conveying *new information* in the discourse but as many have showed (Jackendoff 1972; Buring, 1997; Baltazani, 2002; Chatzikonstantinou et al, 2012) it can also be associated with with quantifier scope. What should be stressed at this point is that prosodic prominence on the NPI serves a different function, namely triggering *scalarity*, than simply setting a lexical item in an exceptional informational position with respect to the rest of the sentence. This is an important point to stress because a focused item and an emphatic NPI, regardless their similarity in acoustic terms, behave differently in several instances (Giannakidou, 1998). Below I present some of these differences:

1) In Greek multiple foci are unavailable. This means that sentences like (18) are not felicitous:

(25)    *O Yiorgos dhen MILISE stin Maria gia to VIVLIO

   *the George neg talked.3 to Mary for the book*

   "George didn't talk to Mary for the book."

In (25) the reason of the infelicity are the two foci, the verb and the PP. The unavailability of multiple foci can be observed in several word orders or number of foci:

(26)    * O YIORGOS dhen ipe MISTIKA se MENA.

   *the George neg told.3 secrets to me*

   "George didn't tell secrets to me."

or under a different word order:

(27)    *Se MENA o Yiorgos dhen ipe MISTIKA.

   *to me the George neg told.3 secrets*

   "It was to me that George didn't tell any secrets."

and number of foci:

(28)    *Se MENA o YIORGOS dhen ipe MISTIKA.

   *to me the George neg told.3 secrets*

"It was to me that George didn't tell any secrets."

However, it seems that this is not the case for the emphatic NPIs. Sentences with multiple emphatic NPIs are grammatical in Greek as (29) shows:

(29)    KANENAS dhen idhe TIPOTA.

      *nobody     neg   saw.3   npi*

      "Nobody didn't see anything at all."

or even (30) with 3 emphatic NPIs is grammatical:

(30)    KANENAS dhen ipe TIPOTA se KANENAN.

      *nobody     neg said.3 npi     to   npi*

      "Nobody didn't say anything to anyone."

Another point of difference between words in focus and emphatic NPIs is that the former are grammatical in syntactic islands whereas the latter are not. This is illustrated below:

(31)     Oi yatri anakinosan oti to KAINOURIO hapi esose ton astheni.

*the doctors announced.3 that the new pill saved.3 the patient.*

"The doctors announced that it was the new pill that saved the patient."


(32)     Oi yatri ediksan to hapi pou esose ton NEARO astheni.

*the doctors showed.3 the pill that saved.3 the young patient.*

"The doctors showed the pill that saved the young patient."


Emphatics however are not licensed by negation in the matrix clause (Giannakidou 1998, 2000):


(33)     *Oi yatri den anakinosan oti KANENA hapi esose ton astheni

*the doctors neg announced.3 that NPI pill saved.3 the patient*

"The doctors didn't announce that no pill saved the patient."


(34)     *Oi yatri den ediksan to hapi pou esose KANENAN astheni.

*the doctors neg showed.3 the pill that saved.3 NPI patient*

"The doctors didn't show the pill that saved any patient."

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Of course NPIs are licensed when the negation is in the syntactic island.

A third difference between a focalized preposed item and an NPI is that the latter can be optionally be co-indexed with a clitic but not the former:

(35)    TO MATHIMA$_i$ *to pira t$_i$.

        *the course it took.1*

        "It was the course that I took."

whereas

(36)    KANENA MATHIMA den to pira.

        *NPI course neg it took.1*

        "I didn't take any course at all."

Giannakidou (1998, p.229) writes that "allowing for clitics, emphatics align with topics" and suggests that these NPI occurrences are closer to topicalization than focus constructions.

To sum up, the different properties between focus and emphatic NPIs were described in terms of licensing in an island, clitic co-indexation and multiple foci availability. It was shown that due to these differences, NPI emphasis should not be considered as a subset of focus. This is a critical distinction and will serve as a basis for my experimental hypotheses in the next sections.

## 2.3    Licensing of the Negative Polarity Items

Giannakidou (1998 et seq) extended the traditional "negative" and "downward entailing" theories of NPI licensing and proposed that "non-veridicality is the regulating factor" (Giannakidou, 1998, p.100) in NPI licensing. *Veridicality* as a notion is a semantic property generated and emitted in the context by a "source" that triggers the specific property. The extension of the previous framework relies on the fact that the previously claimed NPI licensers are a subset of (non)verdicicality (Zwarts-Giannakidou hypothesis):
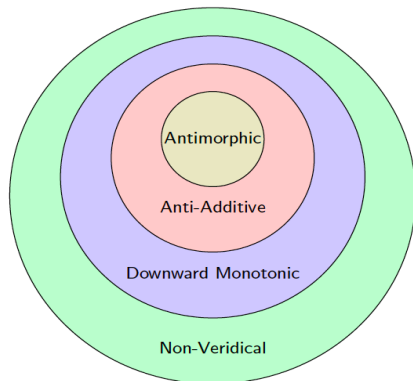


The diagram shows that the properties (of the Operators) considered by previous frameworks (Ladusaw, 1979) to license NPI are a subsets of the properties of (non)veridicality.

Figure 2.1 Properties of Operators

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*(Non)veridicality* is tightly related to the nature of the inference that an *Op(erator)* allows when it interacts with a proposition *p*. Being more specific, Giannakidou describes three types of operators with respect to (non)veridicality:

(37)    An *Op* is *veridical* in case *Op p* → *p* is logically valid. Otherwise *Op* is *nonveridical*

(38)    A *non-veridical* operator is anti-veridical iff *Op p* → ¬*p* is logically valid

An *Op* is considered as veridical if from the truth of *Op p*, the truth of *p* is entailed. In other words, if the truth value of *p* can be safely inferred from the truth value of *Op p* then the operator is veridical. For example, an expression that refers to the Past can be a prototypical veridical operator.

(39)    Harry came *last week* → Harry came.

The expression *last week* by anchoring the event *X comes* to the past allows for a fully controlled knowledge of whether the event actually took place (and therefore the

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proposition that describes the event is True) or not (and subsequently the proposition that describes the event is False). In virtue of this property, expressions of this class are described as *veridical*.

On the other hand, in the case of the non-veridical operators, the truth of *p* is not necessarily entailed by the truth of *Op p*. This implies that even if i.e. *Op p* is true, *p* is not necessarily true. Expressions referring to the future are an example of non-veridical operators and the example below an illustration of a non-veridical environment:

(40)   Harry will come tomorrow $\nrightarrow$ Harry will come.

The future expression *tomorrow* anchors the event *X comes* to the future and this does now allow fully controlled knowledge of whether the event will take place or not. Harry may come but there is also the possibility that he might not come and since the reference is to a situation in the future, it is not humanly possible to know what will actually happen. And this is the essence of *non-veridicality*, the fact that by uttering *Op p*, it cannot be safely inferred which of the two outcomes (Harry comes *vs* Harry does not come) is true.

The last relative notion is that of *anti-veridicality*, the case where from *Op p* the falsity of *p* is entailed. The prototypical anti-veridical operator in English and in other languages is negation and negative expressions like *without*. This means that, upon uttering the sentence below:

(41)   Tim doesn't wear a jacket.

the falsity of the proposition *Tim wears a jacket* is entailed and thus the *not p* (it is not the case that Tim wears a jacket) is safely inferred. Antiveridicality is equivalent to classical negation (including anti-additivity and anti-morphicity; Giannakidou 1998, Giannakidou and Yoon 2016).

The Giannakidou-Zwarts approach offers a uniform suggestion regarding the licensing of the NPIs since both negative and non-negative environments, where the NPIs are attested, are captured in terms of non-veridicality. At the same time, unlike earlier approaches, it allows for non-negative licensers (thus unifying the negative and non-negative NPI environments, while at the same time allowing a difference in strength between negative licensers (classical vs. minimal negation). Zwarts (1995) proves that all DE environments are also non-veridical. In her early work, Giannakidou (1998, 2000) describes the emphatic NPIs as universal quantifiers taking scope above negation via movement in the LF. On the other hand, she describes the non-emphatic as existential quantifier taking narrow scope under negation. Her observation was that the emphatics' pattern systematically with the universal quantifiers in certain aspects whereas the non-emphatics tend to pattern with the existentials.

## 2.4    Emphatics as Scalars

Giannakidou 1998, 2011, and Giannakidou & Yoon 2016, expanding on the theory described so far, suggest a distinction between scalar and non-scalar NPIs. This distinction challenges the common assumption (e.g. as revealed recently by Chierchia 2006, 2013) that all NPIs are scalar and exhaustive.   Chierchia says that "a scalar NPI triggers informational ordering and exhaustification, thus producing an *intensified* negation" (p.7). In Greek, Giannakidou and Yoon argue, the intensified negation is reflected in the intonation of the NPI.

As seen before, In English the intensification effect is clearly illustrated by the addition of *at all*. *At all* creates a scalar statement and can be felicitously combined with an *intensified* "any":

(42)    I DIDN'T see anybody #at all.

(43)    I didn't see ANYBODY at all.

Sentence (43) compared to sentence (42) makes a 'stronger', exhaustified statement with respect to the individuals-not-seen. The felicity only of the stressed *ANYBODY* in these examples suggests that there is a link between some type of special intonation and intensification. As we saw in (5), the same phenomenon is attested in Greek.

The functional role of *stress* on the NPIs has also been underlined by Krifka (1995). In his analysis of the English *any* Krifka identifies a difference between a *stressed* and an *unstressed* "any" and associates the first with the *weak* NPIs and the latter with the *strong* NPIs. He makes the distinction between the two in terms of interpretation by using *at all* only with the "stressed any" and highlights its function as an indicator of a low-end point of a scale. Along the same lines, Haspelmath (1997) underlines the role of *stress* on the NPIs. He claims that in the case of the utterances containing a stressed *any* "a scale of alternative values is present of which the chosen value is the end-point" whereas in those that contain an unstressed *any* "no such scale is present" (p.125). These approaches are on a different direction to Chierchia's (2006, 2013) suggestion that all NPIs are scalar. As we will see, Greek provides more evidence that this position is not correct.

Considering Greek, the "emphatic" NPI *kanenas* seems to serve a similar function with Krifka's stressed *any*. If we imagine a context where at University X there is a rule saying that first year students should pass at least one course per quarter, then the emphatic *KANENA* in (37) points to the minimum value on a scale of number-of-courses-passed.

(44)    Den perase KANENA mathima.

        *neg passed.3 npi course*

        "She didn't pass any course *at all*."

(45)     Den perase kanena mathima.

         *neg passed npi course*

         "She didn't pass any course."

In (44), by stating that she did not pass not even the required one course, it is implied that she did not pass two or three or any courses at all. In other words, we see that the emphatic NPI triggers some kind of scalar reasoning by negating any higher values. On the other hand, nothing like that is evoked in (45) with the non-emphatic which lacks any special intonation. The phrase *kanena mathima* refers vaguely to *a course* perhaps *any course*, leaving underspecified what kind of a course it is. Describing the semantic load of the non-emphatics Giannakidou & Yoon suggest that these items are an expression of referential *vagueness*, meaning that the speaker is actually ignorant or uncertain about the value of the variable that the non-emphatic is bound to.

Finally, to the category of "emphatic" NPIs with scalar properties, Giannakidou (1998) adds also the Greek minimizers. Her claim was that these phrasal NPIs are emphatic NPIs and are attested in the same environments with *KANENAS*.

(46)     Den yparhi psyhi.

         *neg exist.3 soul*

         "There's nobody there."

The utterance in (46) may be paraphrased as "There is not even one soul" where the scalar reasoning is evoked in the sense that since there is not even "one" soul then there are no "two" or "three" or "four" or "any souls at all". Interestingly, the word *psyhi* bears emphatic accentuation and from a bare nominal it becomes an emphatic NPI.

As the theoretical approach by Giannakidou and Yoon as well as the present experimental design relies heavily on specific prosodic concepts (e.g. prosodic prominence) it is important to present briefly some of the key points that have been reported in the literature about the Greek phonetics and prosody.

To sum up, we see that in Greek there are two NPI variants with different distribution and syntactic/semantic differences (Giannakidou 1998 et seq). The emphatic variant exhibits a narrow distribution and is scalar and exhaustive; on the other hand, the non-emphatic has a wider distribution and is non-scalar and non-exhaustive (Giannakidou and Yoon, 2016). As we mentioned earlier, this difference is also observed in English (Krifka, 1995) and is also reflected in prosody which suggests that the experimental exploration that follows in the next chapters may explain similar phenomena in other languages as well. Regarding the distribution of the two NPI variants based on Giannakidou (1998) it was showed that the non-emphatics are licit in a wide range of non-veridical contexts but our interest in the present dissertation is mainly on the negative contexts (explicit or implicit). Finally, and since prosodic prominence plays a significant part in our investigation, based on Giannakidou (1998) it was illustrated why an NPI in focus and an emphatic NPI constitute different entities.

# Chapter 3: INTONATION AND MEANING

The exploration of the interaction between prosody and scalarity or prosody and scope builds on previous literature on meaning and intonation. Starting from Bolinger (1958), who offered a systematic study of the English Accents and their relation to their communicative load, a considerable amount of research effort has produced different interpretations in the field. In the following section we present two lines of research that defined the field and helped to establish a systematic research of the intonation effect on the semantics/pragmatics. Bolinger (1958), Gussenhoven (1983) and Pierrehumbert & Hirschberg (1990) treated the accents or the tones, or sequences of tones called tunes, as communicative intentions within a conversational context. Jackendoff (1972) and Rooth (1985, 1992) approached the intonational meaning and focus marking on the semantic level whereas Buring (1997) looked at the impact of pitch on quantifier scope. Lastly, Ward and Hirschberg (1985) and C. Lee (2000, 2010) promoted a pragmatic component in their interpretations of the contours dealing with intensively with scalar meanings. These last two approaches are more directly related to our question, Ward and Hirschberg can be grouped under the communicative intention camp whereas Lee is more of a purely pragmatic proposal. These studies may provide the diachronic context within which our question arose. In the next section, we briefly present first the two lines of research (communicative and semantic) and then the proposals on meaning and scalarity. The chapter is concluded with a brief presentation of the Greek intonation.

## 3.1    Bolinger (1958)

D. Bolinger in his "Theory of Pitch Accent in English" (1958) is one of the first systematic investigations of the relation between meaning and intonation. His famous Accents A, B and C for several decades were the mainstream tool of segmenting the intonational material before Pierrehumbert's Autosegmental Theory in the 80s and have been exploited by researchers on several phenomena including e.g. scope resolution in English (Jackendoff, 1972).

Bolinger focused on the role of pitch as the most important acoustic cue in intonation. He suggested that there are identifiable pitch patterns in the pitch contours that can function in a similar way as vowels and consonants in segmental phonology. Since however it is hard to identify a starting or an ending point in the pitch continuum; his view[1] is that someone needs to observe the sequences of the pitch movements and define contrastively the "pitch phonemes" with respect to one another. In an early association between meaning and intonation, for the "pitch phonemes" Bolinger uses the term "intonation morph" stating that morph A may differ from morph B in the same sense that "*tower* differs from *bower*". Using such minimal pairs, his intention was to communicate the idea that pitch patterns are identifiable and contrastive and in the same time meaningful

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[1] based on a line of research like Harris (1944), Pike (1945), Trager & Smith (1951)

and productive. Based on the assumption that accents are meaningful units, he describes them as morphemes.

He argues that there are three basic accents in English, which we will describe using single tones in terms of Pierrehumbert (1980). Bolinger uses a different terminology to describe the pitch movements that is a bit sequential e.g. a L* H- (H%) would be described as "approached from above and skipped down to followed by a rise". In this framework there are three Accents:

Accent A : it would correspond to an H* L- (L%) or H* L- (H%)

e.g.    The sky is blue.

    L   H*     H*L-L%


Accent B: which could be described as a H H- H%

e.g.    Were they better?

        H     H* H%


Accent C:  L* H- H%

e.g.    Do you think I am crazy  ?

             L* H H%

Bolinger proceeds in such a classification based on the meaning of each Accent, in his own words "the procedure that I have followed in grouping the accents about certain norms has been first to look for similarities and differences in the meaning, […]" (Bolinger, 1958, p.145). More specifically:

**Accent A** is described as "assertive": It's not entirely clear what Bolinger means by that but he probably wants to convey the intuition that the speaker's assertion is conveyed with a certain degree of confidence about its truth, or that she is committed to the truth of the proposition. Or perhaps the L% could correspond to the "finality" mentioned in Gussenhoven (1983) relevant to Bolinger's falling tone.

Regarding **Accent B** Bolinger claims that it conveys "something like connectedness and incompleteness". To understand better what he means with these abstract terms and in order to see the line of research to more recent approaches, it would be useful to look at Bolinger's examples. He describes the sentence below realized with a B accent from the beginning till "better":

(47)    <u>Were they better</u> they'd be more acceptable

        H        H* H-

as "incomplete" and "connected". This is a case of an intermediate phrase ending with a rising tone at "better". Pierrehumbert and Hirschberg (P&H) would probably say that what is contained in the intermediate phrase forms a larger "interpretive unit" with what follows. This can be paraphrased as "what is contained in the phrase is incomplete and in order to properly interpret we need to somehow connect it with what follows". P&H also give an implicit conditional example (p. 304) similar to Bolinger's above.

**Accent C** is described as "anti-assertive" and an expression of lack of determination. From this we can infer that Bolinger refers to those cases where the speaker does not really commit himself to the truth of the utterance or as Truckenbrodt puts it "the speaker distances himself from the content of the utterance". A declarative question would be a good example, e.g.:

(41)   ANNA may know your names                                  (from Truckenbrodt, 2012)

    L\*           H       H%

This cannot be taken as a request of information as a polar question would be. Someone could say that the speaker actually puts the content of the utterance in question (a role performed by Truckenbrodt's H%).

What we can also note regarding all Accents is Bolinger's approach to interpret the intonation meaning of the different Accents as an expression of the speaker's attitude towards the communicative intention of her utterance. This gives a primarily pragmatic perspective on the interaction between meaning and intonation which will be evident in Gussenhoven's approach next.

## 3.2    Gussenhoven (1983)

Gussenhoven builds his account on Bolinger's three-way accent distinction and the investigation of speaker's attitude in the interpretation of the intonation meaning are at the forefront of his proposal.  He goes further and sets the frame for his approach on the notions of *background* and *contribution*: the former refers to what is assumed as *common knowledge* between the speaker and the listener and the latter to *new input* from the speaker. Importantly, according to Gussenhoven, the intonation of the *contribution* is the result of the speaker's assumption about the status of her contribution relative to the background. These assumptions can be summed up in three categories (or "manipulations" in Gussehnoven's terminology). The word "contribution" is replaced by "variable" – this doesn't refer to a variable which will be later be instantiated in a semantic-like way; this is mostly a reference to a segment of knowledge:

1. The speaker may add the Variable (or "contribution") to the background **(ADDITION).**

2. The speaker may select a Variable from the background **(SELECTION)**

3. The speaker may choose not to commit himself as to whether the variable belongs to the background **(TESTING).**

These three *manipulations* are mapped to three basic tones (for English):

i) ADDITION → fall

ii) SELECTION → fall- rise

iii) TESTING → rise



This inventory seems to fall somewhere in between Bolinger's Accents and P&H single tones. It reminds of Bolinger in the sense of suggesting a three-way distinction and P&H in virtue of including single tones (ADDITION and TESTING) and a combination of two single tones (SELECTION).

Gussenhoven goes further and suggests that each of these manipulations, when realized, may be realized in the benefit of either the speaker (speaker-serving) or to the hearer (hearer-serving). "Benefit" in this case refers roughly to an update to the common background, which may have a "beneficial" effect, or in other words serve the communicative goal of either the speaker or the hearer. In both cases however, the source of the contribution remains the speaker. Below we give an example of how the various meanings are generated using Gussenhoven's mechanics in his examples:

(48)     - Of \COURSE, it's a \UNicorn.     (ADDITION, speaker-serving)

(49)      - /REAlly ? It's a \/UNicorn ! ?     (SELECTION, speaker-serving)

(50)    – It's a /UNicorn ?                (TESTING, speaker-serving)

In (48) the speaker adds his contribution to the background for his own benefit. Using different terminology, this looks like a statement with a L% boundary tone that conveys speaker's commitment to the truth of his assertion. This is perhaps not far from what Gussenhoven would describe as the "benefit" of the speaker in this case by adding (48) in the background. (49) shows how Gussenhoven derives questions: the speaker is not committed that "unicorn" is in the background and asks for the hearer for relevant information. The "benefit" of the speaker seems to be the possibility of resolving her question and updating the background. With (50), the speaker picks a variable that has already been in the background and under particular conversational circumstances this can be to her benefit.

In this brief illustration, we showed how the phrase "it's a unicorn" conveys different speaker attitudes towards updating the common ground under different prosodic realizations. Introducing the notions of common ground and its update with a contribution, Gussenhoven enriches Bolinger's account and gives a discourse flavor in his approach. The notion of common ground will be employed by P&H as the common belief and Gussenhoven's update will be related to the different effect that the pitch accents will be shown to have.

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Paraphrasing the manipulations (e.g. "I am certain that this is a unicorn" or "I am wondering whether this is a unicorn.") we can see in a speech-act like fashion that such interpretations take in account speaker's attitude towards her contribution. We can identify a certain degree of continuity in these interpretations e.g. Gussenhoven's ADDITION is potentially similar with Bolinger's Accent A: they both involve a falling tone at the end and they both express a notion of adding X in the conversation – or making an assertion and being committed to it. Another shared notion is that the communicative intentions are the source of the meaning interpretations. In Gussenhoven the dynamics of this relation are described in a more systematic way and also set against a common ground where assumptions about the interlocutors knowledge status are possible, and thus the explanation of speaker's attitudes towards the contributions relatively predictable.

## 3.3    Pierrehumbert and Hirschberg (1990)

Pierrehumbert & Hirschberg (1990) offer an account with roots in Bolinger's communicative intention and Gussenhoven's common ground but they describe all relevant notions under a different representational system. Their system is based on Pierrehumbert's (1980) single tones or combinations of single tones e.g. H(igh), L(ow), H+L, L+H instead of whole contours. Furthermore, it is compositional: it consists of *pitch accents, phrase accents*, and *boundary tones,* with each component making its own contribution to the interpretation of a contour. To put it schematically, the meaning of an utterance will be an accumulation (not the sum) of contributions:

boundary tone


phrase accent $_i$        phrase accent$_j$ phrase accent$_w$


pitch accent$_i$    pitch accent$_j$    pitch accent$_w$   pitch accent$_y$    pitch accent$_k$    pitch accent$_v$


This means that, if phrase accent$_j$ conveys X, this is not the result of the combination of e.g. pitch accent$_w$ and pitch accent$_y$ . Each of the components makes its own contribution first in relation to its own domain (e.g. pitch accents operate initially in interaction with the other pitch accents) and the multiple contributions constitute the interpretation of an utterance tune. Regarding the general purpose of the accents and tones and what type of information they potentially convey, P&H define them as such:


**Pitch accents** are associated with individual discourse units e.g. discourse referents, predicates and indicate speaker's belief about the saliency of the referent relative to its information status.

**Phrase accents**, which are attested at the end of intermediate phrases, convey information about the relation between preceding and following intermediate phrases. To put it in Bolinger's terms, "how the two phrases are connected".

**Boundary tones** do what the phrase accents do but on the level of whole intonational phrases.

The contributions of the accents and the tones take effect on a conversational universe of *mutual beliefs* between the speaker and the hearer (a concept close to Gussenhoven's *common ground* I believe) and the type of the tones shape the meaning of the contribution (within what is predicted by their general role described above). The goal of the speaker is with her contribution to modify what the speaker believes to be mutually believed (by the hearer and the speaker). More specifically, when a pitch accent is realized as an H, in P&H this would be interpreted as speaker's intention to add something "new" in the conversational space:

(51)     John ate the cake.

         H*   L        L-L%

as an answer to the question "Who ate the cake?" would be felicitous because "new" information in the discourse is "John" and it is marked with an H tone. An H tone on a phrase accent (labeled as H-) on the other hand conveys different information: it signals that the intermediate phrase forms an interpretational unit with the intermediate phrase that follows. For example, in conjuncts "and" may be ambiguous between a temporal and a causal interpretation like below (from P&H, p. 304).

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(452)    George ate chicken soup and got sick

and assuming two different contours with the only difference being the phrase accent:

(53)    H*    H*    H*    **H-**    H* H* L-L%

(45)    H*    H*    H*    **L-**    H* H* L-L%

we get different meanings: in the first case there is a causal relationship between the two phrases (→ George got sick because he ate chicken soup) whereas in the second there is a temporal one. We can think the causal relation as one where the dependency between the two conjuncts is more pronounced compared to the temporal interpretation. This reminds Bolinger's Accent B he claimed to convey "connectedness" – which was however a fall-rise and either phrase accent or a boundary tone.

With such tools P&H describe a great variety of phenomena where meaning is directly affected by intonation. Their system of 1) single tones and their combination with 2) their operation on their own domain allows the emergence of enriched contour meanings. Interestingly in relation to our exploration, they suggest that the L*+H evokes a salient scale. This is what had been previously supported by Ward and Hirchberg (1985) for their falling-rising contour. Considering that the present dissertation explores the emergence of scalar meanings triggered by intonation, this may be a cue pointing to a specific direction.

## 3.4    Jackendoff (1972)

The effect of intonation on purely semantic phenomena has been addressed by Jackendoff (1972) and later more systematically by Buring (1997, 1997a for German) testing semantically ambiguous statements that contained negation and quantifiers. Jackendoff's analysis of intonation is part of his wider semantic interpretation in terms of generative grammar and he by no means provides a systematic approach on the relation between meaning and intonation in the way Bolinger or Gussenhoven do. His approach is also different as he departs from the speaker attitude perspective in the interpretation of the tunes and suggests an explanation via the semantic representation.

He suggests a partition of the semantic representation in *focus* and *presupposition*: he coins *focus* the information not shared by the speaker and the hearer and *presupposition* the information that is shared between the two. Via a *focus assignment* rule this partition is also reflected on the syntactic structure, but this is not of importance for our discussion and we are not going into further details. He uses Bolinger's A (considered as a "fall" by Jackendoff) and B (considered as fall-rise) accents and the relevant part of his suggestion concerns negative sentences like (56) which can have the two readings in (56') and (56"):

(56)      Karl doesn't write radical pamphlets in the BATHROOM.

(56')    It is not in the bathroom that Karl writes radical pamphlets.

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(56") It is in the bathroom that Karl does not write radical pamphlets.

The difference between the two readings is the scope of the negation. Jackendoff argues that (56') is generated when (56) is realized with an A accent and (56") when it is realized with a B accent. His explanation is that in the first case negation will be included in the presupposition:

Presupposition

$\lambda x$ [ Karl does not write radical pamphlets at $x$] [ in the bathroom ]

Assertion:

in the bathroom [ Karl does not write radical pamphlets at]

whereas in the case of (56"), the B accent does not put negation in the presupposition and we get the wide scope reading:

Presupposition:

$\lambda x$[Karl writes radical pamphlets at $x$] [ in the bathroom ]

Assertion:

not [ in the bathroom ] [ Karl writes radical pamphlets]

His explanation of negative sentences that contain a quantifier like (57) is in the same track:

(57)    ALL the men didn't go.

When ALL is realized with a B accent negation is not in the presupposition and it scopes over the quantifier:

(57')    it is not the case that all the men went.

with an A accent, the quantifier takes scope over negation.

(57")   None of the men went.

There was significant criticism of Jackendoff's approach by Gussenhoven who claimed that several of Jackendoff's examples were context-free and could receive different interpretations in different contexts. This kind of critic however is originated in the

pragmatics and looking back to Gussenhoven's framework there is a pragmatic layer in his approach. This is reflected on his perspective of analyzing the meaning of prosody through the attitude of the speaker; similar notions have been employed in pragmatically oriented theories e.g. *speaker's intention* in Speech Act theory. Jackendoff's approach in my view was meant to be primarily semantic with not much attention on the context and he tried to provide a structured analysis of meaning within the generative grammar. The "context-free" critic is a fair one and can probably be applied on a vast majority of semantic studies, but this distinction draws the line between semantics and pragmatics: roughly speaking, the pragmatics deal with what the semantics do but within conversational contexts. Therefore, Gussenhoven is not wrong, but perhaps does not make full justice assuming Jackendoff's semantics motivation.

Rooth's (1985, 1992) *alternative semantics* is a purely semantic approach on focus marking only. Rooth does not provide an analysis of the meaning of the various intonation contours but an account about the semantic role of focus assignment. Some ideas are shared with Jackendoff since both frameworks operate on the semantic level, for example the concept that focus can be interpreted in association with a set of presuppositions relevant to the assertion. In Rooth's account, a sentence like (58) has the ordinary semantic value and the focus semantic value. The former concept refers to the proposition and the second refers to a set of propositions derivable from the ordinary semantic meaning by substituting the focused element:

(58)    Mary$_F$ read a book.

Ordinary semantic value: {read(m, b)}

which presupposes that *someone read a book.*

Focus semantic value: {read(x , b) | x ∈ E } where E is the domain of individuals.

The set of propositions contain syntactic and semantic alternatives to *m*, e.g. [Christina read a book], [Tom read a book], [Janet read a book]

Rooth states that one of the focus-related effects can be a scalar implicature e.g.

(59)    Well, I$_F$ passed.

implies that "I", and probably not Ben, Bill or Oliver passed. Whereas:

(60)    Well, I PASSED$_F$.

seems to deny the stronger alternative "I aced it" by Quantity Implicature: if the speaker had not only passed but aced she would have stated so. Rooth however does not discuss at all the phonetic properties of the contour that triggers such scalar meanings and points to P&H for this purpose.

## 3.5    Buring (1997)

Buring in his "Scope Inversion Conspiracy" (1997) builds on Rooth's (1985) Focus-based alternatives approach and presents a (formal) pragmatic extension in his framework, in particular about the function of Topic intonation. Buring analyzed sentences similar to Jackendoff's but in German:

(61)    Alle Politiker sind nicht corrupt.

(62)    /ALLE [2] Politiker sind NIGHT\ corrupt

        = all politicians are not corrupt

---

[2] "/" denotes a rise and a "\" a fall.

He suggests that in the above examples (61) with a neutral intonation is ambiguous between neg $> \forall$ and a $\forall>$ neg meaning whereas (62) conveys only a $\forall>$ neg meaning. Buring identifies the Topic intonation as the source of the semantic disambiguation stating that it is this special intonation on the Topic "which leads to certain implicatures which differ for both LFs". His account is based on the assumption that within a specific Context (or Common Ground) some implicatures are "reasonable" (or "disputable" in Buring's terminology) in the sense that they are informative with respect to the (updated) Context. For example, in the following Question - Answer sequence, the raising intonation on the Topic poses implicitly the question in (63) which Buring calls Residual Topic:

(563)   - Where are the unicorns?

        - SOME unicorns are [in the GARden]$_F$

Residual Topic:  Where are the other unicorns?

The *Residual Topic* in this case is the result of the non-exhaustive Answer and what is left open is information about the whereabouts of the unicorns. The emergence of the *Residual Topic* in this case is triggered by the *topic intonation* and is "reasonable" in the sense that it poses a question about information that is not part of the common ground. The topic intonation on SOME triggers a set of implicatures (which is in fact a set of combinations

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of alternatives to the Topic and Focus in an utterance) one of which is "the unicorns are" may serve as a "reasonable" -in the sense of adding new information to the question posed by the *Residual Topic* -answer and therefore the whole reasoning seems felicitous.

## 3.6    Ward and Hirschberg (1985)

Ward and Hirtschberg proposal focuses on the falling-rising contour and they provide a pragmatic interpretation for its meaning in the discourse. Their approach builds on Bolinger's approach under which the meaning of an intonational contour is interpreted via speaker's attitude. In Ward & Hirtschberg, this meaning is in the same sense non-semantic and conveys speaker's intention to "an understanding, which a hearer can be expected to derive" (p.774). The claim to hearer's expectations is a first cue to the Gricean roots of their suggestion and what establishes the pragmatic dynamic is the interpretation of the meaning as conventionalized implicature. Using this assumption Ward and Hirtschberg will talk about prosody's role to trigger a *scale* of discourse referents and how this can be interpreted via speaker's intentions.

More specifically, the main point in this account is that the most appropriate prosodic realization of PARTIAL ORDERING relations is the falling-rising contour. By this in fact the authors refer to the notion of a scale where discourse referents may be arranged under different rankings and the intention of the speaker can be inferred with the aid of prosody, e.g.

(64)    A:  How do I get back to Manhattan from Roosevelt Island?

        B: You can take the \tram/way.                          (W&H, p.758)

The claim in this example is that based on the falling-rising contour, A will infer that B is aware of other possible transportation means from Roosevelt Island to Manhattan and among them B suggests the "tramway". The *other possible transportation means* corresponds to the notion of a scale of "transportation means" where "tramway" has been qualified as the most salient value by B. W&H argue that this understanding that involves scalar reasoning is triggered via the falling-rising contour and wouldn't be evoked in the case of e.g. a falling contour.

The second important component that links this account to the pragmatics is that when the speaker evokes a scale via the falling-rising contour, there are different types of *uncertainty* that characterize about speaker's use of the scale:

a) Type I: uncertainty about whether it is appropriate to evoke scale S at all.

b) Type II: uncertainty about which scale to choose.

c) Type III: uncertainty about which value on S to use.

For example, in the exchange below from W&H (p.765):

(65)    A: So you speak Sephardic?

B: Huh?

A: Do you speak Ladino?

B: I speak \Spa/nish.

In this case according to the authors, B is uncertain whether his contribution is supposed to provide information in relation to other Iberian languages or a more appropriate contribution in this context would concern only the knowledge or not of Ladino regardless knowledge of other Iberian languages. In other words, speaker's (Type I) uncertainty in this case is derived from not being certain whether evoking a scale in this context is felicitous. The different Types of uncertainty are taken as expressions of speaker's attitude relative to what is expected to be derived by the hearer in the case of a falling-rising contour. W&H argue that this understanding of the falling-rising contour constitutes its MEANING. They go further and propose that the emergence of this understanding is the result of a *conventional implicature*, we are not going into details about their explanation here however.

## 3.7    C. Lee (2006, 2010)

C. Lee (2006, 2010) focuses on the role of the Contrastive Topic (CT) intonation and advocates a deeply Gricean view with scalar meaning having a core role in his theory. He

is working on an extended notion of a "scale" where e.g. propositions can be taken as scalar terms and the informational ranking of the values on the scale depends highly on the context. This understanding, he argues, emerges via CT intonation, which in languages like English corresponds to the fall-rise Jackendoff's B accent (L+H*LH%). Assuming that Ward and Hirschberg (1985) focused on the falling-rising contour to explain the emergence of scalar meanings in their framework, we can start thinking that this may be a candidate tune to be associated with a scalar interpretation of the Greek NPIs.

Lee states that when CT intonation is associated with a scalar term $p$, then "but not $q$" (where $p$ and $q$ are on the same scale) is derived as an implicature via the Maxims of Quantity and Quality. This means that when a quantifier like *some* is uttered with CT intonation, then the *but not all* implicature will be triggered. To this Lee adds that one thing which shows that CT is associated with negating higher alternatives is that it is that ALL$_{CT}$ is illicit: "all" is the strongest term on the quantifier scale and subsequently there is nothing stronger to negate, therefore, CT intonation would be redundant or inappropriate.

(66)     *ALL$_{CT}$ children like ice cream.

Lee insists on the emergence of the *concessive "but"* (Horn, 1989) and claims that these implicatures are not conjunctions ("*and" not p*). Therefore, in (67):

(67)     I ate SOME$_F$ fruits.

it can be inferred that

(68)     I ate some, but not all fruits.

If this doesn't sound like a new idea, we should think of Lee's approach in these cases as if CT is considered the most "appropriate" intonation when the intention is for the stronger alternative to be negated. Therefore, for these traditionally scalar terms –traditionally in the sense that their scalar meaning is not so often context-dependent – the implicature is in fact triggered, not generated by CT intonation. This of course assumes that implicatures are not always generated but this is a different big debate.

A more interesting feature in Lee's proposal however concerns non-traditional scalar terms like verbs. For example, we can think of a scale of "contact X" where the terms may express different degrees of "contact" with someone, e.g.:

<touch, hold, squeeze>

the left-most term expresses the smallest degree of contact and the right-most the strongest one. This is not a scale where a quantity implicature is readily available, in other words,

when we hear the word "hold", the meaning *but not squeeze* is not as prominent as the *but not all* is when we hear "some". Lee suggests that in these cases CT intonation may trigger the negation of the stronger alternative:

(69)    I HOLD$_{CT}$ her.

implies that *I did not squeeze her*. This meaning does not arise without the CT intonation. Leaving aside any contextual factors if this can be possible, this is a case where intonation in fact generates a quantity implicature and someone could say that its effect on the pragmatics becomes more obvious in these cases.

Concluding, the effect of intonation on meaning has been a matter of research for several decades and it has been shown that these two levels interact with each other in various ways. Our role in this dissertation is to ask how they interact in order to trigger a scalar interpretation of the Greek NPIs and what can find about quantifier scope looking at these items. Next we present the basic facts of the Greek intonation.

## 3.8    Greek Phonetics

### 3.8.1    Stress

Greek has been suggested to exhibit "dynamic stress" (Setatos, 1974; Joseph & Philippaki-Warburton, 1987) which suggests that the primary acoustic correlates of the stress in Greek is *amplitude* and *duration*. The position of the stress on the word is not predictable, it is lexically specified and occasionally it is regulated by morphological and phonological rules (Arvaniti, 2007) e.g. 1) there is only primary stress in Greek (i.e. αυτοκίνητο /afto'kinito/), in principle no secondary stress is observed in Greek apart from very specific paradigms that involve clitic attachment to a word *i.e.* το μάθημά μου (/to 'maθi'ma mu/ = my course) vs μάθημα (/'maθima/) or 2) all words are stressed in one of the last three syllables (a rule that is inherited from Ancient Greek) .

The stressed segment is associated with vowel lengthening –subsequently with syllable lengthening– as well as with higher amplitude (Arvaniti, 2007). As Arvaniti points, it is not a necessary condition that the two acoustic events always co-occur on a stressed syllable: often only one of the two is present but the simultaneous presence of both is frequent. Fundamental frequency has been reported not to be related to stress in Greek (Botinis, 1989, 1998), but it has been suggested to be a significant component of the Greek prosodic structure (Baltazani&Jun, 1999; Arvaniti, Ladd & Mennen, 2006a, Arvaniti, Baltazani & Grylia, 2014).

### 3.8.2   Intonation

The theoretical and experimental approaches on Modern Greek (contrary to Ancient Greek) are relatively new: Botinis, (1998), Mennen & Os, 1993, Arvaniti, (2007), Baltazani, 2002, 2006, Arvaniti, Ladd and Mennen (2006); Arvaniti, Baltazani and Gryllia (2014) provide descriptions of major prosodic phenomena in Greek (tone inventory, different types of utterance contours, intonational phrasing, boundary tones) whereas Baltazani & Jun (1999), Arvaniti et al, (2006a and 2006b) and Gryllia (2009) explore *topic* and *focus* intonation. There is little work done in the relation between pragmatics/semantics and prosody: Chaida et al (2009) on the role of prosody on the perception of different sentence types in Greek; Baltazani (2002) and Chatzikonstantinou, Giannakidou and Papadopoulou (2012) on the role of intonation on quantification.

The present dissertation comes to fill that gap by providing experimental data relative to the interaction between pragmatics/semantics and prosody in Greek. I will approach the prosodic events within the autosegmental-metrical framework based on the work of Pierrehumbert (1980). In this framework the intonational contour is represented as a string of tonal (H(igh) and L(ow)) elements whose different arrangements and alignment with the segmental material has been shown to be associated with particular functions (most prominently with a) focus or 2) *new* vs *old* information in the discourse or 3) the difference between a declarative and an interrogative and other discourse functions on the sentential level, a.o.). I will not describe in detail the autosegmental-metric framework

(unless when it is necessary) but I will briefly illustrate the basic facts about Greek based basically on Arvaniti et al (2006) who adopt the same framework in their analysis. Additionally, I will elaborate on those aspects that are of significance with respect to the present dissertation.

### 3.8.3 Pitch Accents

Arvaniti et al (2006a) and Arvaniti & Baltazani (2005) report 5 types of pitch accents in Greek: H*, L*, L*+H, L+H*, H*+L.  The H* is typically associated with broad focus (Baltazani & Jun, 1999, Baltazani, 2003) and commonly it is the *nuclear accent* in declarative sentences. This is illustrated in Figure 3.1:
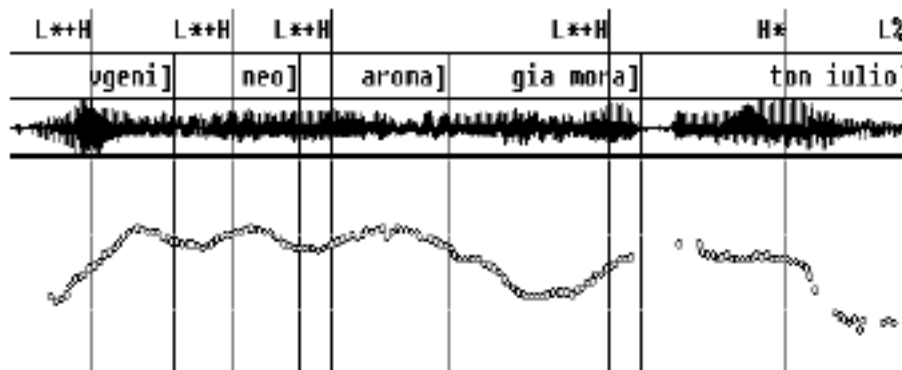


Figure 3.1. Greek Nuclear Accent (adapted from Baltazani & Jun, 1999)

The sentence in Figure 3.1 is a neutral declarative and we see that the last accent is a H*, a pattern typical for this type of utterances. It should be noted that across different types of sentences the position of the H* as an indication of broad focus may different (Baltazani, 2003). While the main role for H* in Greek prosody is to signal broad focus, what also becomes obvious in Figure 3.1 is the systematic use of L*+H in (all) pre-nuclear positions; this is a repeated pattern for (neutral) declaratives as well as for wh-questions (Arvaniti and Ladd, 2009). The L*+H is contrasted with the L+H* tone that is primarily associated with *contrastive* or *narrow* focus (Botinis, 1989, Arvaniti et al, 2006a). The difference between the L+H* and the L*+H is that in the case of the former, the H is aligned with the accented vowel (in the above case /i/) whereas in the case of the latter it extends to the post-accented syllable. Figure 3.2 shows exactly this: a L+H* tone aligned with the stressed syllable of the word *Λίβανο* /'livano/ (=Lebanon) which in the particular spectrogram is uttered contrastively:
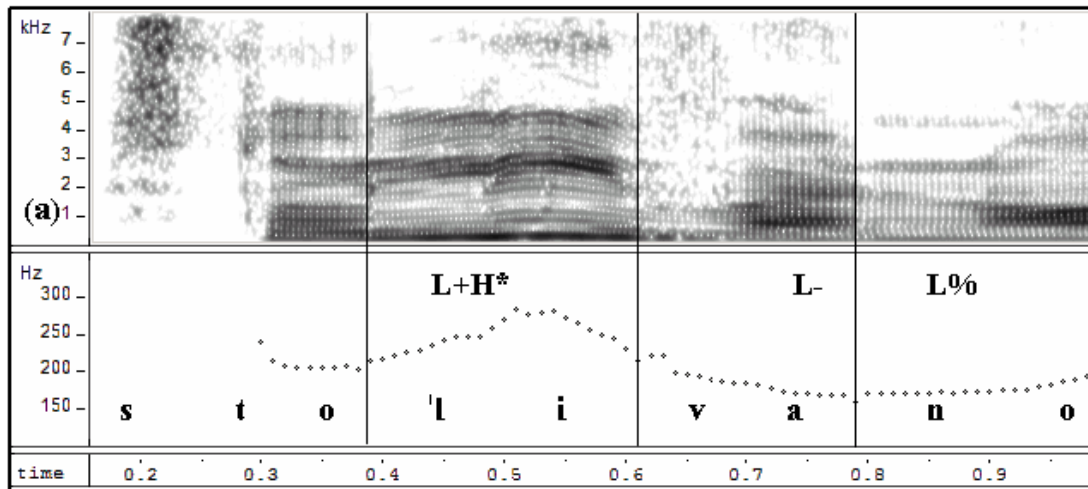


Figure 3.2. L+H* associated with contrastive focus. (adapted from Arvaniti et al. 2006)

This particular observation is of significant importance when it comes to the prosodic profile of the scalar exhaustive NPI where we will see a L+H tone associated with the accented syllable and its exact alignment will tell us whether the tone is a L+H* or a L*+H. If our analysis shows that it is an L+H* aligned with the stressed syllable, then this might also add to the relation between contrastive and exhaustive interpretation (Gryllia (2009) talks about this relation in her PhD thesis on preverbal object foci in Italian and Greek). In any case, there is a consensus in the literature about the link between contrastive accentuation and rejection of (some or all) alternatives (C. Lee (2000, 2010) for the pragmatics/prosody interface (in Korean), Arvaniti (2007) for prosody in Greek). Talking in purely pragmatic terms, this is a notion close to scalar reasoning that in the case of the Greek emphatic NPI may be also triggered by similar prosodic means; this remains however to be experimentally tested.

On the other hand, L* is another tone that will come up in our data and it is associated 1) with topic intonation and 2) post- focal de-accentuation realized as a low plateau.
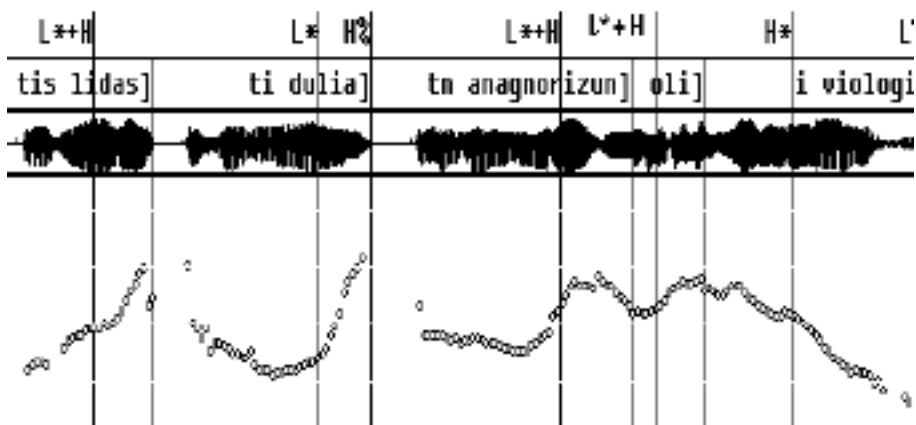
Figure 3.3  The topic phrase (ti doulia) is associated with a L* followed by a H%

(Baltazani & Jun, 1999).

Baltazani and Jun (1999) show that L* followed by a H% form the typical *topic intonation* pattern in Greek (Figure 3.3 The L* in this case is the nuclear accent of the intonational phrase that corresponds to the Topic and ends with a H%. The H%, described in Pierrehumbert & Hirschberg (1990) as the "continuation rise", is a reasonable closure of a Topic phrase: since the Topic is what a sentence is roughly about (aboutness), it makes sense that after the introduction of the Topic, further elaboration is expected. This expectation is prosodically realized by the H% in the case of utterances like the one in Figure 3.3 Going back to a subset of the utterances that we will be testing (that are negative SVOs with the NPI immediately preceding and modifying the Object), we can expect to see the familiar L*H% pattern associated with the Topic.

On the other hand, narrow or contrastive focus (which is of interest to this dissertation) intonation (in declarative sentences) is different: the general pattern (as observed in Botinis (1989), Arvaniti (2007)) is that the word in focus is associated with a

L+H* tone followed by a low plateau that ends in a L-L%. Arvaniti (2007) reports that this post-focal de-accentation is a stronger cue to the perception of the narrow focus than the pitch range of the focused word. This is an important observation to be taken in account throughout the dissertation; even if the scalar NPI is aligned with a particular tone, increased pitch range may not be linked to a "more scalar" notion. There may be (or may not be) other cues in the sentential contour that enhance the scalar reading and this is one of the goals of this dissertation to explore. For example this might mean that if the scalar NPI is aligned with an L+H* tone, then we can expect de-accentuation of the segmental material that follows, in our case the Object, and this may be a corroborative cue to an extended acoustic profile for the scalar exhaustive NPI.

We need to be cautious though with the above observations and not take them for granted. The reason is that we are testing negative sentences and the observations about the role of the tonal inventory, topic and focus intonation in Greek are based primarily on declarative and interrogative sentences. Baltazani (2006) tested negative sentences but provides little pragmatic/semantic support to her data (she presents an Information Structure Theory approach). Her data show that when a negative sentence (in Greek) is pronounced "out of the blue", then the negative marker is aligned with an L*+H tone. Her explanation is that the main reason for this particular alignment is that negation conveys *new* information in the sentence. However, one could equally argue that in negative sentences negation is expected to be the part that draws the attention (in the sense that under negation *p* in VERUM(p) is updated/reversed and this is signaled by prosody. Furthermore,

the fact that in her data negation is associated with an L*+H tone that is indicative of pre-nuclear positions and not of focus should raise questions.

Overall, in this section I presented a brief introduction to theoretical issues I will be exploring experimentally in this dissertation. The Greek Negative Polarity items under G&Y (in press) approach will serve as the basis for the investigation of the interaction between prosody and scalarity. In the next chapters, I will present a series of experiments that put under test this interaction.

# Chapter 4: EXPERIMENTAL INVESTIGATION OF THE GREEK NPI PROSODY

One of the main goals of this dissertation is to answer the question of whether prosodic cues can be used to the disambiguation of a *scalar* vs *non-scalar* meaning. The Greek NPIs under Giannakidou (1998) and Giannakidou & Yoon (2016) proposal are ideal candidates for such an investigation as their main arguments unfold around two interpretations, a scalar and a non-scalar one, of the same orthographic form. What makes the Greek NPIs a proper testable case as well, is that the two interpretations may emerge in exactly the same context:

(70)    Η Ελένη δεν αγόρασε *κανένα* μολύβι.

        *the Helen not bought NPI-item pen.*

(70a)   "Helen didn't buy any pen at all."                    SCALAR

(70b)   "Helen didn't buy some pen or other."                 NON-SCALAR

In negative contexts like (70), the NPI *κανένα* is ambiguous between a scalar (70a) and a non-scalar (70b) interpretation. The hypothesis we put under test here is that this semantic

ambiguity is resolved via prosody, which means that in each case, the NPI (or the sentence that contains it) exhibits a different prosodic profile. Therefore, the first part of our investigation will concern the acoustic cues that signal the difference between a scalar and a non-scalar NPI.

Going further and looking at the bigger picture within the universe of Prosody, the question that follows is whether, these allegedly different prosodic profiles of the two Greek NPIs variants are unique or if they bear similarities with other prosodic phenomena. Giannakidou in her earlier approach (1998) coined the prosodic term "emphatic" to what in Giannakidou & Yoon (2016) is described as "scalar" NPI and "non-emphatic" to the "non-scalar". As the term "emphasis" in the literature on prosody can be used in a rather unconstrained way, a close approximation to what has been described as an "emphatic NPI" could be considered the phenomenon of prosodic Focus (at least in Greek). Focus in Greek is one of the few topics in prosody that has been studied systematically and there is a relevant abundance of experimental data (Baltazani & Jun, 1999; Baltazani, 2002, Arvaniti, 2001; Gryllia 2009). Therefore, a comparison between the cases of (non)Focus and (non)Scalarity can be a good match in order to answer the question of whether the prosodic profile of (non)Scalar NPIs is unique or it bears similarities with other prosodic phenomena in Greek.

To sum up, two hypotheses will be tested in this chapter:

**Hypothesis 1**: Prosody disambiguates between a *scalar* and a *non-scalar* NPI. in Greek Each of the two NPI variants exhibits different prosodic profile.

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**Hypothesis 2**: Scalar prosody is associated with Focus prosody in Greek. Both phenomena exhibit similar acoustic properties but the reason that triggers each is different in each case (*scalar reasoning* in the first case, *information packaging* in the second).

In order to test the above hypotheses we design and conduct two experiments: in Experiment 1 we trigger the (non)scalar meaning of the NPIs via *context manipulation* and we ask participants to read sentences that contain an NPI. This is a technique previously used in the experimental semantics/pragmatics settings to test a variety of phenomena like Quantifier Scope (Musolino, 2000; Musolino & Lidz, 2003), Implicatures (Gualmini et al, 2001), Downward Entailingness (Gualmini and Crain, 2001), Interpretation of Numerals (Musolino, 2004) as well as for the disambiguation between the scalar and the non-scalar e*re* in Basque (Etxeberria & Irutzun, 2015). Experiment 2 is a replication of classical experiments in Information Theory where researchers have used Question-Answer pairs in order to trigger prosodic Focus in particular words (Baltazani 2002 for Greek)

## 4.1   Experiment 1

As mentioned above, in Giannakidou & Yoon (2016) the relation between intonation and scalarity is explicit. In this experiment we investigate this relation by presenting sentences that contain an NPI after contexts that 1) trigger scalar reasoning and 2) neutral with respect

to scalarity and we ask participants to read them aloud while being recorded. Our expectation is that, assuming that participants interpret each context accordingly, their respective realization of the presented sentences will differ for each NPI paradigm.

### 4.1.1 Participants

For the purpose of this experiment 30 native speakers (15 male, 15 female) of Greek were recruited aged from 22 to 55 (mean age 32). All of them were born in Greece and had completed at least the 12 obligatory years of school education while some of them had a higher education degree. They all live in north Greece and they use Greek as a first language in their everyday life. None of the participants has lived for an extended period of time abroad. At least half of them speak English as a second language without having often the opportunity to practice it. IRB for this study was obtained from the University of Chicago.

### 4.1.2 Material

We employ critical sentences with an SVO word order and contain the NPI *κανένα*

positioned immediately before the Object, e.g.:

(71)     I Maria dhen aghorase kanena vivlio.

*the Mary neg bought NPI book*

"Mary didn't buy any book at all." / "Mary didn't buy some book or other".

It is important to say at this point that the critical sentences are the same in both Experiment 1 and 2 in order to allow for their comparison (scalar realization vs. focus realization). This constraint poses certain limitations (in the selection of segmental material proper for the purpose of a prosodic analysis *e.g.* to contain primarily phonemes that convey rich pitch information and in the same time can trigger naturally the (non)scalar meanings we aim for) and it had been a significant aspect of the design. Greek is a free word order language but the most frequent patterns are the SVO and VSO (Philippaki - Warburton, 1985). Subsequently, by using the SVO order only, we reduce the possibility of any effects due to a marked order (i.e. OVS - where we might expect an effect of topicalization).

Furthermore, in order to keep the critical item unaffected by the sentence final intonation, the NPI was always in the penultimate position immediately preceding the Object -which was the final word. The functional role of the sentence final tone has been illustrated thoroughly (Pierrehumbert & Hirchberg (1990), Bartels (1999), Truckenbrodt (2012)) for a variety of discourse phenomena. Particularly for the Greek negative

sentences, Baltazani (2006) shows that when negation is considered *new*, the sentence final tone is systematically an H% whereas when negation is considered *old*, the tone is a L%. Therefore, positioning the NPI in a non-final position, we do not anticipate this boundary effect previously observed in the negatives.

For reasons of uniformity across the critical sentences, only the *neut.sing.acc* nominal NPI *κανένα* that agrees in case, number and gender with the following noun has been used. The theoretical predictions in Giannakidou (1998) do not make any distinction regarding the nature of the emphatic accentuation on the masculine or feminine or neutral nominal NPI. In order to perform a uniform acoustic analysis of the data and in order to facilitate the pitch measurements, we put the following constraints on the segmental material:

(A)     All the words (apart from the determiner and the negative marker) have a CVCVCV structure stressed either on the first or the second syllable.

(B)     The words consist of sonorant phonemes whenever possible. The reason is that sonorant phonemes produce a continuous F0 track, which is one of the acoustic cues we intend to measure.

The NPI itself consists of a CVCVCV structure stressed on the second syllable /k a . n 'e .

n a s/ and it's middle part consist of sonorant phonemes.

The filler sentences had an identical structure (negative SVO) but instead of an NPI, an AP or a QP was used in the same position:

<u>Within an AP</u>

(72)        I Marina dhen zighise to mikro lemoni.

            *the Marina neg weighed the small lemon*

            "Marina didn't weigh the small lemon."

<u>Within a QP</u>

(73)        I Marina dhen zighise pola lemonia.

            *the Marina neg weighed many lemons*.

            "Marina didn't weigh many lemons."

In the case of the AP, the D and the A form a phonological phrase and thus this structure is closer to the NPI (3 syllables, CVCVCV whenever possible). This is not always the case for the QP, however but whenever possible the 3-syllable structure is retained e.g. αρκετά

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(= many)

**Context Manipulation**

The different senses of the NPIs were triggered via *context manipulation.* More specifically, in order to trigger the "emphatic" scalar variant, participants were asked to read a short story that was relevant to a critical sentence that followed right after the story. The sentence was a kind of continuation/one-sentence-summary of what had been just described in the short story. Importantly, the context was manipulated in such a way that the NPI would be interpreted as scalar (after the "scalar" contexts) or as non-scalar (after the "non-scalar" contexts). Below is an example of a "scalar" context:

**Scalar Context:**

*Mary is a first year undergraduate and at her university it is obligatory for the first-years to register for at least one course in the first quarter. Otherwise they lose the quarter. Mary however is renowned for forgetting about everything. The result in her case was to lose the quarter.*

Upon reading the context silently, participants were instructed to read aloud the target

sentence as a continuation of the story they were presented with. They were notified that their utterance would be audio recorded. All audio files were recorded on a Macbook laptop using Praat software. There was no time limitation with respect to participants' responses and in general participants tended to read the target utterance immediately upon having read and understood the context.

(74)    I Mary dhen dhilose kanena mathima.

        *the Mary neg registered NPI course*

        "Mary didn't register for any course at all."


In this "scalar" context, the expectation is that lexical cues like "at least" would favor a scalar exhaustive interpretation of *κανένα*. The whole story is designed to assist this interpretation. On the other hand, in order to trigger a non-scalar interpretation, we used neutral contexts where no scale relevant to the NPI would emerge. For example:


**Non-Scalar Context:**

*Mary comes from a very rich family and her friends are very rich as well. It was her birthday yesterday and traditionally she receives very expensive gifts. Her friends usually buy for her Louis Vuiton handbags or jewelry. They don't keep it as simple as an SMS text to send their wishes. Therefore, they send expensive gifts, not simple ones:*

Participants were then asked to read (75) aloud:

(75)    I Mary dhen elave kanena minima.

        *the Mary neg received NPI message*

The manipulation of the context does force a scalar reading of the NPI and is relatively neutral to this respect. That said, in this context a non-scalar interpretation in (75´) is more prominent:

(75´)    Mary didn't receive some message or other.

This is because the expectation invoked by the context does not concern the number of messages Mary is supposed to receive. Subsequently, no scalar reasoning about the number of messages received is relevant and there is no need for the NPI to point to the end of such a scale (as it would under a scalar interpretation). Furthermore, the context does not create any expectations about any specific message(s) that Mary would receive but rather (75) vaguely refers to the domain of messages in general.

Thus, under this method the expectation is that participants will extract fine semantic/pragmatic senses from the context and interpret the NPI accordingly. In the end they are expected to produce a prosodic realization that, according to our hypothesis, will be different for each NPI interpretation.

Overall, as for the critical sentences, there were 6 tokens x 2 conditions (scalar vs non-scalar) which in the case of 30 participants amounts to 360 observations, 180 per condition. There were 12 filler sentences, therefore each participant saw 24 items (12 critical, 12 fillers) in total. All participants saw one list where items were randomized and repeated sequences of the same type of context were avoided.

### 4.1.3   Method

The test was administered individually to each participant on a computer screen. Each slide consisted of the context and a target sentence in bold font. Each participant was instructed to first read the context and try to get a good understanding of it. There was no time limit for this and participants were told that they could read the text as many times as they wanted. Upon this the instructions guided them to read the target sentence aloud as if it was a kind of summary or continuation of what has been narrated in the context. Participants were also informed that during the whole process, their voice would be audio recorded. In each session the experimenter was present and assisted with the procedure as well as with any technical issue relevant to the audio recordings and slide presentation.

### 4.1.4   Data Analysis

Based on previous approaches on the interaction between pragmatic interpretation and intonation in Greek; (Arvaniti et al (2014); Arvaniti&Ladd (2009); Arvaniti, Ladd and

Menen (2006); Baltazani (2002, 2006)), the F0 contour is a significant reflection of this interaction (Etxeberria Irutzun (2015) for the role of pitch in scalarity in Basque. In these studies, the analysis of the data was performed under the "autosegmental-metrical" approach based on the work of Pierrehumbert (1980). In this framework the intonational contour is represented as a string of tonal (H(igh) and L(ow)) elements whose different arrangements and alignment with the segmental material has been shown to be associated with particular functions (most prominently with focus on the word level or *new* vs. *given* information on the discourse level or the difference between a declarative and an interrogative and other discourse functions on the sentential level, a.o.). In light of the importance of pitch found in previous research, F0 was examined by visual inspection and quantitative analysis:

### 4.1.5   Visual inspection

Following Arvaniti et al (2014), Baltazani & Jun (1999), Baltazani (2002, 2006) for Greek) we performed visual analysis on the F0 contour. More specifically, we observed the L-H sequences and identified 1) any systematic patterns, 2) how and if these patterns correlate with (non)scalarity associated with the NPIs. Visual inspection of the F0 contour has long been a common method of analyzing data in prosody. In their core work Pierrehumbert and Hirschberg (1990) examined the relation between intonation and several discourse/semantic/pragmatic phenomena relying basically on their acoustic impression (perhaps lack of speech processing software at that time prevent them from further

analysis). Following work on the interface of intonation and semantics/pragmatics or information theory was widely based on visual inspection of the F0 contour (Buring, 1997) C. Lee (2006), Truckenbrodt (2012).

## 4.1.6   Quantitative Analysis

Different approaches in Greek – mainly coming from phoneticians– have taken a more quantitative route. One of these approaches (Arvaniti, Ladd and Menen (2006) for Polar questions in Greek; Arvaniti et al 2014 on different kinds of Questions in Greek) concentrates on specific tonal points of interest (tonal targets) across the sentential contour and measure pitch values on the particular points. The tonal targets can be taken as predefined points on the pitch contour (i.e. the F0 associated with the stressed syllable of the focused word or the peak associated with an expected rise-fall or the pitch rate at the end of the utterance). Other quantitative approaches take additional measurements *e.g.* duration, intensity, syllable F0 means or maxima (Winters & O'Brien, 2013; Lee & Watson, 2011; Elordieta and Irutzun, 2010). For the present study, we follow Etxeberria and Irutzun (2015) analysis because their experiment is similar to ours (they investigate the effect of intonation on scalarity) on a language (Basque) that is similar to Greek in terms of lexical stress. More specifically, we measured the F0 phoneme mean and duration on specific segments within the NPI *κανένα* /k a n `e n a / which was the one used in all our critical sentences. More specifically, measurements were taken from the stressed vowel /e/ and the following nasal consonant /n/.

The speech signal was segmented manually using Praat. For the segments of interest (/e/ and /n/), the cut off points were based on the formant differences between the two: the nasal stop can be identified by the strong low frequency at around 200Hz and relatively lower spectral energy in the higher frequencies. In the case of /e/ on the other hand, all formants are clear. Therefore, since /e/ is in between two /n/s, we use this information to define the cutting points for this phoneme. /n/ on the other hand is preceded by /e/ and followed by /a/; like /e/, higher formants are relatively clear and visible in the case of /a/ compared to the lower frequency only /n/. Based on the formant information therefore, we defined the cut off points for /n/. Below is an example of segmentation. Measurements for each segment of interest were taken using Praat scripts.
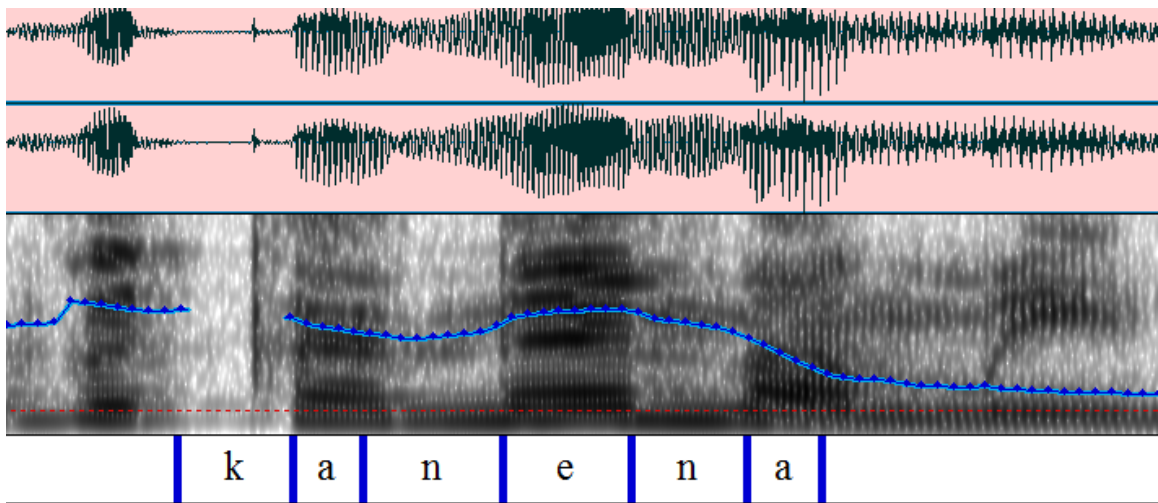


Figure 4.1 Segmentation example

### 4.1.7 Results

Below I report the results of both the visual and the quantitative analysis. At this point it should be mentioned the following regarding the participants. From the visual analysis, it became obvious that male participants (N=15) provided very poor data in general. This is translated in very flat F0 contour and absence of any variety in terms of intensity or duration. This is not something entirely new in the literature: Gender effects on intonation are reported by Dally and Warren (2001) in New Zealand English and by McConnell-Ginet (1978) in American English. Interestingly, Etxeberria and Irutzun in their study included only 9 participants, all female. This interesting effect that emerged in our study could be traced somewhere in the transition from the pragmatic interpretation of the context to a corresponding prosodic realization of the critical sentence. This is something that is worth of further sociophonetic investigation.

Under these circumstances, we analyzed the results of the female participants only (in Appendix B we provide the results from the male participants as well). From the initial group of 15, the results from one participant were excluded because she failed to properly control the audio settings during the session. Therefore, the data analysis was performed on a sample of 14 female native speakers of Greek aged 20 – 58 (M= 36). First I provide a visual illustration of the data:

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(76)     I Merula dhen elave kanena minima.

*the merula dhen neg received NPI message*

"Mary didn't receive any message at all."
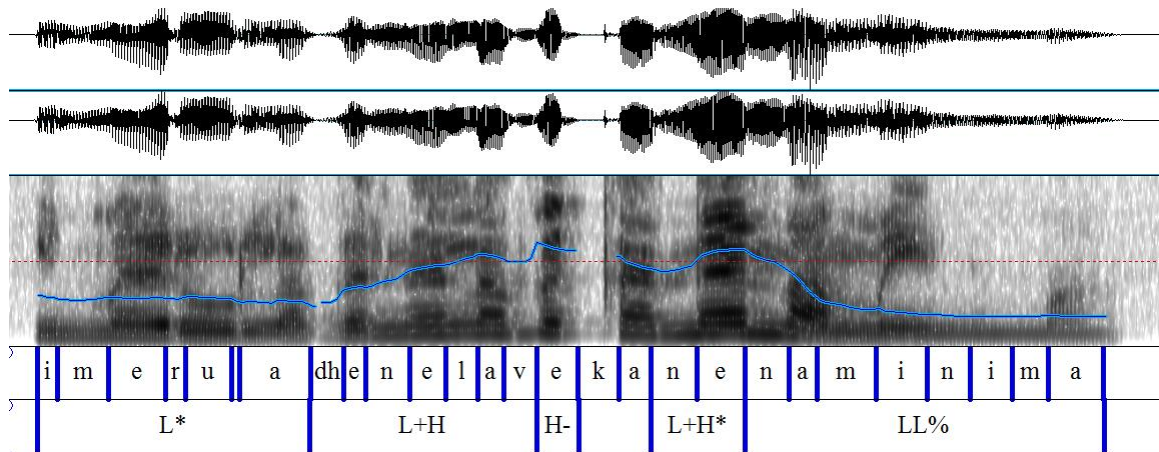


Figure 4.2: Sentential contour after a scalar context.

This is a typical realization of a critical sentence after a scalar context where the NPI was expected to be interpreted as scalar. We can see that the sentence starts with a Low plateau and then there is a continuous rising that finishes in a H- intermediate tone. Depending on the participant there was a small pause of various lengths at that position. Participants who were talking faster did not produce a pause at that point but for others who were reading in slow pace, the pause could be lengthier. Also the H- illustrated in this spectrogram is relatively quite high and clear; this was not always the case but there was a general trend

to this direction.

The notable part in our case is the one that follows and contains the NPI: in the majority of the cases speakers produced a L+H* accent aligned with *κανένα*. This can be observed on the stressed syllable /n e/ with the L starting on /n/ and the H peak anchored on the stressed vowel. This was not always the case as often from the visual inspection the fall started on /e/ and the peak was aligned with the following /n/. This is not unexpected and it was also observed in Etxeberria and Irutzun: the peak was aligned not with the particular phoneme that naturally would be the most prominent one but with the one that follows. In any case, the mechanics of intonation are not always characterized by a one to one mapping with the phonemes or syllables and a sentential contour can be a highly dynamic phenomenon. That said, we are able to identify a general pattern that may not be replicated every time with exactly the same alignment with respect to the phoneme level.

The spectrogram below is a closer illustration of the NPI:
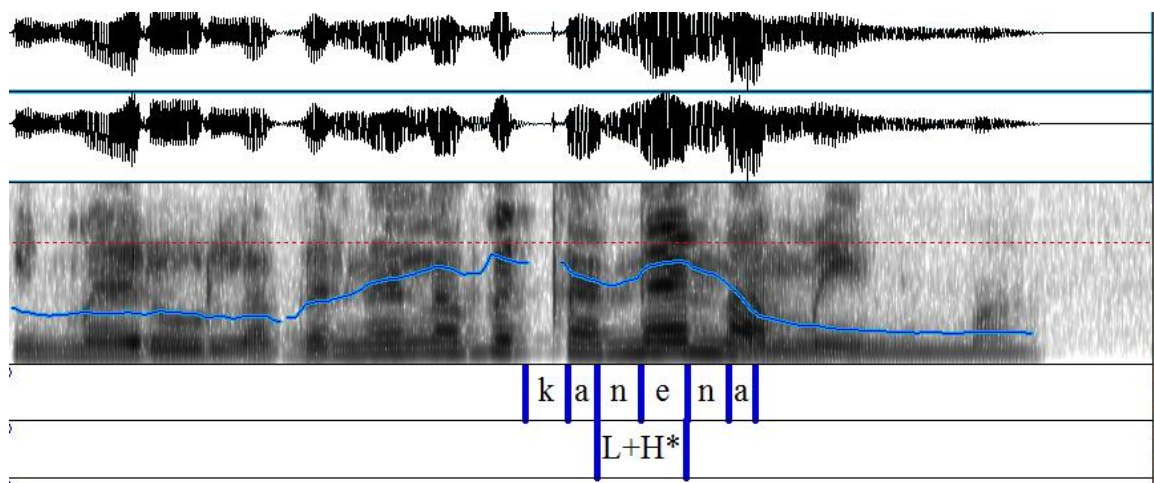


Figure 4.3: Scalar NPI.

After the NPI we see a sharp fall of the F0 which fades out towards the end; it can be said that this is a kind of deaccentuation. To summarize the results of the visual inspection, we can say that the observed sentential pattern in the case of a negative SVO sentence in Greek that contains an NPI in the O position is the L* L+H H- L+H* LL%.

**Non-scalar context**

For the same critical sentence as in (76), the speakers typically produced realizations like the one below:
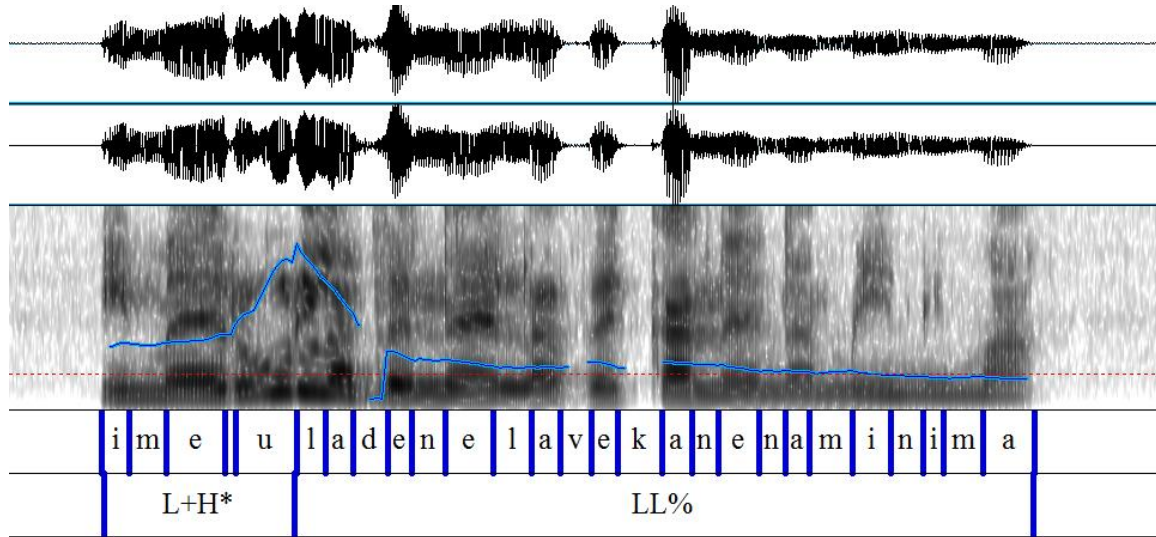


Figure 4.4: Sentential contour after a non-scalar context.

It becomes obvious that the contour is different from the one after the scalar context and

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the most notable difference being the Low plateau within which the non-scalar NPI is realized. There is a High peak in the beginning of the utterance and then a deaccentuation till the end. The alignment of the High peak - here aligned with the S in the beginning of the utterance - varied as often it was aligned with the negative marker bearing a more typical negative contour (Baltazani, 2006). No intermediate phrase was observed as no pauses during the utterance were perceivable. In light of this, it can be said that the typical pattern of a negative sentence in Greek that contains a non-scalar NPI in an O position in our data is the L+H* LL%.

Pitch

A quantitative analysis was performed on the same data targeting the middle part of the NPI *κανένα*. More specifically F0 means were measured for the stressed vowel and the following nasal. We ran a 2 way Anova (Scalarity (scalar, non-scalar) * Tonal Target (/e/, /n/)). All effects are reported as significant at $p<0.001$. There was a significant main effect of *scalarity* on the pitch value produced, $F(1,83)= 104,097$, $p<0.001$. There was also a main effect of *tonal target* $(1,83)= 18,859$, $p<0.001$ and an interaction effect between scalarity and tonal target $F=17.917$, $p<0.001$. We also tested for random effects for subject and we found no significant effect (Wald $Z= 0.584$, $p=0.5$). The pitch values in the scalar condition where significantly higher than those in the non-scalar condition:
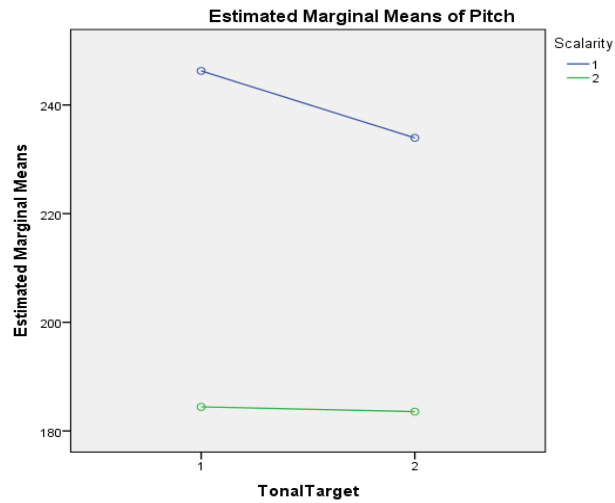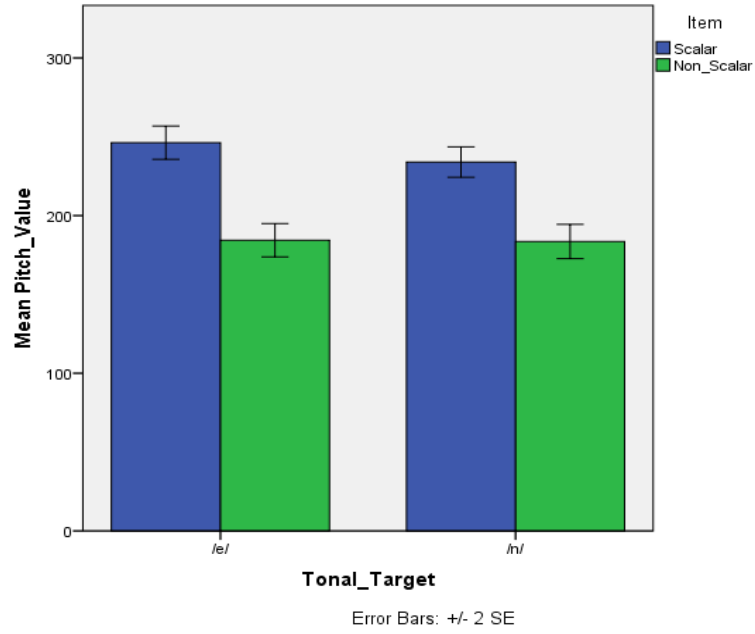
Figure 4.5: Pitch (in Hz) of scalar (blue) and non-scalar (green) /e/ and /n/.

Top: bar graph of the result. Bottom: line graph of the result

The blue columns correspond to the pitch measurements in the scalar condition: the left

blue column depicts the measurements from the stressed vowel /e/ and the right blue

column the measurement from /n/. Similarly the green columns but for the non-scalar condition. We see that the pitch values for the scalar condition are higher than those in the non-scalar condition. This is in agreement with the visual inspection derived from the figures above. The table below shows the mean values for each phoneme:

|  | Mean | SD | N |
|---|---|---|---|
| Scalar e | 246,27 | 48,524 | 84 |
| Scalar n | 233,94 | 44,292 | 84 |
| Non-scalar e | 184,43 | 48,417 | 84 |
| Non-scalar n | 183,56 | 49,724 | 84 |

Table 4.1: Means of pitch values (in Hz) for scalar and non-scalar /e/ and /n/.

When doing the visual inspection of the spectrograms we noted that the pitch contour was rather flat for the non-scalar NPI whereas the scalar was aligned with an L+H* accent followed by a sharp fall. The figure above shows this clearly for the non-scalar: the green line depicts the pitch transition from /e/ to /n/ and it is quite flat. The blue line depicts the sharp fall from the H* that is aligned with the stressed /e/ to the Low /n/.

Duration

We also ran a 2-way Anova to investigate whether there was a difference in terms of duration between the two conditions. We took duration measurements from both tonal targets (/e/, /n/) by running a Praat script. The results show that there was a significant main effect of *scalarity* on the duration $F_{(1,83)} = 51,283$, $p<0.001$. There was also a main effect of *tonal target* marginally significant at $F_{(1,83)} = 3,964$, $p<0.05$ and no interaction between the two factors $F=1,621$, $p=207$. There was no significant effect for subject (Wald Z = 0.532, p=0.9) . The table and the figure below illustrate the differences:

|  | Mean | SD | N |
|---|---|---|---|
| Scalar e | 78,83 | 18,370 | 84 |
| Scalar n | 65,01 | 11,317 | 84 |
| Non-scalar e | 74.04 | 17,863 | 84 |
| Non-scalar n | 63,58 | 15,452 | 84 |

Table 4.2: Means of duration (in ms) for scalar and non-scalar /e/ and /n/.

The figure below illustrates the difference: the blue line depicts the measurements from the scalar condition and the green from the non-scalar condition; it can be noticed that the

scalar realizations were lengthier than the non-scalar ones for /e/ and /n/ :
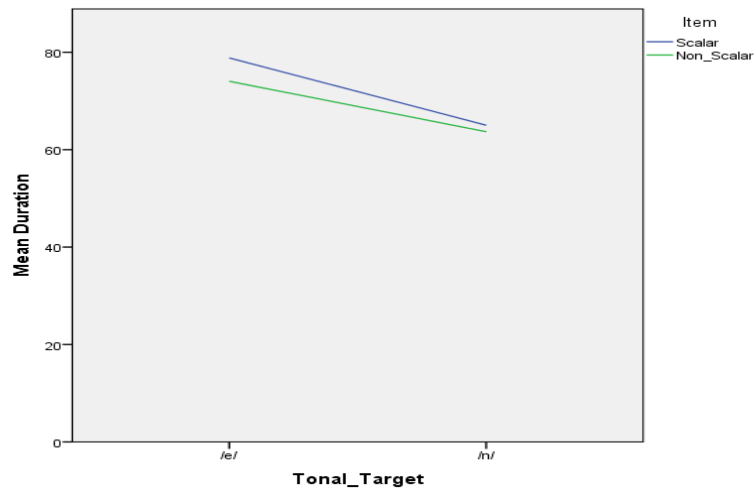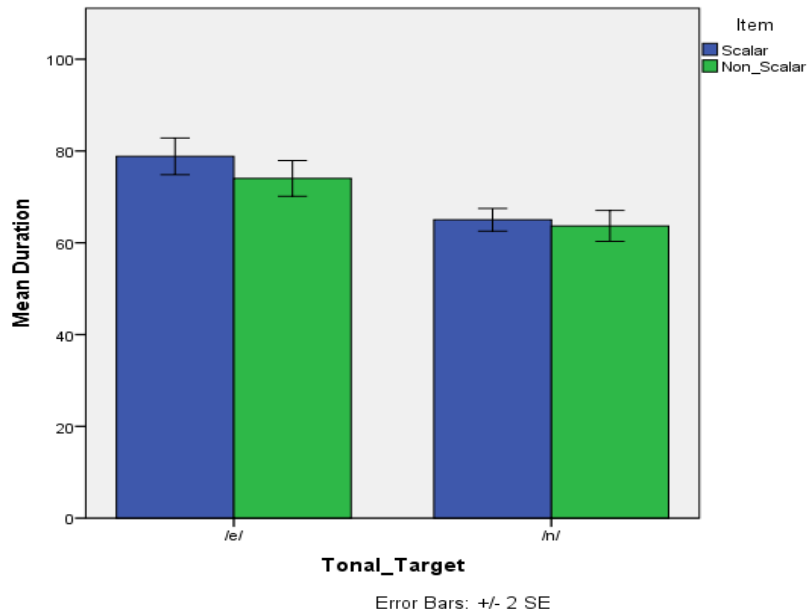


Figure 4.6: Duration (in ms) of scalar (blue) and non-scalar (green) /e/ and n/

Top: bar graph of the results. Bottom: line graph of the results

Intensity

Finally, we measured intensity in both conditions using a Praat script. We ran a 2-way Anova (Scalarity*Tonal Target) and found a main effect of scalarity and a main effect of tonal target F=69,412, p<0.001. There was also an interaction effect F=14,394, p<0.001. The results from testing for random effects for subject were not significant (Wald Z= 0.580, p=0.5). Table 4.3 shows the raw means of intensity in dB and below that F=99,228, p<0.001 there is a graphic illustration of the results:

|  | Mean | SD | N |
|---|---|---|---|
| Scalar e | 75,46 | 5,9 | 84 |
| Scalar n | 73,21 | 5,6 | 84 |
| Non-scalar e | 70,96 | 7,8 | 84 |
| Non-scalar n | 69,02 | 7,6 | 84 |

Table 4.3: Means of intensity in dB for scalar and non-scalar /e/ and /n/.
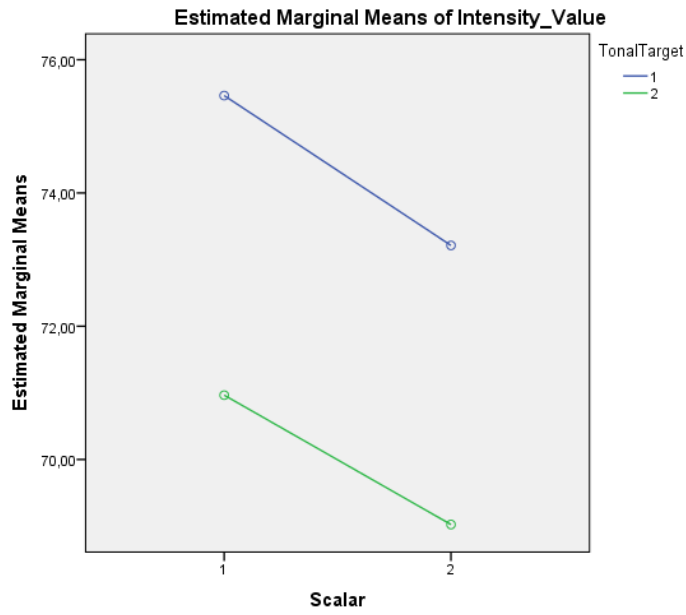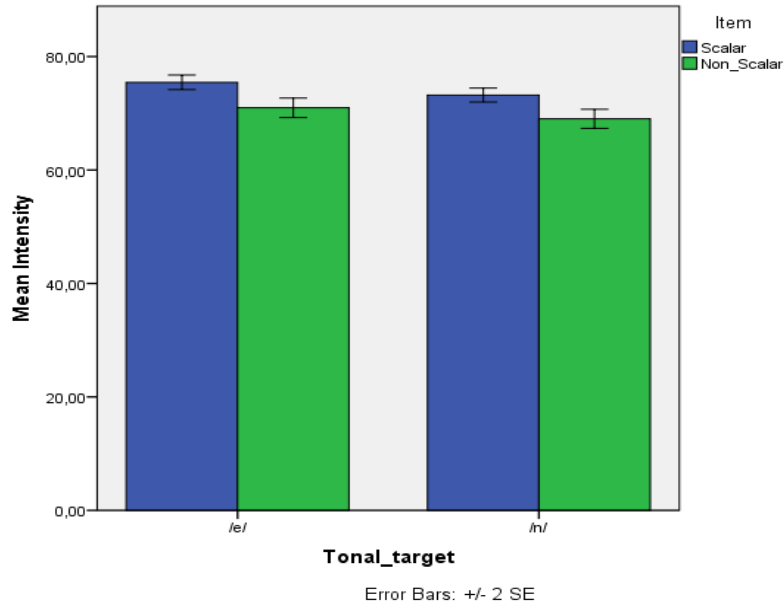
Figure 4.7: Intensity (in dB) of scalar (blue) and non-scalar (green) /e/ and n/.

Top: bar graph of the results. Bottom: line graph of the results.

### 4.1.8 Discussion

At this point it is important to comment on the main points of these findings starting from the word level:

A.      An L+H* accent aligned with the scalar NPI is systematic. On the other hand, the non-scalar NPI is realized within a Low plateau.

B.      The result from the visual inspection was also confirmed in our quantitative analysis; the two NPI paradigms differ in terms of pitch; no difference was found in terms of duration as for the stressed vowel.

On the sentence level, we observe that:

C.      In a negative sentence that contains the negative marker /dhen/, other words *e.g.* an NPI may be associated with a rise in pitch; this may not necessarily related to the information status of the words but also with other properties like (non)scalarity.

D.      The sentence final L% tone in our data is in agreement with Baltazani (2006) sentences when negation was *given* but not when it was *new*.

E.  The measurements of *pitch*, *duration* and i*ntensity* on /e/ and /n/ confirmed our

predictions in all   three cues

Points A and B are important because they state the difference in terms of prosody between a scalar and a non-scalar NPI. The results from Experiment 1 suggest that native speakers signal the different semantic/pragmatic interpretations of the NPI *κανένα* via prosody. This confirms Giannakidou (1998) and Giannakidou & Yoon (2016) argument that the different semantic/pragmatic properties of the two NPI paradigms in Greek correspond to two different prosodic profiles. Therefore, it can be argued that an NPI like *κανένα,* when it is associated with prominence, it is related with the notion of a scale and points to the lower end of this scale making an exhaustive statement. Based on this, we propose that the L+H* in Greek, next to its other functions, is also a manifestation of a particular reasoning scheme associated with Negative Polarity. If we are to connect the present data with the current experimental semantics/pragmatics data from other languages, they are in line with Etxeberria and Irutzun (2015). Their study showed that (non)scalar meanings can be disambiguated via prosody in Basque. Therefore, the interaction we reveal between prosody and semantics in the case of the Greek NPIs is not an isolated fact but is in track with recent studies that investigate the way semantic relations can be shaped by prosody.

Point C concerns the intonational properties of negative sentences in Greek and the role of prominence on more than one word in these sentences. Baltazani (2006) approaches this issue from an information theory point of view: she proposes that when negation is *new* it is aligned with a L*+H NPA (Nuclear Pitch Accent) and the rest of the utterance is deaccented ending in an H%. When negation is *given*, she reports that it is contained in a topic phrase that consists of verb+negation and the verb is associated with an L* tone. As

mentioned previously, direct comparison with our data is not felicitous due to the different word orders, however, we can say that, even when negation was associated with an L+H tone, it was not necessarily the NPA of the whole sentence. The NPA was associated with the NPI or at least the NPI exhibited equal pitch height with the negative marker. In these cases, the negative marker did not bear any special informational status since the preceding context did not clearly prime negation in a way it is primed in studies in information theory. That said, it can be argued that the sentential intonation in negative sentences that contain NPIs (and perhaps other scalar terms) can be affected not only by the informational status of the words it contains but also by other properties of these words (in our case (non)scalarity).

Point D is in partial agreement with Baltazani (2006) findings: she reports an H% sentence final tone when negation is *new* and L% when it is *given* information. In our data in both the scalar and the non-scalar condition we found a L% sentence final tone which suggests that this boundary tone was not affected by the difference between a scalar or a non-scalar NPI. What makes this point interesting for our purpose however is that, despite the fact that in the scalar condition the negative marker was aligned with a raising intonation – in Baltazani's terms this would imply *new* information – the sentence final tone was not a H%. Therefore, there is a difference between a negative sentence that contains a prominent negative marker and a sentence that contains a prominent negative marker and a scalar NPI: the boundary tone is H% in the first and L% in the latter. It would be risky to assign a meaningful interpretation to this difference since there are no previous attempts to explain the boundary tones in the negative sentences (compared to the

abundance of often conflicting interpretations of the boundary tones in the declaratives and interrogatives). In examining hundreds of negative sentences with different structures, very few of them had a H% boundary tone. That said, it could be said that the L% sentence final tone can be considered the expected one and the H% reported by Baltazani may have been the result in the particular dataset.

For Exteberria and Irutzun (2015) the role of the special intonation on the Basque *ere* in the generation of the scalar reading is explained through Rooth's alternative semantics. For example, the meaning of a sentence like (77):

(77)     [Jon]$_F$ ere etorri da.

         *John even come AUX*

         "Even John came."

consists of a complex presupposition "someone came and it is not John" and the assertion "John came", the joint computation of which produces the meaning "John is the least expected person to come". The role of focus is the generation of alternative values in the presupposition of the type [Tom came and it is not John], [Bill came and it is not John], [Kathy came and it is not John]. This is an attractive explanation of the focus intonation on the Basque *ere* and we agree with it. We can think of the Greek examples in a more scalar way perhaps. If we paraphrase (78) using "even":

(78)     Dhen perase KANENA mathima.

         *neg passed   NPI      course*

         "He didn't pass any course at all."

we would get something like "He didn't pass even one course." From this it can be inferred that, since he didn't pass the minimal amount of courses, he didn't pass higher amounts and therefore he didn't pass two, three or more. This is a typical Gricean scalar reasoning and generates the same inference with Rooth's alternative semantics.

Having collected crucial information about the prosodic profile of the (non)scalar NPIs, the next step is to ask how the observed tunes pattern with those triggered by Focus. For this reason, we conducted Experiment 2.

## 4.2     Experiment 2

In order to see how the type of intonation that triggers (non)scalar readings of the NPIs patterns with Focus intonation in Greek, a second experiment was conducted. This study is designed to explore the prosodic properties of the Greek NPIs in focus and non-focus position which, as we claimed in the previous section, is a prosodic phenomenon close to what could be characterized as prosodic "emphasis". For this reason, we employ the Question/Answer method commonly mentioned in the relevant literature (Valduvi & Engdahl (1996), Baltazani (2002) for Greek) and test the NPIs in focus and non-focus positions.

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### 4.2.1 Participants

The same individuals who participated in Experiment 1 participated in Experiment 2. This would allow a direct comparison of the voice samples recorded during the two experimental settings. We will analyze the results from the same 14 female participants we analyzed in Experiment 1. The visual inspection showed again that male participants provided poor data in this experiment as well. For this study IRB was obtained from the University of Chicago.

### 4.2.2 Material & Methods

Common in this kind of experiments, the Question – Answer design was employed. It consists of a Question followed by an Answer while the Question is worded in a way that draws the attention to a specific word in the Answer. This word is expected to be the most prominent one in the utterance, therefore in "focus", and trigger a particular prosodic event, e.g.

(79)    - What about Mary ? What did she give to Harry ?

        - She gave a [SHIRT$_F$]to Harry.

                                        (from Valduvi & Enghdal, p. 7)

In the present study, we used wh-words in a similar way to create the following two conditions:

**NPI in Focus:**

(80)   - Posa minimata elave I Marina ?

      *how-many messages received the Marina*

      "How many messages did Marina receive?"

      - I Marina dhen elave [kanena$_F$] minima.

      *the Marina neg received NPI message.*

      "Marina didn't receive any message at all."

In this case "how many" asks about quantity and the NPI *κανένα* that provides the necessary information is in focus.

**NPI not in focus**


(81)    - Pjos dhen elave minima? O Giannis i i Marina;

       *who neg received message? the John or the Marina?*

       "Who didn't receive a message? John or Marina?


       - I [Marina$_F$] dhen elave kanena minima.

       *the Marina neg received NPI message*

       "Marina didn't receive any message."


In this case, the Question triggers prominence on the subject and subsequently we expect "Marina" to be the most prominent word. Therefore, we would expect participants to be able to pick up the information structure in the Question and read the Answer accordingly assigning prominence to a specific item.


### 4.2.3    Results

First we report the results from the condition where the NPI is in focus:


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**NPI in Focus**

A commonly produced sentential contour is the one depicted in figure 4.8 below:
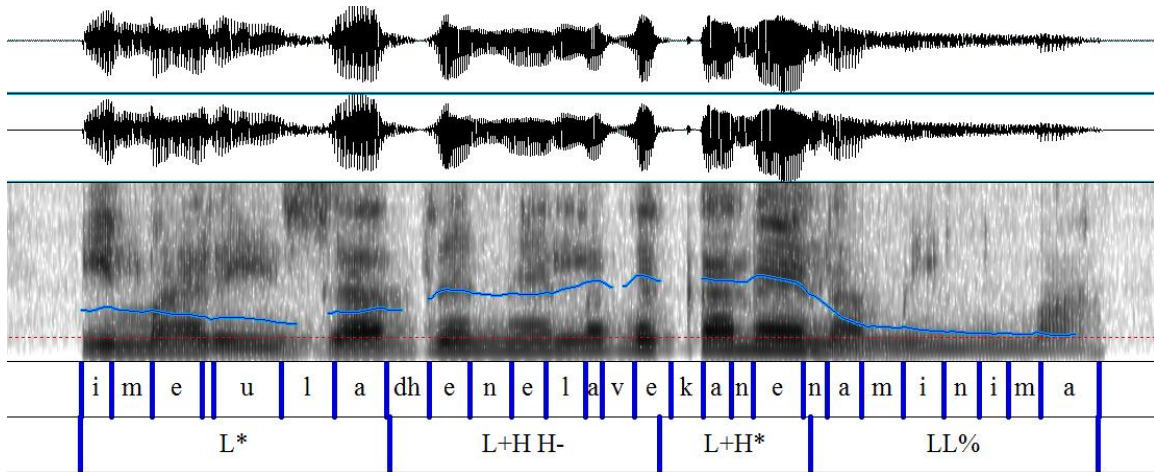


Figure 4.8: Sentential contour of NPI in focus

We see that the utterance is realized with a Low plateau aligned with the Subject and the pitch gradually rises around the negative marker with a L+H accent. A H- tone signals the boundary of an intermediate phrase which is followed by the NPI in a focus position aligned with a L+H* accent. A subsequent fall and a continuous deaccentuation lead to a L% sentence final tone. This is very similar to the sentential contour produced in the "scalar" context (Figure 4.7). Figure 4.9 below is a clearer illustration of the NPI:
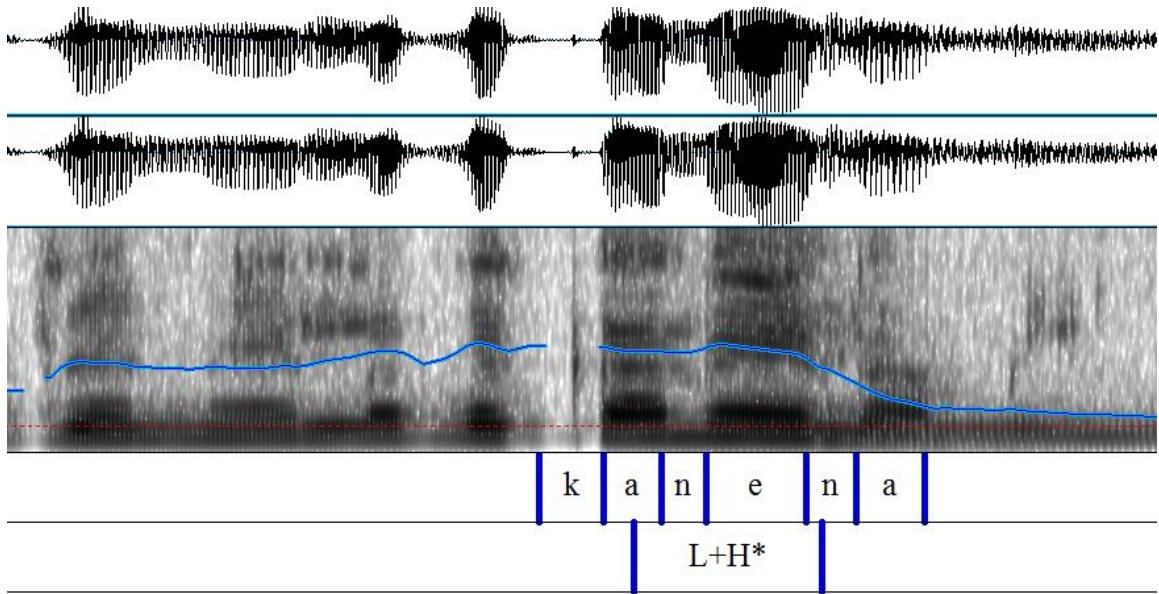
Figure 4.9: NPI in focus.

Here we see again that the middle part of *κανένα* is where the pitch movement can be observed. The L+H* is the Nuclear Pitch Accent (NPA) of the utterance and its shape varied depending on the speaker but its alignment was retained with the NPI throughout all trials. The L+H* (and in earlier approaches the H*) accent has been associated with Focus in Greek (Arvaniti, 2007) therefore, the present results replicate previous findings. Another fact that agrees with previous results is the deaccentuation that follows the focused item and continues on the rest of the utterance. Baltazani and Jun (1999) found a similar effect testing declarative sentences. Baltazani (2006) who tested the realization of negative sentences with a [V + conjunction of Subjects] order does not report a systematic pattern when the Ss were in focus. However, her results cannot be considered as directly comparable with the present results due to the different word order.

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**Non-focus**

The tune speakers' produced in the condition where the NPI was *not in focus* was rather different:
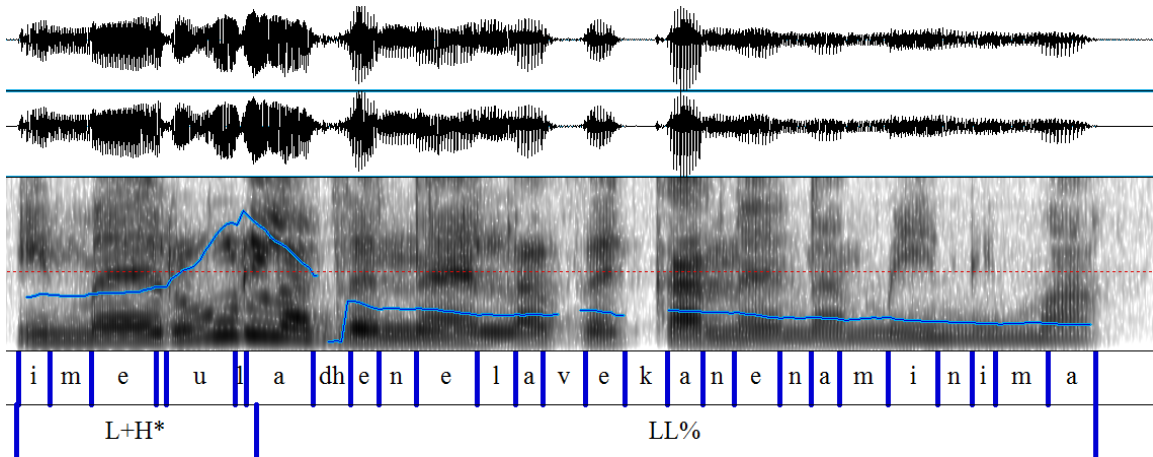


Figure 4.10: Sentential contour of NPI not in focus.

The utterance starts with a L+H* aligned with the subject that is the focused item. It is followed by a sharp fall that leads to a Low plateau till the end of the utterance. The NPI that is not in-focus is realized within this Low plateau and exhibits a flat intonation. The profile of the NPI is illustrated more clearly in the spectrogram below:
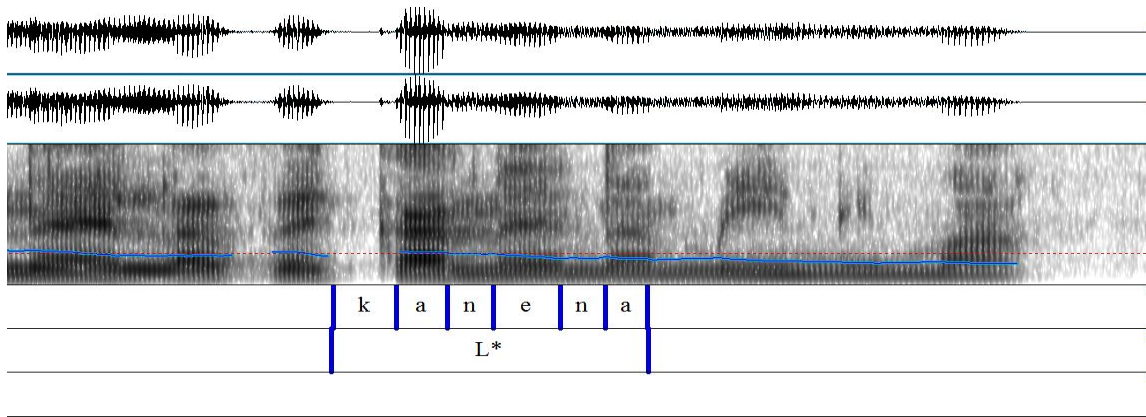
Figure 4.11: NPI not in focus

We see that there are no pitch movements of any type during the realization of *κανένα* and no distinct role prosodically associated with the NPI.

Pitch

On the quantitative side, a 2 way Anova (Focus (focus, non-focus) * Tonal Target (/e/, /n/) showed a main effect of Prominence on the NPI on the pitch value produced, $F(1,83) = 98,151$, $p<0.001$ but no effect of the Tonal Target, $F(1,83)=2,971$, $p=0.88$. There was also no interaction between Prominence and Tonal Target. Testing for random effects for subject showed no significance (Wald $Z = 0.548$, $p=0.5$).

|            | Mean   | SD   | N  |
|------------|--------|------|----|
| focus e    | 242,88 | 50,7 | 84 |
| focus n    | 236,58 | 40,4 | 84 |
| Non-focus e | 193,17 | 26,6 | 84 |
| Non-focus n | 191,90 | 28,5 | 84 |

Table 4.4: Means of pitch values (in Hz) for focused and non-focused /e/ and /n/.
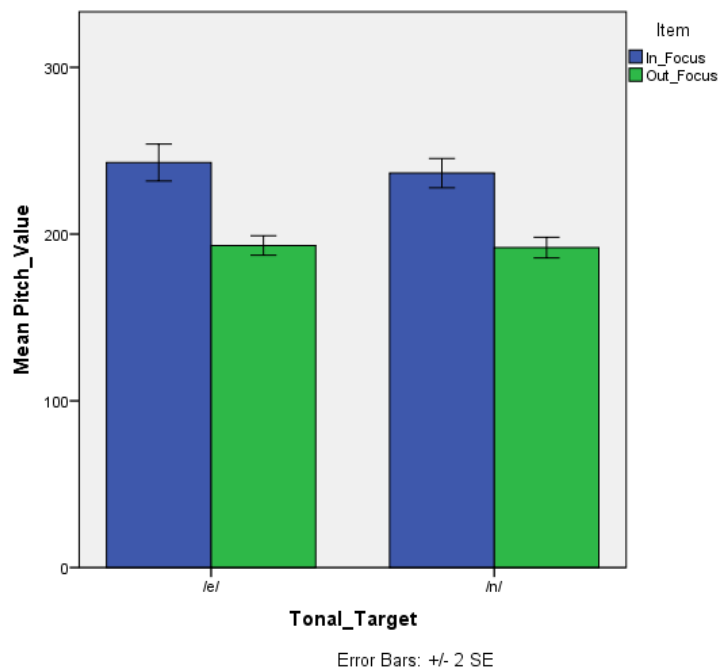


Figure 4.12: Pitch (in Hz) values of scalar (blue) and non-scalar (green) /e/ and /n/

Top: bar graph of the results. Bottom: line graph of the results.
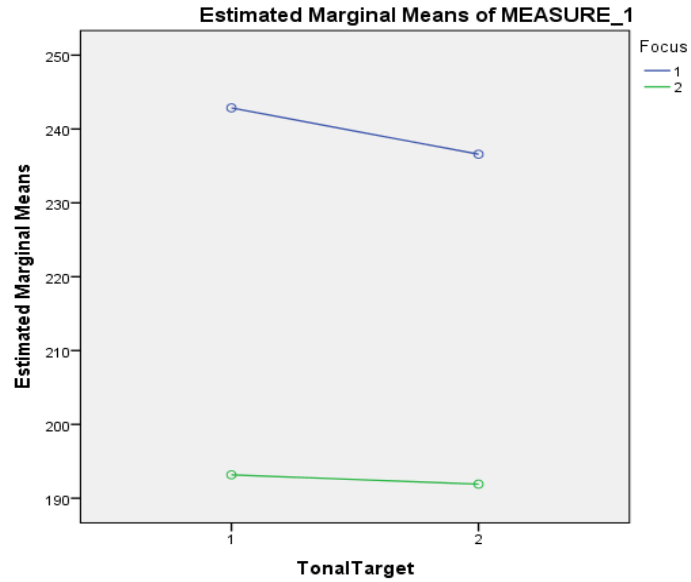
Figure 4.12 continued.

Overall, the comparison between the two conditions shows that the produced sentential contours are different and similarly the NPIs in both cases are realized differently. The results about the properties of Focus intonation are in agreement with the general consensus in the Greek literature that 1) Focus is associated with an L+H* accent and 2) after the focused item the rest of the utterance is deaccentuated. This is what we saw in our data: in both conditions the focused item was indeed associated with an L+H* accent and the rest of the utterance was deaccentuated. The deaccentuation was pronounced more profoundly in the case of the Subject in focus due to the long segment that followed the prominent word.

Duration

We ran a 2 way Anova (Focus*Tonal Target) looking at the differences in duration. There was a main effect of Focus (F=116,410, p<0.001) and a main effect of Tonal Target The interaction between the two conditions was reported significant (F=10,225, p<0.002). There was no significant effect for subject (Wald Z = 0.003, p=0.9) The figure below illustrates the difference visually and Table 4.5 contains the raw means in terms of milliseconds:

|  | Mean | SD | N |
|---|---|---|---|
| focus e | 86,70 | 2,1 | 84 |
| focus n | 62,30 | 1,3 | 84 |
| Non-focus e | 77,79 | 1,8 | 84 |
| Non-focus n | 61,90 | 1,3 | 84 |

Table 4.5: Means of duration values (in ms) for focused and non-focused /e/ and /n/.
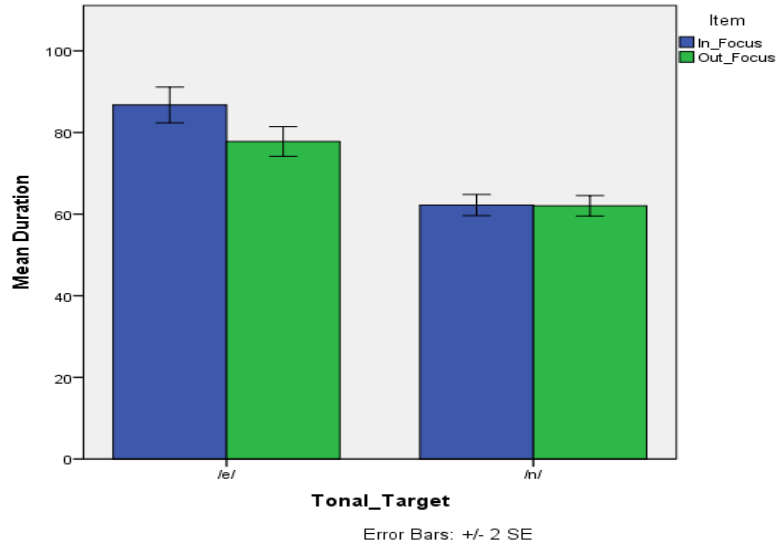
Figure 4.13: Duration (in ms) of scalar (blue) and non-scalar (green) /e/ and n/.

Top: Bar graph of the results. Bottom: line graph of the results.

Intensity

 Finally, we measured for intensity and ran a 2-way Anova. The results showed that a main effect of tonal target (F=11.149, p<0.001) but not a main effect of Focus (F=1,106, p=0.296). There was also not interaction between Focus and tonal target (F=0.82, p=0.77). Testing for random effects for subject showed no significance (Wald Z = 0.640, p=0.5)

|  | Mean | SD | N |
|---|---|---|---|
| focus e | 72,25 | 8,5 | 84 |
| focus n | 72,91 | 5,6 | 84 |
| Non-focus e | 70,70 | 4,5 | 84 |
| Non-focus n | 71,06 | 4,5 | 84 |

Table 4.6: Means of intensity values (in dB) for focused and non-focused /e/ and /n/.

Figure 4.14: Intensity (in dB) of scalar (blue) and non-scalar (green) /e/ and n/

Top: bar graph of the results. Bottom: line graph of the results.

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### 4.2.4   Discussion on the acoustics of Focus in relation to previous findings

The results replicate Baltazani and Jun (1999) results relative to their pitch observations. We observed a rise in pitch associated with the focused word and a de-accentuation of the rest of the utterance. Baltazani & Jun interpreted this rise as H*, however in consequent analyses of the Greek focus it was interpreted as L+H. This can be a terminological/descriptive issue only, we favor though the L+H* interpretation because in most of our data there was a fall associated with /e/ and the peak of the rise was associated with /n/. If the peak was associated with /e/, we would favor an H* interpretation. Furthermore, we found duration of the accented syllable of the focused item to be significantly different from its non-focused counterpart. Baltazani and Jun did not take this measurement, they measured instead the whole utterance and report that in the focus condition the utterance was lengthier. They do not report any intensity measurements. The fact that we don't see any significant difference between the focused and the non-focused condition in our data might suggest that intensity is not an index of focus. In all previous studies pitch has been identified as the basic acoustic cue of focus but no specific reports exist to our knowledge that intensity is not. Perhaps this is a finding specific to our data and it should be investigated in the future.

Overall, our data seem to be in the same line with Baltazani and Jun particularly in terms of pitch: a very similar pitch contour has been identified in both studies and the results overlap in certain extend.

### 4.2.5 Comparison scalar vs. Focus NPI

With all these data in hand, we did a last comparison: we compared acoustically the scalar NPI with the NPI in focus initially in terms of pitch. This was possible because the critical items used in both Experiment 1 and Experiment 2 were exactly the same and this allowed us a direct comparison. We ran a 2 way Anova (Scalar_Focus (ScalarNPI, FocusedNPI) * Tonal Target (/e/, /n/) which did not show a significant difference in terms of pitch between the scalar NPI and the NPI in focus ($F_{(1.83)}=0.3$, $p=0.9$). There was however a significant effect of tonal target ($F=11,692$, $p<0.001$) and no interaction between the two factors.
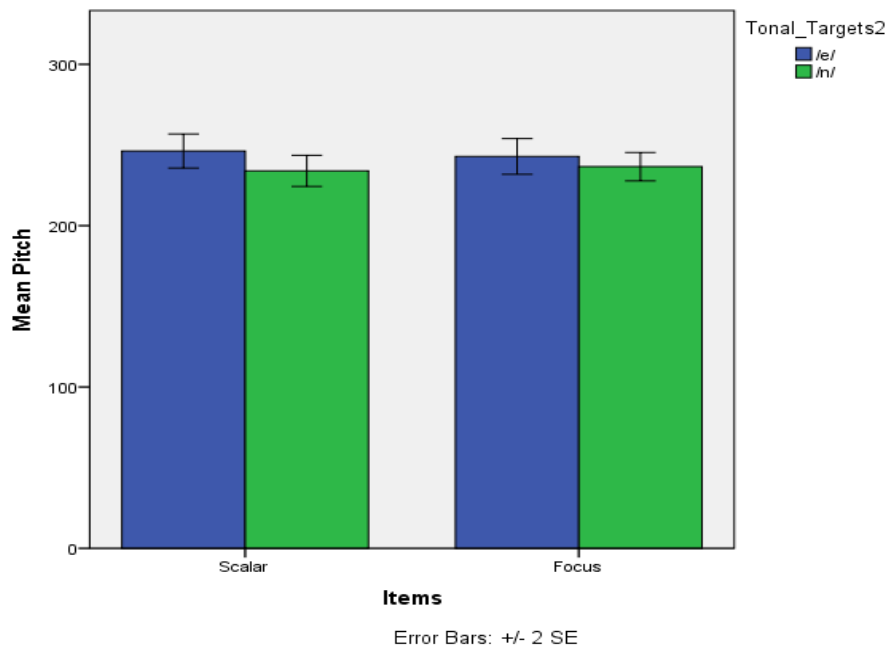


Figure 4.15: Pitch (in Hz) of scalar /e/ and /n/ and in focus.
Top: Bar graph of the results. Bottom: line graph of the results
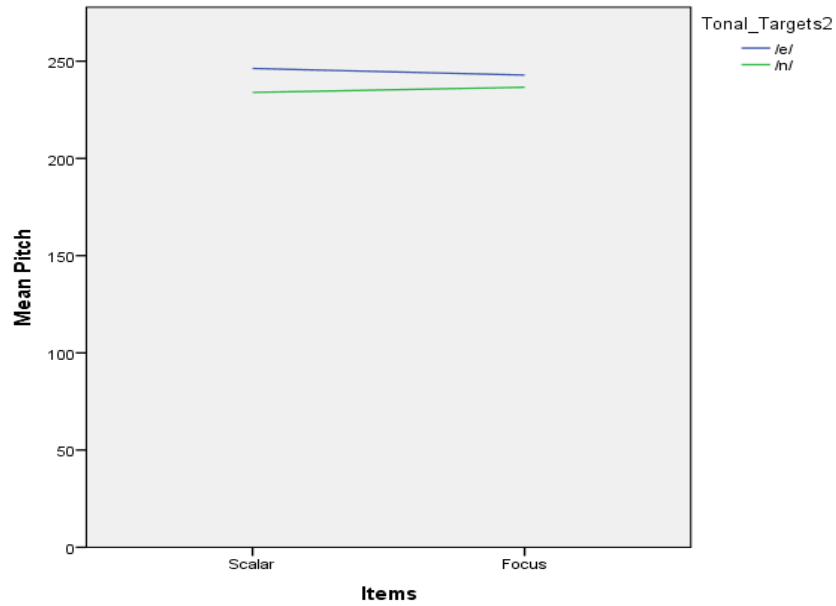
Figure 4.15 continued.

In terms of duration there was a main effect of Scalarity/Focus (F=4.701, p<0.03) and a main effect of tonal target (F=121,8, p<0.001). There was also an interaction effect between the two independent variables (F=13,394, p<0.001):
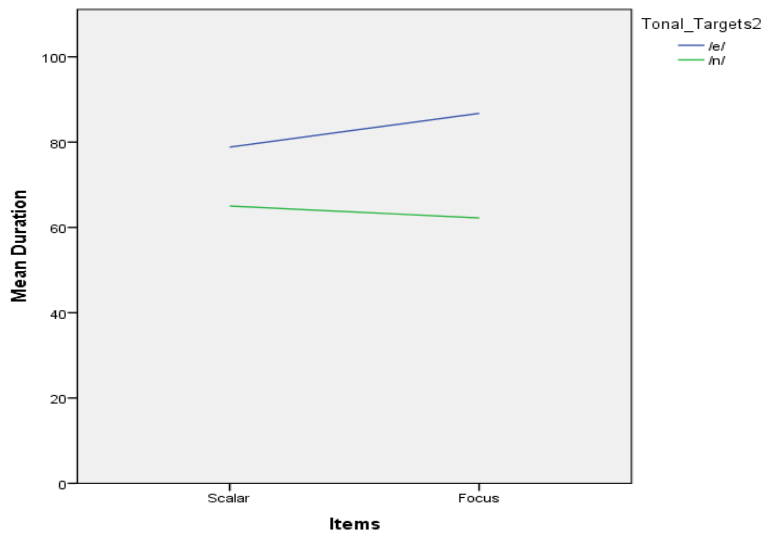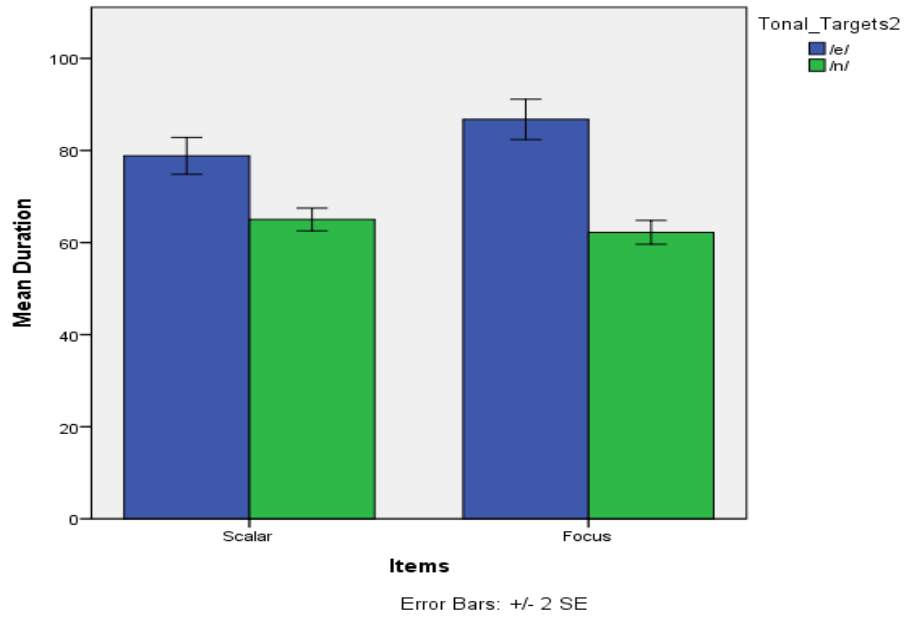
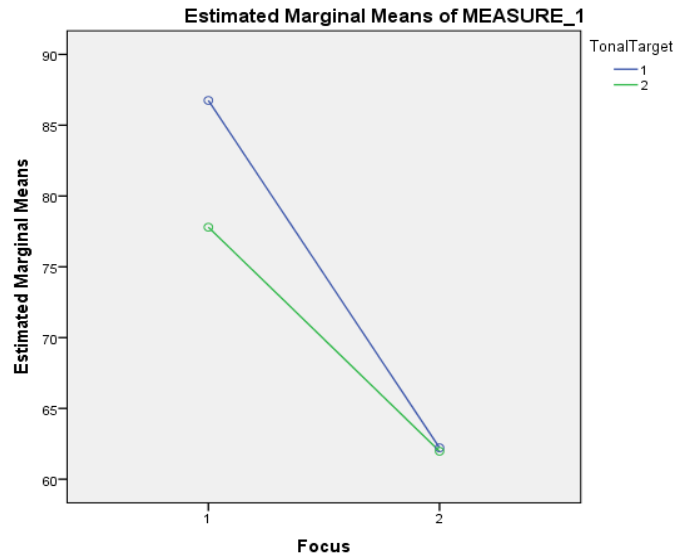Figure 4.16: Duration (in ms) of scalar /e/ and /n/ and in focus.

Top: bar graph of the results. Bottom: line graph of the results.

Finally, we compared the two conditions in terms of intensity and we found that the difference between the scalar NPI and the focused NPI is not significant (F=5.13, p=0.47)

and there was neither a main effect of tonal target (F=1.8, p=0.18):
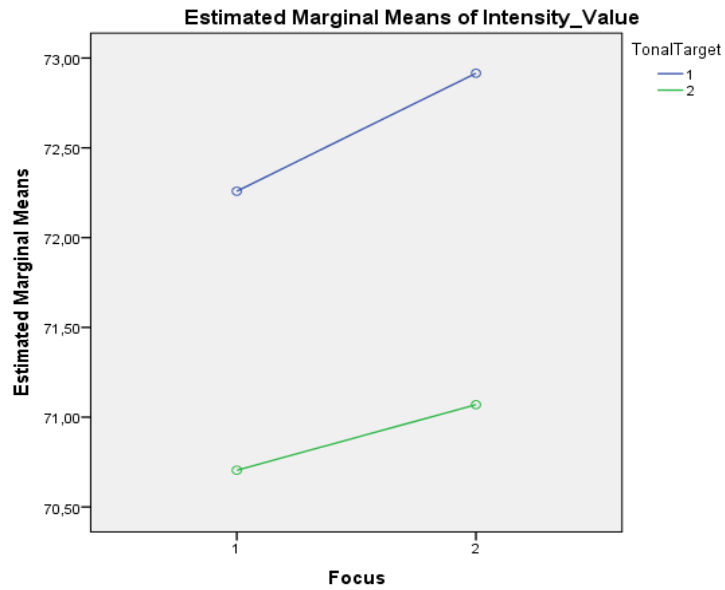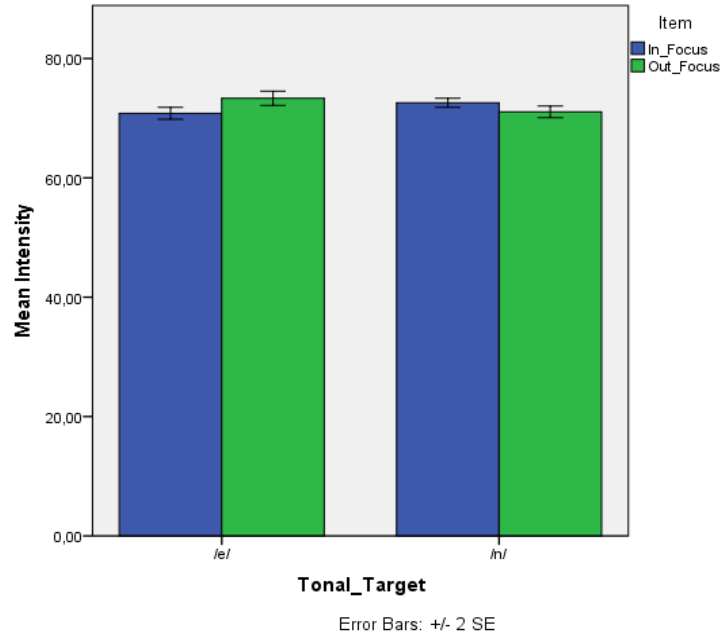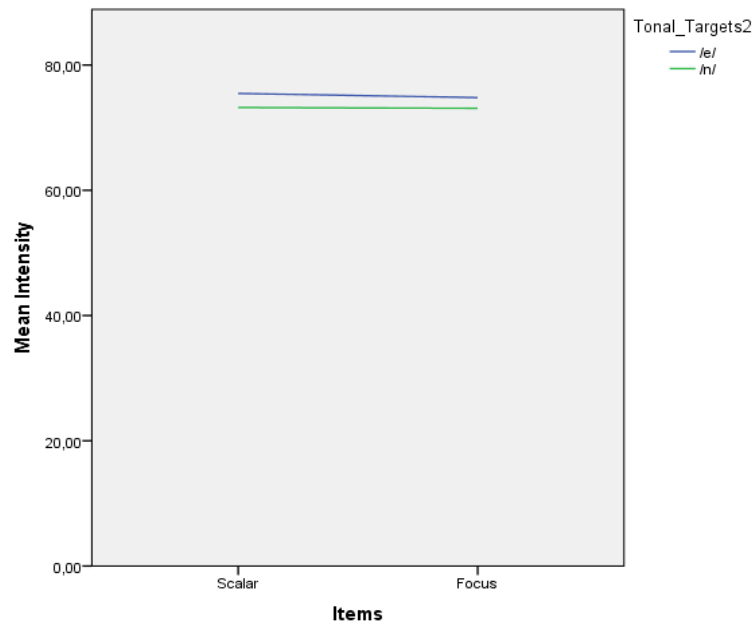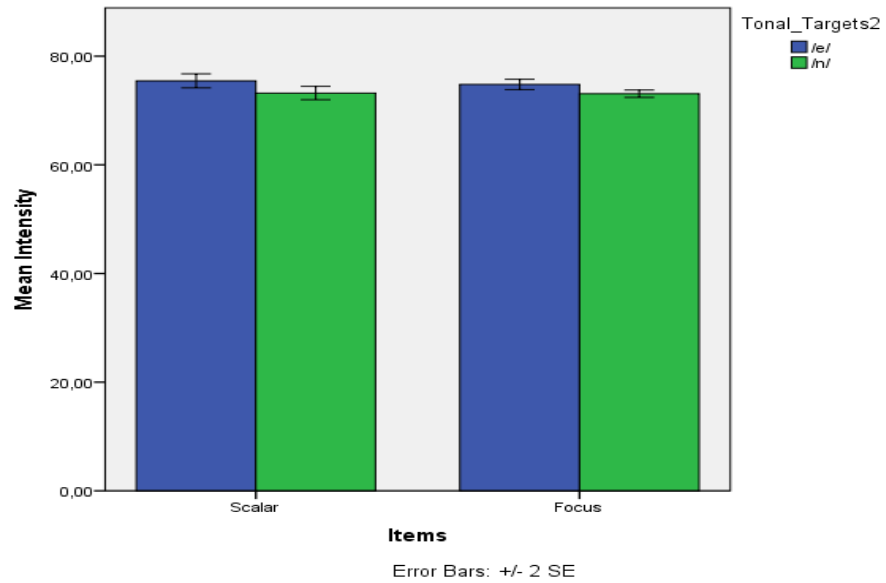


Figure 4.17: Intensity (in dB) of scalar /e/ and /n/ and in focus
Top: bar graph of the results. Bottom: line graph of the results.

### 4.2.6   Final observations:

The present results bring evidence that allow us to answer one of the main questions in this dissertation: what is the prosodic relation between an NPI in focus and a scalar NPI. Based on our analysis, there are several observations that assist in this task:

1)      Both the NPI in focus and the scalar NPI bear the same accent, namely an L+H*.

2)      An NPI not in focus and a non-scalar NPI in our data were both realized within a Low plateau.

3)      The sentential pitch contours in the scalar condition in Experiment 1 and the NPI-focus condition in Experiment 2 are very similar. Same for the non-scalar condition and the NPI not-in-focus condition.

4)      Pitch, duration and intensity were shown to be the critical acoustic cue that differentiates the prosodic profiles of the two NPI paradigms.

5)      There is no difference in terms of pitch or intensity but there is in terms of duration between a scalar NPI and a focused NPI.

6)      Deaccentuation was observed in the post-NPI part of the utterance both in the case of the scalar NPI and the NPI in focus.


This suggests that, in the case of the Greek NPIs, the prosodic apparatus employed to signal

focus and scalarity exhibits a partially similar profile. This illustrates the multi-dimensional role of prosody within natural languages: a continuous property of the speech signal relatively difficult to be segmented and yet a handy tool for speakers to express both fine grained semantic/pragmatic notions and package information.

To sum up, in Experiment 1 we saw that speakers manipulated prosody to distinguish between a scalar and a non-scalar interpretation of the Greek NPI *κανένα*. This confirms Hypothesis 1 that emphatically realized NPIs are scalar items whereas the non-emphatic ones do not share this property. We also replicated previous results on the Focus prosody in Greek and saw that this phenomenon shares a very similar contour with the NPIs (Hypothesis 2). Furthermore, in the last part we saw that apart from duration, the scalar NPI and the NPI in focus exhibit similar acoustic properties.

# Chapter 5: INTONATION, NEGATION AND SCOPE IN GREEK NPIs

Setting the goals of this dissertation in the beginning, we stated that we want to explore the relation between scope and NPI-hood. In the present Chapter our aim is to present our experiment and findings on scope. I will rely on the study of Chatzikonstantinou, Giannakidou and Papadopoulou (2012); Chatzikonstantinou et al. for short) on the intonation of the Greek NPIs, and draw some new conclusion of how these data can be interpreted given the Giannakidou and Yoon's position that emphatic NPIs are scalar NPIs., and exploiting the results from Experiment 1 which revealed a difference between a scalar and a non-scalar NPI. I suggest improvements in Chatzikonstantinou et al which will provide a better understanding of the relation between NPIs and scope. The study is based on Giannakidou's earlier analysis under which the emphatic NPIs are described as universal quantifiers that take wide scope above negation whereas the non-emphatics take narrow scope under negation (Giannakidou, 1998, 2000, 2006).

Starting from this point, our question is whether emphatic intonation – which in Chapter 2 was shown to be an L+H* tone associated with the scalar NPI – always triggers a wide scope interpretation or if this is a feature of the emphatic NPI per se that interacts with its semantics. If the first is true, it can be taken as evidence in favor of a general prosodic mechanism that applies uniformly on all quantificational expressions and their scope taking in Greek.  In the case of the second, it will suggest that the effect of intonation

can be lexical and perhaps be encoded as a kind of morphological feature on the lexical entry. Taking all these in account, we took a developmental perspective on our investigation and we tested the relevant hypothesis with 6 years old native speakers of Greek.

## 5.1    Background

There are two NPI paradigms in Greek which differ in certain syntactic respects. In Chapter 2 we also showed that the emphatic variant exhibits scalar properties whereas the non-emphatic does not. Below we list some of the syntactic diagnostics used in Giannakidou (1998) that illustrate the different syntactic behavior between the two variants:

(i) Fragment answers

Only the emphatic NPI can give a successful fragment answer:

(82)     - Pjon idjes?

        "Who did you see?"

        - {KANÉNAN/*kanénan}

          Nobody/*Anybody.

The ability to answer negatively as a fragment is the hallmark property of NPIs known as n-words (Laka 1990; Zannutini 1991, Giannakidou 2006). The emphatic NPI can be used as a negative fragment answer, but the non-emphatic NPI cannot. Giannakidou 1997, 1998, 2000 argues that the fragment NPI is the remnant of an elliptical structure, and "given that the remnants in fragment answers are accented, non-emphatics are excluded because they are not accented. Considering that utterances with non-emphatics typically involve pitch accent on negation, we may argue alternatively that ellipsis excludes non-emphatics because the accented negation itself must be deleted." (Giannakidou 2000: 469). The negative fragment answer does not entail that the emphatic word is negative, since the structure contains ellipsis that itself contains negation.

(ii) Licensing in islands

Another difference between emphatic and non-emphatic NPIs with negation concerns locality. Non-emphatic NPIs, but not emphatic NPIs, are licensed in syntactic islands. The example below illustrates this with a relative clause (but other examples are given in Giannakidou 1998; see also Quer 1993 for a similar observation about Catalan n-words):

(83)  Dhen prodhosa      mistiká [pu      ekséthesan {kanénan/*KANÉNAN}]

*betrayed.1st secrets    that exposed.3pl n-person*

"I didn't reveal secrets that exposed anybody."

In this respect, non-emphatics are like any, which is also licensed in islands as we see in the translations. Importantly, the inability of KANENAN to be licensed in the island was one of the arguments in Giannakidou that set apart the emphatic NPI from a focus in situ which is typically fine in islands (see also Tsimpli 1995).

(iii) Long distance licensing

Given that non-emphatics appear in islands, it is not surprising that they also appear long-distance, again like any. Notice too the contrast with the emphatic NPI:

(84)      I      Ariadne      dhen    ípe      oti      ídhe    {típota/*TÍPOTA}.

          *the      Ariadne      not      said.3sg      that      saw.3sg n-thing*

          "Ariadne didn't say that she saw anything."

The observed locality of the emphatic NPI is again typical of negative concord, and is reminiscent of universal quantifier dependencies, which are also clause-bounded (for Greek, see Farkas and Giannakidou 1996).

(iv) Strict negative concord, and n-words as strong NPIs

Greek exhibits strict negative concord, i.e. it always requires the presence of negation for the licensing of the emphatic NPI:

(85)  a  KANÉNAS *(dhen) ípe    TÍPOTA.                          Greek

         *n-person      not    said.3sg n-thing*

         "Nobody said anything."

      b  Nikt   *(nie) uderzyl nigogo.                          Polish

         *n-person      not hit.3sg n-person*

         "Nobody hit anybody."

      c  Balázs *(nem) beszélt senkivel     semmiröl.          Hungarian

         *Balázs not spoke.3sg   n-person n-thing*

         "Balázs didn't talk about anything with anybody."

Greek, Hungarian, Japanese, Korean, and Slavic languages form a natural class in terms of strict negative concord, and require sentential negation even when more than one n-word occurs in a sentence. It is in this sense that n-words in these languages are strong NPIs: they need negation to be licensed (Giannakidou 1998, 2000), and cannot appear in non-negative nonveridical or downward entailing contexts:

(86)　　　　　Píjes　{poté/*POTE}　sto　　Parísi?

　　　　　*went.2sg ever　　　　in-the Paris*

　　　　　"Have you ever been to Paris?"


(87)　　　　　An dhis　　　tin Eléna {puthená/*PUTHENA}, na tis milísis.

　　　　　*if see　　　　　the Helen　anywhere　　　　subj her talk.3*

　　　　　If you see Eléna　　　　　anywhere,　　　talk to her.


(88)　　　　　Pare　　{kanéna/*KANÉNA} mílo.

　　　　　*take.imp.2sg　any　　apple*

　　　　　"Take any apple."


(89)　　　　　Borí　　　　na　　írthe　{kanénas/*KANÉNAS}

　　　　　*can.1sg　　　subj left.3sg n- person.*

　　　　　"It is possible that anyone/someone came."


The nonemphatic NPI is further licensed in disjunctions, with various modalities, and habitual sentences. With a few exceptions (noted in the literature), these are also licensing

contexts for any, but the Greek NPI lacks the free choice reading that any may exhibit in some of these contexts, and it is also non-scalar (Giannakidou 1998, 2009). In all cases above, the non-emphatic NPI is a narrow scope, non-specific existential.

(v) No double negation:

The multiple emphatic NPIs in Greek do not give rise to double negation:

(90)         KANÉNAS dhen ípe  TÍPOTA.

              *n-person        not     said n-thing*

              "Nobody said anything."

              # It is not the case that nobody said anything.

The sentence does not have a double negative reading, as we would expect under the hypothesis that the n-words are negative (e.g. Nobody said nothing). Based on such and other diagnostics Giannakidou (1998, 2000) suggests that the Greek emphatics are not negative quantifiers, but rather, universal quantifiers interpreted outside the scope of negation. She suggests that the difference between emphatic and non-emphatic NPIs is reflected in the following two logical structures:

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Logical representation of general negative statements

        a. $\forall x[P(x) \rightarrow \neg Q(x)]$         (Universal negation, emphatic NPI)

        b. $\neg \exists x[P(x) \land Q(x)]$         (Existential negation, non-emphatic NPI)

Since Giannakidou's claim, universal NPI n-words have been identified in Korean (Yoon 2008), Japanese (Yoshimura 2007), and one variety of Hungarian n-words (Suranyi 2006). These n-words, crucially, also have emphatic intonation. Puskás 1998 in particular argues for Hungarian that "This stress [i.e., the accent observed in Hungarian n- words] cannot be assimilated with the stress assigned in FP [Focus Phrase] which has strong emphatic or identificational reading. Therefore it cannot be argued that Hungarian negative phrases carry the feature [+f]" (Puskas 1998, p. 199). If these n-words are also universal quantifiers, the fact that the accent is not focus ties in with their semantic function as universals, and supports the argument that the morphological feature of NPI-universal relies on intonational recycling. Therefore, it seems that there are cross-linguistic cues that connect polarity, quantification and intonation. The interaction between quantification and intonation has been prominent since the early 70s; this is briefly introduced below with citations on recent work in Greek.

## 5.2 Prosody and Quantification

Sentences like (91) can be ambiguous in two ways depending on the scope relation between negation and the quantifier:

(91)   Every woman didn't sleep.

   a. "No woman slept"  (every > not)       =      ∀x [woman (x) ∧ ¬sleep(x)]

   b. "Some woman slept"  (not > every)     =      ¬∀x [woman (x) ∧ sleep(x)]

The meaning in (a) is generated if every is interpreted as taking wide scope over negation whereas the meaning in (b) corresponds to the case where negation scopes over the quantifier. For English, it has been observed (Jackendoff, 1972; Buring 1997) that each interpretation corresponds to a different prosodic structure; thus intonation was associated with the disambiguation of such sentences. In Greek, Baltazani (2002) investigated experimentally the interplay between prosody and quantification by adults conducting both a production and a perception study. The design included quantifiers like πολλά (=many) in object position within VO and OV structures that are ambiguous between two readings e.g.

(92)   Dhen elysan pola provlimata                (= not solved many problems)

       neg  solved.3p many problems

In the production study, Baltazani found that, depending on the meaning conveyed, (92) was realized under two distinct prosodic contours. More specifically, in both readings, the operator that was taking wide scope was associated with a focus NPA with the following part of the utterance being de-accented. In these cases, the focused word was aligned with a L+H* tone, which is the tone type commonly associated with focus in Greek (Baltazani and Arvaniti (2004)). This means that, when participants' intention was to convey the NEG > Quantifier reading, the negative marker was aligned with a L+H* tone and in the case of the Quantifier > NEG, it was the Quantifier that carried the particular tone.

In the perception part, the participants listened to sentences like (92) with a prosodic focus either on the negation or on the quantifier again within VO and OV orders. After listening to each sentence, the participants were given a table with 5 answers to choose which one corresponded better to the sentence they had just heard. In the case of (92), the 5 answers referred to small or large quantities of problems solved or not solved. The design was based on the hypothesis that sentence (92) under different interpretations refers to different quantity of solved or not solved problems. More specifically, the prediction was that, if negation is focused and takes wide scope, then (92) means «the problems they solved are not many», whereas, if the quantifier is focused and takes wide scope, then it means «the problems they did not solve are not many». The results showed a trend towards prosody playing a disambiguating role between the two readings in this design as well. This was not pronounced to the same extend for all quantifiers and for the decreasing ones it was less evident.

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In the current study we explore how Greek-speaking children interpret emphatically realized NPIs and universal quantifiers in object position. Before describing the experiment, we present previous experimental investigations on children's comprehension of sentences that contain negation and quantifiers and on children's ability of using prosodic cues in order to resolve different types of ambiguities.

## 5.3 Experimental investigations of existentially and universally quantified NPIs

Musolino, Crain and Thornton (2000) tested children's comprehension of sentences that included negation and an existential or universal quantifier like (93) and (94):

(93)    Every horse didn't jump over the fence

(94)    The detective didn't find someone/some guys

As it was mentioned above, these sentences can be ambiguous between a wide scope and a narrow scope reading. The authors tested children (3 – 7 years old) in a series of experiments using a Truth Value Judgment Task (TVJT) during which participants see a scenario involving an agent acting as the main character who performs an action with

different outcomes (he may fail or succeed) upon a set of objects or a set of other characters. Then they listen to a sentence, in the case of Musolino et al., a semantically ambiguous sentence containing a quantifier and negation like (93) and (94), that comments on the action performed in the scenario. At that point the participant is asked to respond by accepting or rejecting the comment. The benefit from such design is that the responses are associated with a different scope reading for the quantifier in the sentence-comment, which was exactly what Musolino et al. (2000) were investigating. Their results suggested that children showed a preference in resolving scope ambiguities on the basis of overt syntax whereas there was not such an observation for the adults. Musolino et al. coined the term Isomorphism for this phenomenon and the main claim made by the authors was that "children have INCOMPLETE rather than ACCURATE knowledge of the adult grammar" (Musolino et al. 2000, p. 2).

However, a different line of research of the same phenomenon suggests that inverse scope readings are in fact available in child grammar and that children differ from the adults in terms of their response strategy to infelicitous statements (Gualmini, 2004, p.8). In a TVJT, Gualmini showed that children accommodate differently sentences with the same truth-value but with different felicity properties with respect to a scenario they saw. Musolino and Lidz (2006) tested children at the age of 5 and reached a similar conclusion by manipulating the contextual conditions in a TVJT. According to the authors, this ability was "masked" in the design of Musolino et al. (2000) due to task-effects and what, in fact, children differ in is: "[…] their command of pragmatic principles associated with the use

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of quantified statements is much more fragile than that of the adults" (Musolino and Lidz, 2006, p.1).

In the developmental research on NPIs, Thornton (1995) used a TVJT to investigate the comprehension of the English existential any in relation to the negation by children in the age between 3;6 - 4;11. The results showed that by that age children can generate both $\exists > \neg$ and $\neg > \exists$ readings depending on the surface position of the NPI with respect to the negation. Further evidence on the acquisition of the NPIs comes from O'Leary and Crain (1994) who conducted an Elicited Production task (reported in Musolino et al., 2000.) in order to investigate children's (4;4 -5;4) command of the NPI any/anything and the Positive Polarity Items (PPIs) some/something. The results showed that in the case of the NPI the children exhibited adult-like awareness of the distributional constraints that govern the licensing of any, whereas, according to the data, this conclusion did not apply on the case of some.

### 5.3.1 Previous experimental investigations

The experimental data from recent research on children's ability to resolve ambiguities of different types do not point to a clear conclusion. Choi and Mazuka (2003) tested 3 and 4-years old Korean-speaking children in two tasks: one involved word segmentation ambiguities and the other structural ambiguity. The results showed that children effectively used the prosodic cue on word segmentation but not on the structural ambiguity task.

Similar results are reported in Snedeker & Trueswell (2001) who investigated English-speaking, 5-years-old children's competence with respect to the disambiguation of Prepositional Phrase (PP) attachment relying on prosodic cues. The results based on off-line judgments suggested that children failed to use prosodic information to disambiguate sentences like tap the frog with the flower in order to distinguish between a VP-attached instrument meaning or an NP-attached modifier meaning of with the flower. Zhou et al. (2011) report that 4 to 5-year-old Mandarin-speaking children did not use stress in order to resolve structural ambiguities that involved the focus particle zhiyou "only" whereas adults did. While this result was based on off-line judgment data, Zhou et al. also used an on-line technique (eye tracking), the results of which brought evidence that children did indeed use stress.

Against this skepticism, it seems that there is experimental evidence supporting the view that children use prosodic information effectively in order to resolve different types of ambiguities. Zhou et al.'s in the same paper describe a second experiment where the data showed that children prosodic cues in order to resolve a speech act ambiguity in the case wh-phrases in Mandarin. Nakassis & Snedeker (2002) explored the degree to which children use prosodic information in the comprehension of ironic statements. Their findings suggested that during comprehension of ironic statements children were as sensitive as the adults to particular prosodic realizations of such statements when uttered within specific type of contexts that triggered non-literal interpretations. Finally, Snedeker & Yuan (2008) in a follow up of Snedeker & Trueswell (2001) investigated the relation

between intonation and PP-attachment, this time using an on-line eye-recording method and found evidence that children used the prosodic cues to resolve the structural ambiguity.

## 5.4    The present experiment

In light of the above considerations the primary research question we addressed was the extent to which children associate prosodic focus on a universal quantifier or an emphatic NPI with wide scope reading. This gives the opportunity to investigate how children use prosodic cues in the interpretation of universally quantified structures in Greek and whether the wide scope reading can be attributed to a general effect of the prosodic component or alternatively whether it is a morphological feature of specific lexical items.

The experiment was designed to test children's comprehension of sentences where an emphatically realized NPI or universal quantifier occurs in a post-negation position in the overt syntax. The questions that arise are whether children interpret the quantified expressions as taking wide scope over negation and whether this is a general mechanism that applies both in the case of the NPIs and the universal quantifiers. For this reason we compared the emphatic NPI " KANÉNA" with the quantifier "όλα" (=all) located in a post-negation object position.

This study might also add to the discussion about children's competence in using prosodic cues in order to resolve different types of ambiguities and their ability to access both isomorphic and non-isomorphic interpretations.

### 5.4.1  Participants

We tested 18 Greek-speaking children (8 boys and 10 girls) aged from 5;8 to 6;2 (mean  6) years. The children were selected from a primary school in Greece. After the studies of Thornton (1996) on NPIs and O'Leary & Crain (1994) on NPIs and PPIs, both in English, we know that children younger than 6 are competent in the production and comprehension of these lexical categories. However, our reason for testing subjects of age 6 was that the experimental task we engaged the subjects in involved competence in the use of prosodic information. That was an extra task compared to the previous studies in English. Moreover, taking into consideration the mixed results on children's ability to use prosodic information for resolving semantic/pragmatic ambiguities, we decided to test subjects 1-2 years older than those that Thornton and O'Leary & Crain tested. For this study IRB was obtained from our Greek collaborator and the Aristotle University of Thessaloniki.

### 5.4.2 Procedure

We tested the subjects using a TVJT (Crain and Thornton, 1998; Musolino et al. 2000) during which the participants saw a pictorial scenario on a computer screen where an agent was performing an action upon a set of objects (4 or 5 objects) and listened to a sentence that contained an NPI or a universal quantifier. The sentence was a statement relevant to the outcome of the agent's action and the participants were asked to accept or reject the statement. A third option of "not sure" was also available.

### 5.4.3 Materials

The pictorial scenario consisted of cartoon pictures and the sentences - statements were pre-recorded by one of the researchers (female) in order to control for uniformity regarding the prosodic realization of the utterances, since this was important for the study.

The stories depicted a set of four or five objects (apples, windows, etc.) and an agent who was supposed to perform an action related to the objects. Each pictorial scenario was preceded by an introductory written text that introduced the subjects to the main character and the set of objects that appeared on the screen. It was $1 - 1,5$ lines long and it was designed to be as neutral as possible by providing only the necessary context for the interpretation of the scenario. Figure 5.1 shows an example of a pictorial scenario:

[*introductory text*]

*Mary is a cleaning lady. In the morning she opens the windows of the house she is cleaning.*

*This morning:*



Figure 5.1: A typical pictorial scenario.

Since this study addresses the question of whether the prosodic focus on universal quantifiers triggers a wide scope interpretation, we used sentences - statements like those in (95) - (97) that differed only in the use of an emphatic NPI or a universal quantifier in an object position.

(95)    Dhen anikse KANENA parathiro.

       *neg opened.3s    NPI    window*

       "She didn't open any window"

(96)    Dhen anikse OLA ta parathira.

       *neg  opened.3s ALL the windows*

       "She didn't open all the windows"

(97)     DHEN anikse ola ta parathira.

    *neg opened.3s  all the windows*

    "She didn't open all the windows"


The crucial conditions were sentences (95) and (96) that contain an emphatic NPI and an emphatically realized universal quantifier respectively. In the pre-recorded material, the sentences were systematically realized as a L*  H-  L+H* L% contour. In line with the previous literature, the focused item was aligned with the L+H* and the highest peak in the utterance e.g.


    Dhen anikse KANENA parathiro.

    *neg opened.3s    NPI    window*

    "She didn't open any window"

        L*    H-      L+H*        L%

If the prosodic focus is in general associated with wide scope then we should expect that both KANÉNA and ÓΛA would be assigned a wide scope interpretation. The expectation about the quantifier in (96), which is not in prosodic focus, is to be interpreted under a narrow scope reading that corresponds to the overt syntax of the sentence (Musolino et al.,

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2000). The prosodic pattern in (96) was different with the negative operator being in focus and subsequently carrying the L+H* tone followed by a low plateau.

The motivation for using the quantificational expressions only in a post-negation position was to minimize the effect of Isomorphism that Musolino et al. (2000) observed under a similar design. If KANÉNA or ÓΛA were preceding the negative marker, the wide scope reading associated with these elements could be attributed to some extent to the surface syntactic position of these elements. By putting KANÉNA and ÓΛA in a post-negation position, we minimize the association between overt syntax and wide scope. Thus, limiting the effect of overt syntax, we can be more confident that the wide scope interpretation of KANÉNA or ÓΛA emerges through a covert movement in the LF triggered by the prosodic focus. In this case, the NPI or the universal quantifier moves covertly to a position above the negation and this movement generates the wide scope reading.

We manipulated the cartoon pictures in order to design scenarios where the sentence - statement was true under a narrow scope reading and false under a wide scope reading. We also added scenarios where the sentence was true under the wide scope and false under the narrow scope reading. Therefore, we make the following two predictions:

Hypothesis 1:

The sentence with the emphatic NPI will always be interpreted as having the logical structure of a universal above negation. Thus, we expect that the emphatic KANENAS, but not necessarily the other universal quantifier, will be associated with a $\forall\neg$ reading. In this

case, there is no generalized effect of intonation. The association between the emphatic KANENAS and the wide scope is on the lexical level of the NPI.

Hypothesis 2: The scope-negation hypothesis

 In Greek, a pitch-accented quantifier takes wide scope over negation and a generalized intonation mechanism serves to disambiguate. Therefore, both the NPI universal and the universal quantifier will take wide scope over negation.

Overall, we used 30 critical items (10 tokens x 3 conditions) and 15 fillers randomized in 6 lists. Thus, each list consisted of 45 items (30 critical and 15 fillers) and each participant saw one list.

### 5.4.4   Method

The task lasted approximately 20-25 minutes (usually developmental studies tend to last no longer than that). Each participant saw 6 practice trials before that task started. All items were presented in a Macbook 13' screen. Children were told that they will see some pictures and then they will listen to a lady saying something about the pictures. They were also told that the goal of the game was to identify whether the lady is telling the truth or she was lying. So for each slide (that consisted of 1) a set of objects, 2) an agent, 3) an introductory context, 4) an audio file embedded), the experimenter would read the

introductory context and then immediately play the audio file. The participant then would

provide a judgement verbally in response to what she just heard.

### 5.4.5 Results

Table 5.1 presents the frequencies for wide, narrow scope answers as well as for "I am not

sure" responses.

| NPIS | WIDE SCOPE | NARROW SCOPE | NOT SURE | TOTAL |
|------|-----------|--------------|----------|-------|
| KANENAS | 149 | 1 | 30 | 180 |
| OLA | 77 | 36 | 67 | 180 |
| óla | 10 | 139 | 31 | 180 |

Table 5.1: Scope interpretation for NPIs

The results indicate that the children confidently associated prosodic focus with wide scope

in the case of KANÉNAS, whereas the wide scope answers were fewer for the case for

ÓΛA. As expected, children consistently associated the neutrally realized óla with narrow

scope under negation. The following figure illustrates this set of data in percentages.
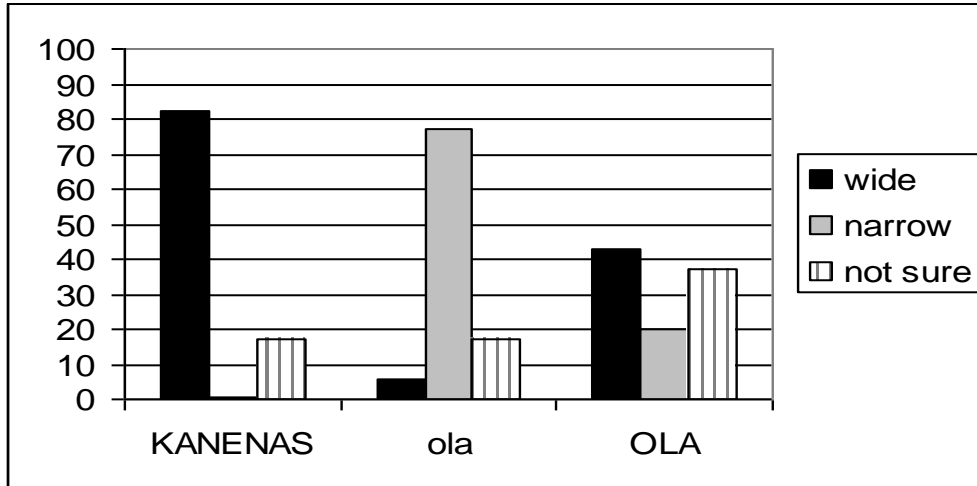
Figure 5.2. Scope interpretations for NPIs (%)

In order to detect whether the type of the quantifier affected the children's responses we conducted non-parametric correlation analyses, excluding all "not sure" answers. We conducted a non-parametric correlation analysis because the responses provided categorical data. The "not sure" responses were excluded because in several cases it was not certain from children's response whether that was an original expression of uncertainty or children were just playing. The first analysis in which we compared the responses for KANENAS with those for OLA showed that the quantifier correlated with the participants' performance ($\chi2$=51.867, p=.000, Cramer's V=.444), in that there were significantly more wide responses for KANENAS than for OLA. Furthermore, there was a significant correlation between quantifier type and scope interpretation when the data from OLA and óla conditions were analyzed ($\chi2$=109.338, p=.000, Cramer's V=.646). This means that OLA yielded significantly more wide scope responses than óla. Moreover, chi-square tests performed on the data from each quantifier revealed that the wide scope readings

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significantly outnumbered the narrow responses for both KANENAS ($\chi 2$=146.027, p=.000) and OLA ($\chi 2$=14.876, p=.000), whereas the opposite pattern was attested in the case of óla ($\chi 2$=111.685, p=.000).

## 5.5    Discussion and Conclusion

The results show that intonation did not have the same effect on an emphatic NPI and a pitch accented universal quantifier in Greek. Children showed a strong preference in associating KANÉNA with wide scope above negation, therefore we conclude that the emphatic NPI hypothesis is confirmed. Since intonation was not found to have a similar function in the case of ÓΛΑ 'all', we assume that emphasis is not associated with wide scope over negation in general. These observations suggest that the association of emphatic intonation with wide scope is a function specific to the emphatic NPIs in Greek as part of the lexical entry. Furthermore, the subjects were sensitive to the prosodic cues conveyed by the NPI and could effectively map intonation to semantics. Interestingly, children appeared to be in position to judge when prosodic emphasis was linked to wide scope and when it was not, which perhaps shows a certain degree of competence in mapping intonation to semantics. This might be considered as evidence to the direction that children are competent users of the prosodic information when it comes to the semantic interpretation.

Linking the present results to the developmental literature, cases like the Greek emphatic NPIs suggest that, when specific aspects of the prosody have been lexicalized and interact with the semantics of an entry, the preference to the overt syntax may not be retained. From this point of view, this observation is in the same frequency with the proposal that, when other factors come into play, children may not rely on the overt syntax and inverse scope can be an option showing a more adult-like behavior. (Gualmini, 2004 for the interpretation of negative sentences containing "some"). Furthermore, the semantic effect of prosody revealed on the lexical level is at some extend in line with those studies that show children's competence of using prosodic information when it comes to the processing of phenomena on different levels. (Snedeker & Yuan, 2008).

There are improvements that can be made to the current experiment which could help in our understanding of the scope of NPIs (this is also discussed in the Conclusions in the end of the dissertation). The first one concerns a comparison with an adult group. This will give us a means to compare to which extend our young participants' behavior is adult-like. Furthermore, it will be useful to include the non-emphatic kanena in the design and compare people's responses to the emphatic NPI. Initially we didn't include it because we were primarily interested in the effect of emphatic intonation on quantification and as the non-emphatics do not have such a prosodic profile were not included in any condition. Including a condition with non-emphatics would also capture the following scenario: the (only) scenario under which the emphatic is true is one that the non-emphatic can also be true. In the latter case the statement with the non-emphatic is a weak expression -in the sense that when someone sees five closed windows by saying "There are no open

windows" makes a stronger statement than saying "Some windows are not open.", even if both statements are true. Considering this, it would be useful to include the non-emphatic in the design in order to exclude this possibility as well as the possibility of children misinterpreting the intonation on the NPI while employing the weak statement in their judgment.

Additionally and in light of the findings in Experiment 1, we can give a different perspective on the interpretation of the data in the present experiment. In Experiment 1 we showed that the emphatic NPI was associated with a scalar interpretation whereas this was not the case for the non-emphatic. As Giannakidou and Yoon (2016) (p.3) argue, the scalar NPI is also exhaustive which for the items in the present experiment can be reflected in translations like "She didn't open any windows at all.". This seems to be true in those cases where the ∀¬ reading is true and thus it bears a truth conditional resemblance with what we have treated as an NPI-universal in this experiment. I would also argue that in these terms (scalar & exhaustive vs. non-scalar & non-exhaustive & anti-specific) and in the present experimental set up, there is a high possibility that KANENAS is not anti-specific or non-scalar. It cannot be anti-specific because the sentence that contains it concerns specific items upon which a judgment is asked for. There is little chance of being non-scalar because a scale is visually presented e.g. a scale of open/closed windows. Someone would use the non-emphatic in this case in order to make a statement about some window or other but not about specific windows that are in her visibility. And considering the scalar set up, it would be bizarre to expect that any judgment under these circumstances does not involve in the calculation all five windows that are visually present. In this perspective, a

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second reading of the results can be that children associated the emphatic NPI with an exhaustive/intensified interpretation that bears the same truth value with $\forall\neg$. This however does not allow for a direct comparison with OLA since the effect of intonation in each case would have a different explanation (the truth conditional hypotheses we stated in the beginning do not change though).

Concluding, the results showed that the children in the age of 6 systematically interpreted the emphatic NPI KANÉNA as a universal quantifier above negation. It can be argued that in the case of the emphatic NPI the association between emphasis and wide scope becomes conventional whereas for the non-NPI universal quantifier, emphatic intonation was not found to have a similar function.

# Chapter 6: TWO MODELS OF NPI LICENSING: EXPERIMENTAL EVIDENCE

In this chapter we explore further experimentally the phenomenon of polarity sensitivity and we ask whether the relation between a licenser and a licensee can be gradable. Similarly, to other linguistic phenomena that have been described as being gradable, we explore the possibility that the relation between an NPI and its different licensers vary in terms of strength. To put it simply, we ask the question of whether people find NPI licensing more felicitous under specific licensers than others.

## 6.1    Theoretical Background

Giannakidou (1998) proposes that there are two modes of NPI licensing, the "direct" and the "indirect" licensing. In short, the first is a semantic mechanism and refers to the licensing in the LF by non-veridicality whereas the second operates on the pragmatic level and exploits the implicature triggered by the various operators. The second is also coined the term "rescuing" which metaphorically implies that this secondary mode of licensing is coming in "rescue" in the absence of the primary semantic mechanism.

In order to investigate whether this claim corresponds to a certain psychological reality, we designed an offline task that sheds light to this fine distinction between semantic and pragmatic licensing of the NPIs in Greek. The different imprint of the semantics vs.

pragmatics in online or offline processing has been previously reported in the relevant literature. The seminal study by Noveck (2001) showed that French speaking children, even till the age of 11, show a preference in the semantic – instead of the pragmatic – interpretation of quantifiers like "some" or of certain modals. In the field of the NPIs, Xiang et al (2013) show that individuals in the autistic spectrum exhibit a lower performance with respect to the acceptability of rescued NPIs. Considering that individuals in the autistic spectrum exhibit weaker pragmatic skills, their result suggests that rescued NPIs are treated via a different route than those licensed in the LF. In a follow up online study Xiang et al (2016) show that in American English there is a qualitative difference between integrating semantic and pragmatic information conveyed by NPI licensers.

In a similar track, we designed a study with the aim to explore the distinction between semantic and pragmatic licensing of NPIs in Greek. This distinction can also be seen as a distinction between explicit vs. implicit negation: for example, whereas licensers like negation convey an explicit negative meaning in the semantic assertion, licensers like the *emotive factives* do that implicitly via a negative implicature. Furthermore, seeking cross-linguistic evidence to this distinction, we make a tentative comparison with data from Cypriot Greek (Chatzikonstantinou and Pavlou (in progress) and Pata & Chatzikonstantinou (in progress) who tested the same assumption on Greek attriters in the U.K.

In the following subsection and in order to illustrate the theoretical motivation of the present experiment, I will present briefly the theoretical claims about the distinction between direct licensing and rescuing as described by Giannakidou (1998, 2006).

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## 6.2    Rescuing by non-veridicality

In Chapter 2 we saw what it means for an NPI to be licensed by non-veridicality and illustrated that the relation between the licenser and the licensee operates on the semantic level. *Rescuing* on the other hand operates on the pragmatic level and can be considered as a secondary mechanism of NPI licensing. Giannakidou (1998, 2006) builds on Linebarger (1980) and suggests that "Polarity Item $\alpha$ can be rescued in the scope of a veridical expression $\beta$ in a sentence S, if (a) the global context C of S makes a proposition S' available which contains a nonveridical expression $\beta$; and (b) $\alpha$ can be associated with $\beta$ in S'. The non-veridical expression $\beta$ in this case involves negation and it is conveyed from the global context via a conversational implicature or a presupposition". In other words, in those cases when negation is not asserted in the semantics, it is implied via the pragmatics and "rescues" the NPI.

The case of the *emotive factives* is a good example of how rescuing works in English. Emotive factives presupposing their complement are veridical and therefore shouldn't license NPIs.

 (98)    Jill regrets that she killed the cat. → Jill killed the cat.

However, it seems that some polarity items like *any* in English are grammatical in such

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structures:

(99)  Jill regrets that she killed any animals.

In (99) *any* is not predicted to be grammatical since it is not in the scope of a non-veridical operator. Following Giannakidou (2006), we will assume that *any* in these cases is *rescued* due to a non-veridical inference in the context of the sentence provided via expressive content/attitude of verbs like *regret*. Being more specific, from (99) it can be inferred that:

(100)  Jill would prefer she had not killed an animal.

(100) is a non-veridical inference and it can be thus suggested that this is the reason why *any* is tolerated in such structures. In light of this, one might expect a qualitative difference in terms of processing (used in the broader sense, meaning any type of off-line judgment or on-line response) by the individual. As Giannakidou points out, "the tolerance in the case of rescuing is a LIKELY state of affairs, rather than a NECESSARY one". This is an important point for the theory overall and for the types of dependency between the NPIs and their licensers: in the case of licensing, the constraint that requires the NPI to be in the syntactic scope of its licenser must be satisfied. If it is not satisfied, the NPI is not grammatical. In the case of rescuing, this primary condition is violated and the parser

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initiates a different procedure trying to rend the NPI grammatical. She searches for non-veridical traces in the sentence that in this case will be derived by the global context as an implicature. Therefore, rescuing is a secondary and LIKELY state of affairs that relies on pragmatic inferences that can potentially be controversial, negotiable and selectively derived. This type of dependency will be assumed to be weaker compared to the one that is 1) NECESSARY and 2) it operates on the syntactic level and the dependency between the NPI and the licenser is regulated by the scope relation between them without any reference to additional inferences. For the shake of conventionality, we will call the first type of dependency *weak* and the second *strong*.

As it was mentioned in the previous paragraphs and as it will be shown in the following sections, we expect the difference between *strong* and *weak* dependency to reflect, not only metaphorically, a hierarchy of licensing strength within and between the NPI licensers and rescuers. This means that we expect to see native speakers treating differently sentences with NPIs in the presence of different (weak *vs* strong) licensers.

## 6.3    Experiment

In order to test the above theoretical assumptions, we performed an offline study and asked whether native speakers of Greek treat differently sentences that contain NPIs licensed by different operators. For this purpose, we conducted an Acceptability Judgment Task (AJT) assuming that, if the different modes of licensing correspond to qualitatively different relations between the licenser and the licensee, then we will see a variance in people's ratings.

**HYPOTHESIS**

**Licensing vs Rescuing**: A licenser that operates on the LF triggers a stronger licensing relation with the licensee than one that licensees an NPI via pragmatic inference.

### 6.3.1   Participants

75 individuals aged from 19 to 35 years old were recruited for the purpose of this study. They were all speaking Greek in daily life and the majority were in the process of obtaining a higher education degree from a Greek institution (University of Patras). The call for participants was for native speakers of Greek only; in the demographic data participants provided information about the number of languages they speak (most of them speak two, Greek and English). However, we did not collect information about the level of knowledge for the second language or years of living in a non-Greek-speaking environment. The fact that most of the participants were undergraduates may reduce the possibility for some of having spent significant amount of time abroad.

### 6.3.2   Material

The grammaticality judgment task comprised of 54 pairs of sentences of which 30 were

test items and the rest were fillers. The test items consisted of 5 conditions (30 test items x 5 conditions = 150 tokens) each corresponding to a different licenser and one condition without a licenser. Half of the fillers consisted of sentences similar to the experimental items but without an NPI and the other half consisted of pragmatically ill-formed utterances. The test items and the fillers were randomized in 5 lists and in each list each condition appeared 6 times. All pairs consisted of two sentences: one served as a context and the second was the target sentence (either a test item or a filler).

For example:

(101)  -  O Giorgos ine ekpliktos ithopios.                    (Context)

      *the George is    amazing   actor*

    "George is an amazing actor".


    - Elahistoi theates tou vrikan pote elatoma.            (Target)

    *very few spectators him found ever flaw*

    "Very few spectators ever found a flaw on him."


The target sentences contained a licenser and an NPI in a post-licenser position. In order to test the different modes of licensing, we employed four different licensers:

| Type of Dependency | Licensing | Mixed | Rescuing |
|---|---|---|---|
| **LICENSER** | Classical negation | Only (μόνο) | Emotive factives |
| | Very few (ελάχιστοι) | | |

We expect *classical negation* and *very few* to be stronger licensers than *only* and the *emotive factives. Negation* is considered to be the prototypical negative operator conveying a strong negative meaning, it is anti-morphic and anti-veridical whereas *very few* is anti-veridical but minimally negative (Zwarts, 1995; Giannakidou, 1998). Furthermore, negativity is morphologically marked on *negation* but not on *very few*. Therefore, we expect a higher acceptability rate in the case of the *classical negation* than on *very few*.

We classify *only* as a mixed case following Atlas (1993) and Giannakidou (2006) and their assumption that its semantics is a conjunction, for example:

Only John drank milk.


Entails: John drank milk ∧ no person other than John drank the milk


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the first conjunct is veridical whereas the second is non-veridical and thus we take *only* to be a case of mixed-veridicality. The second conjunct, which also happens to assert negation, is the source of NPI licensing. We assume that *only's* licensing strength is weakened due to this conflict of (non)veridicality and we expect participants to rate it lower than *classical negation* and *very few*. It can be however classified among the LF licensers as its negative meaning is asserted. The emotive factives on the other hand can be characterized only as rescuers as it was described in the beginning of the chapter.

We could also classify these operators in terms of *asserted* vs *non-asserted* negation following Xiang et al (2016) who based their approach on Horn (2001). The authors also use Clark (1976) terminology and call the first group **explicit** negation and the second **implicit**. In their own words "Some instances of explicit negation contain overt negative morphology (e.g., no, nobody other than); some contain no overt morphology but pass syntactic diagnostics of negation (few); and yet others are neither morphologically nor syntactically negative, but nevertheless assert a negative meaning (only). We call all these cases in which negation is an entailment of the sentence "explicit" negation, regardless of their morphosyntactic realization". On the other hand, as the negative meaning of the emotive factives is pragmatically inferred and non-asserted, this category is considered as implicit negation.

Each token contained the NPI "ποτέ" at the same position across all conditions. We kept the same NPI token across all tokens in order to avoid the possibility of different NPIs interacting differently with any of the four licensers. Therefore, we designed sentences like the following:

(102)  Kanenas fititis dhen djavase pote to Polemos kai Irini.

*no       student    neg  read     ever the  war     and peace*

"No student ever read War and Peace."

(103)  Elahisti fitites djavasan pote to Polemos kai Irini.

*very few   students    read      ever the war     and peace*

"Very few students ever read War and Peace."

(104)  Mono fitites djavasan pote to Polemos kai Irini.

*only   students    read      ever the   war     and peace*

"Only students ever read War and Peace."

(105)  Meno ekpliktos pou fitities djavasan pote to Polemos kai Irini.

*stay amazed      that students   read       ever the war and peace*

"I am amazed that students ever read War and Peace."

(106)  Fitites djavasan pote to Polemos kai Irini.

*students    read      ever the war     and peace*

"Students ever read the war and peace."

The last condition is the no-licenser condition and it is ungrammatical. We use this condition as a reference point of how the participants rate a plainly ungrammatical sentence of this type and how this would compare with the weaker modes of licensing.

In order to keep the distance between the licenser and the licensee equal across all conditions for the same token, *ποτέ* was always positioned at the same position in every sentence. The equal distance condition was possible for *ελάχιστοι*, *μόνο* and the *emotive factives* while for the classical negation, the licenser was somewhat closer to the NPI. The reason was that in Greek, the negative quantifier "no", that is located in the same position as the other licensers, is grammatical only under the presence of the negative marker "δεν". And in this structure, the negative marker is positioned one word after "κανένας" as in (102). Finally, regarding the emotive factives, we 've used three different tokens. This does not mean that the distance between the licenser and the licensee what the same across all tokens. For example in token A the distance may have been 4 words and in token B 6 words. We tried however to keep the distance across the different conditions of token A as similar as possible.

**Fillers**

We used two types of fillers:

**Type A**: sentences similar to the stimuli but without the NPI, e.g.

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(107)  Mono fitites djavasan to Polemos kai Irini.

   *only   students   read     the   war     and peace*

   "Only students read the war and peace."


(108)  Elahisti fitites djavasan to Polemos kai Irini.

   *very few   students     read     the   war   and peace*

   "Very few students read the War and Peace."


The purpose of including such sentences was to reduce participants' exposure and attention to "ποτέ".


**Type B:** We also included pragmatically ill-formed or tautologies, e.g.

(109)  Ta mila fitronun stin myti mu..

   *the apples grow       on   nose my*

   "The apples grow on my nose."

(110)  To Parisi ine to Parisi.

   *the  Paris    is    the Paris*

   "Paris is Paris."

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### 6.3.3   Method

All participants received the experimental material (one list out of the five we had prepared) in a Word document and completed it on their personal computer. They were asked to read the pairs of sentences and point on a scale from 1 to 5 whether the second utterance is an acceptable continuation of the first. This was important since the second utterance contained the NPI *ποτέ* which is the focus of the present study. It was explained to them that 1 corresponds to a non-acceptance of the second utterance as a logical continuation of the first and that 5 to the acceptance whereas 2, 3 and 4 correspond to intermediate stages of acceptance.

### 6.3.4   Results

In general, the results show a clear pattern of a strength hierarchy amongst the different licensers in Greek. As predicted (Zwarts & Giannakidou Hypothesis), sentential negation was found to be the strongest licenser followed by *very few*. The emotive factives and *only* received lower scores but without significant difference between them. As expected, the condition without licenser was rated with the lower score. Table 6.1 and Figure 6.1 below show the raw means for each condition:

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| Licenser | N | Mean | Std. Deviation |
|---|---|---|---|
| Negation | 75 | 4.4972 | ,54921 |
| Very few | 75 | 3,6417 | 1,05391 |
| Only | 75 | 2,5948 | 1,00654 |
| Emotive factive | 75 | 2,3627 | ,95795 |
| no licenser | 75 | 1,5845 | ,82462 |
| total | 375 | 2,9362 | 1,35654 |

Table 6.1: Mean acceptability scores for the different licensing conditions
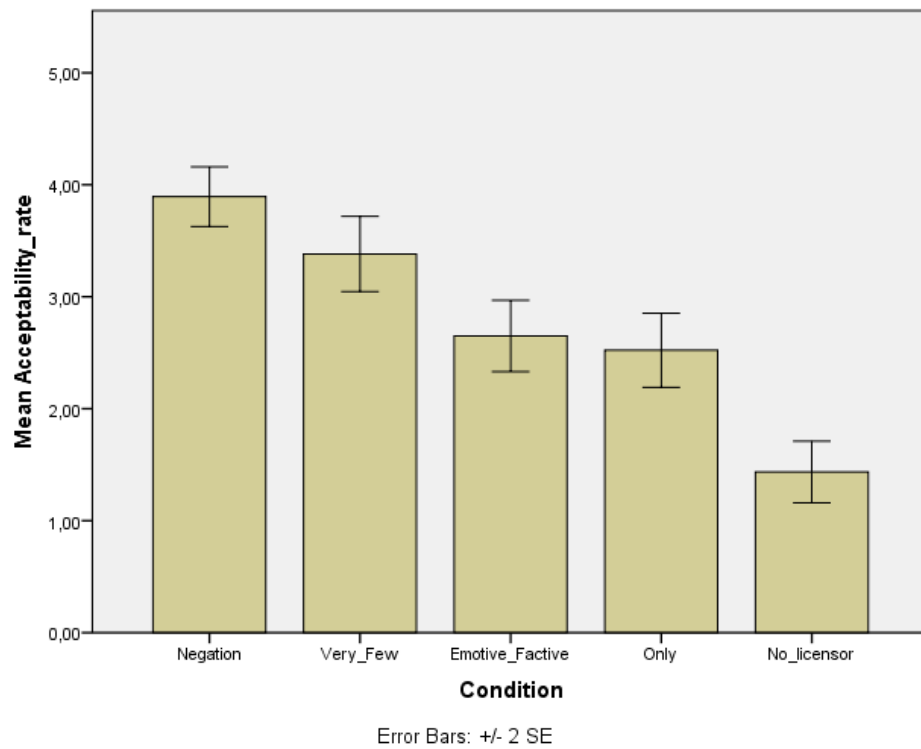


Figure 6.1: A visual illustration of the results in Table 6.1

A one way ANOVA showed a main licenser effect (F = 121.337, p<0001). Further analyses showed that apart from the comparison between the *emotive factive* and *only* (p = 0.14), all other comparisons were statistically significant (p<0001). Pairwise Bonferroni comparisons between all the other possible pairs of licensers showed that all the comparisons reached significance (p<0.0001).

Regarding the individual comparisons, the difference between the sentential negation and *very few* shows that in Greek there is a partition within the LF licensers. This is also evidence that the theoretical difference between an anti-morphic and a downward entailing operator in terms of licensing an NPI took effect in this study. The difference between the two operators is also illustrated in figure 6.2 below: comparing the first two rows (the topmost corresponds to Negation and the one immediately below to *very few*) the much higher concentration of responses between 4 to 5 in the case of the Negation compared to *very few* is evident:
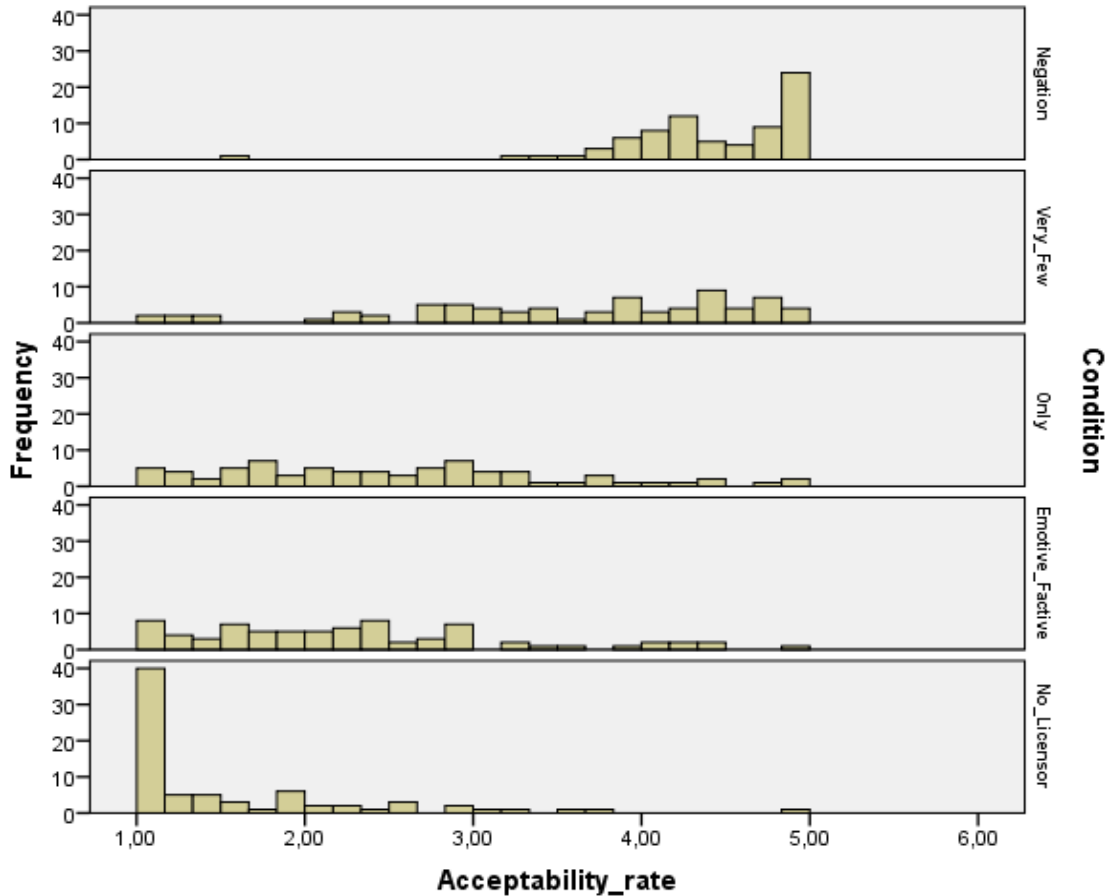
Figure 6.2: Distribution of participants' responses across the five conditions

In the case of *very few*, the acceptability rate is much more dispersed across the $1-5$ scale that is averaged in the 3.7 mean score. In light of this, we can say that negation in Greek is the prototypical NPI licenser and this is confirmed by the significantly higher acceptability rate we see in the present results.

Regarding the other pairs, the analysis shows that the difference between *very few* and the *emotive factives* is also statistically significant (p<0.0001). This again is another instance of explicit vs implicit negation or licensing vs rescuing where the difference

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becomes empirically supported. The difference between *very few* and *only* is also significant and this makes us think that the reason for this is the mixed profile of *only*. It is known (Giannakidou, 1998) that the Greek NPIs are "strict" NPIs and impose several constraints on their licensing, something that we don't see in the case of e.g. the English *any*: in our study it can be argued that *ποτέ* "sees" both conjuncts in the assertion of *only* and the veridical conjunct creates an infelicity. On the other hand, *any* is a more liberal NPI version and sees only the negative conjunct while it "tolerates" the non-negative one. This is something that we see in Xiang et *al* acceptability task and the relatively high acceptance of *only* as a licenser in English compared to our result.

Importantly, the emotive factives were rated lower than all the other licensers and this confirms the hypothesis that pragmatic licensing or rescuing or implicit negation is a weaker form of licensing. The fact that the difference with *only* was not significant can be attributed solely to the weakened profile of the latter due to its mixed profile. At this point we would say that these two operators are "equally weak".

These two operators are not as weak as the condition with no licenser. The fact that we see some degree of acceptance let us think that the Greek native speakers were perhaps more "tolerant" in semantic/pragmatic ill-formedness/infelicity than e.g. Cypriot speakers are. Chatzikonstantinou & Pavlou (in progress) ran a version of the present study on Cypriot Greek and the preliminary results show that the mean in the non-licenser condition is below 0.5. Perhaps this is a sociolinguistic effect considering the linguistic reality in Cyprus: the official language is Modern Greek while Cypriot Greek is widely spoken and in the same time there is a certain degree of English penetration due to the history of the

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island. Within this reality, Modern Greek is considered the most prestigious register. Perhaps the Cypriot participants exhibited a rather strengthened prescriptive approach when they are asked to provide grammaticality judgments in order to make a clear statement that they are competent speakers of Modern Greek. This however is a question to be answered by Chatzikonstantinou and Pavlou in the future. Pata and Chatzikonstantinou (in progress) tested the same material with Greek attriters in the U.K. and what they found was that the attriters rated the *emotive factives* higher than the native speakers of Greek. Despite the fact that the difference between the two populations did not reach significance, it shows that there was a raising trend for the emotive factive which suggests that pragmatic inferencing may be the first level that is subject to attrition.
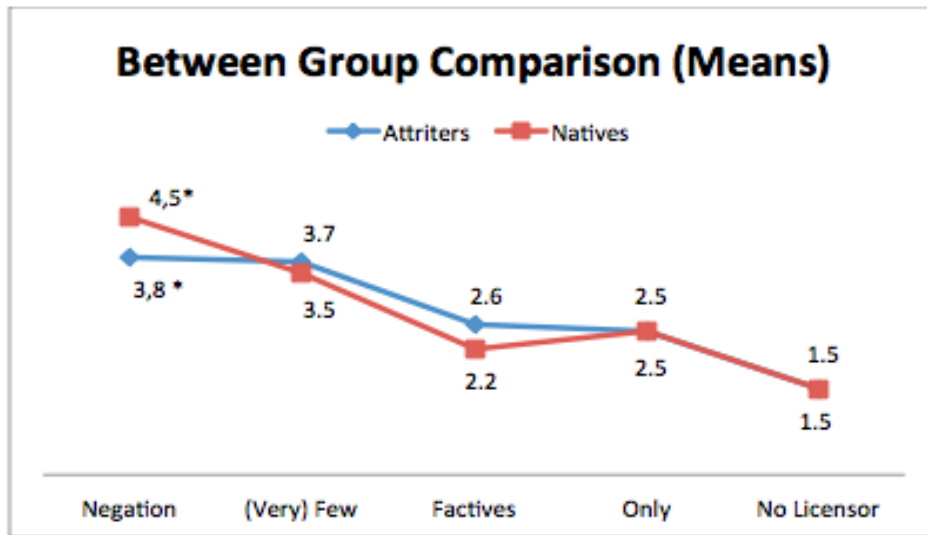


Figure 6.3: Comparison of the results between native speakers of Greek and Greek attriters in the U.K.

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## 6.4    Conclusion


To sum up, the present study is an advancement to the exploration of negative polarity that is a central goal in this dissertation. We asked whether native speakers of Greek treat differently NPI licensing under different licensers and we found that they did. Licensing at the LF was shown to be stronger than rescuing via pragmatics. The high acceptability rates for *classical negation* and *very few* in combination with the low acceptance of the emotive *factives* illustrate this. This result can also be interpreted in terms of explicit vs implicit negation with the former shown to be stronger than the latter. Judgments on *only* were closer to those on the *emotive factives* and we attributed this to the mixed profile of this operator. Overall, we showed that in Greek the dependency between an NPI licenser and NPI can be gradable in terms of strength and the emerged hierarchy we revealed captures this pattern.

# Chapter 7: FINAL CONCLUSIONS

Returning to where we started, the exploration of three different aspects of the NPI-hood and the Greek NPIs, we can now discuss in which ways the experimental findings presented so far inform both the theoretical and the experimental literature.

## 7.1    NPIs and Intonation

The first property of the NPI-hood we explored was whether and how the scalar variant is associated with intonation. Our first experiment suggests that the native speakers of Greek in our sample produced NPIs under two different prosodic patterns depending on the preceding context. Our interpretation was that the scalar interpretation was associated with an L+H* pattern aligned with the NPI whereas the non-scalar was realized within a L plateau. Considering this point first, it should be mentioned that the L+H* has been previously associated with scalarity (Pierrehumbert and Hirschberg (1990), C. Lee (2010)). The present study adds to this literature by providing experimental data -these previous studies are not supported by experimentation- to the interpretation of the L+H* and on the NPIs. I consider the present approach to be a continuation of this school of thought as well as Rooth's focus alternatives (even though Rooth does not clearly state that his focus alternatives are informationally arranged, and not just alternatives, on a scale just like C.Lee for example does). A recent study however (Exteberria and Irutzun, 2015) took an

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experimental approach on scalarity and their findings are worth to be discussed relative to our study.

In our study of the Greek NPIs from measurements we took from the vowel /e/ in the stressed syllable of *kanena* and the following nasal /n/, we find that *pitch*, *duration* and *intensity* are correlated with a scalar interpretation. Exteberria and Irutzun studied the Basque *ere* and explored further the acoustic correlates that trigger its scalar meaning in a production study similar to ours. They took measurements from different points in the utterance and report that *pitch*, *duration* and *intensity* were all correlated with a difference between the scalar and the non-scalar interpretation of *ere*. This does not mean that the difference was always associated with higher values in the scalar condition; for example, syllable *re* from *ere* was associated with significantly higher pitch on the non-scalar condition. Does this suggest that *re* is not aligned with a H or an L+H* tone perhaps which is the "scalar" tune reported in the literature and the one we see in our data? They don't provide a description in terms of Pierrehumbert's terminology and from their spectrograms, even if the difference between the simple and the scalar condition is evident, it is not entirely straightforward whether a specific contour pattern emerged, either sentential or phrasal. Our data allow for a rather clear picture in terms of pitch contour; even for the sentential level about which we don't make a claim for, in the scalar condition we observed a L* L+H H- L+H* LL% sentential pattern. This observation can serve as the basis for future research and be compared on specific terms (similar to what we did on the syllable level in Experiment 1) with similar structures (Baltazani (2005) studies Greek negative sentences but only visually). It should also be noted that the differences in pitch between

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the scalar and the non-scalar condition in our data are much larger than what Exteberria and Irutzun report in their data: we found a difference of approximately 60hz between the scalar and the non-scalar NPI whereas in Exteberria and Irutzun the larger the difference between the two conditions was 16 hz. This however should be taken with caution since the threshold of such differences in Basque may be different than what it is in Greek, and this certainly is another interesting path to investigate in the future for Greek.

Another point relevant to the specific acoustic correlates that should be discussed is the one that emerged when we compared the acoustic profile between *kanena* in focus and the scalar *kanena*. In our comparisons the two phenomena bear a significant similarity as they are both aligned with a L+H* tune followed by deaccentuation and they are similar in terms of intensity. However, they are different in terms of *duration*. Can this be taken as the differentiating factor between scalarity and focus in Greek? To our knowledge duration on the syllable level has not be linked so far with a particular phenomenon (but the literature is growing). Baltazani and Jun (1999) report that the duration of sentences that contain a focused item is larger than the same sentence without a focused item. We also know (Arvaniti, 2007) that stressed syllables are longer in duration compared to unstressed ones, but in the comparison under discussion this won't help us since both syllables are stressed. Greek is a language with lexical stress and it may be a bit hard to find instances where duration is a distinctive factor on the syllable level. For example, there is no distinction between lax and tense vowels, a distinction that might signal a special role for duration on the syllable level. But, we should not exclude the possibility that there are no such cases simply because researchers have not searched deeper in this direction so far. Perhaps in

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Greek duration on the syllable/lexical is correlated with semantic/pragmatic distinctions rather than dialectal differences. This leaves open for research a great deal of topics in the Greek experimental semantic/pragmatics where our method could be potentially applied.

At this point I would like to make a connection between the scalar meaning of the NPI and the implicated meaning of some scalar terms in virtue of both being to some extend "enriched" versions relative to what is conveyed by their counterparts (the non-scalar NPI and the semantic/not implicated meaning of some scalar terms). This is a rough approach and not an exact match but what I want to describe here is that the scalar NPI carries an intensified load compared to the non-scalar and this is an extra informational load. Similarly, the implicated meaning of a scalar quantifier like *some*, is an extra piece of information (*but not all*) added to its semantic meaning. We showed that as for the NPIs, this "enrichment" or intensification is realized via the particular type of prosodic prominence we observed. C Lee (2010) argues that a similar process of "enrichment" is achieved when Contrastive Topic intonation is applied on *some*. By no means do I suggest that the two phenomena are semantically or pragmatically the same, I only observe that in both cases we have some kind of meaning "enrichment" that, if true for *some*, both are linked to prosodic prominence. In the case of *some* of course, this does not result in a lexical distinction as in the case of the NPIs, it only triggers an upper bound implicature. To sum up, based on these two phenomena, it seems that when prosodic prominence is at play on semantics/pragmatics grounds, it produces a kind of meaning "enrichment".

Concluding, Experiment 1 draws the prosodic profile of the Greek scalar and non-scalar NPIs. The suggestion in Giannakidou and Yoon (2016) that prosodic prominence

is associated with the scalar variant was born out in our data. If intonation is an integral feature of the NPI-hood, then our results could be extended to English for which Krifka (1995) claims a similar distinction between a scalar *any* with special intonation.

## 7.2    NPIs and Scope

The second property of the NPIs we looked at was the scope properties of the emphatic variant. The fact that Giannakidou (1998, 2000) treats this variant as a universal quantifier also allowed us to shed light to the relation between quantification and intonation, a long standing question in the relevant literature (Jackendoff (1972), Buring (1977), Baltazani (2002)). We also looked at this from a developmental perspective bringing evidence to a not immense but growing literature on children's treatment of negative polarity. The results of this study touch several topics which I will address below as well as aspects of the design that can be improved.

The main finding was that the emphatic NPI is systematically associated with a wide scope interpretation above negation. This confirms Giannakidou (1998, 2000) who argued that the emphatic NPI in Greek always undergoes Quantifier Raising above negation in order to achieve the "none" reading. Children's responses were systematic in this respect; thus it can be said that they favored this interpretation. Why is this important for the question we set in the beginning of this dissertation and how does it fit the big picture? It is important for this dissertation because it reveals aspects of the Greek NPI profile beyond negative polarity or dependency to a licenser and suggests that NPIs also

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function as quantifiers with specific scope properties. Moreover, the special role of intonation on the emphatic NPIs played a crucial role and it was showed to interact decisively with the semantics of *kanenas*. Therefore, in the case of the emphatic we see a complex phenomenon of polarity, quantification and intonation all being at play.

Our findings suggest that intonation had larger effect on the NPI-universal than on the universal quantifier. In light of this, we wondered whether this prosodic feature is specific to the emphatic, perhaps it is somehow part of its lexical entry, this is how children learn it and the results in our experiment point to this developmental direction. In Greek however, apart from the lexical stress, we rarely see other a phonological or prosodic feature being part of a lexical entry in the way it may be attested in tonal languages. But in the same time and considering that in languages like in English the distinction between "anyone" and "nobody at all" is lexicalized, it wouldn't strike bizarre to expect that, since in Greek this distinction is not lexicalized, it may be signaled via another linguistic tool. This can be prosody. If this is true, the present findings give us a new perspective on the role of prosody in Greek and we can start looking at directions we didn't in the past due to a stereotypical conception of prosody in this language.

Attributing to prosody the role described above has a lexicalist flavor and we have put aside for a while the question of whether intonation has the same effect on all universal quantifiers. In this perspective we are not dealing with prosody as a lexical feature and we are looking at a generalized prosodic mechanism that may be systematically associated with scope. In Chapter 4 based on the results, we suggested that prosodic prominence is not associated with wide scope in general since our participants did not favor such an

interpretation for the emphatically realized "all". At this point I will take this a bit further combining input from the previous paragraph and make a hypothesis on an economy of language basis: perhaps there is a generalized role for prosody that interacts with scope somehow and it is applied on the emphatic NPI, and potentially on "all". Its application on the emphatic NPI however being more systematic in virtue of producing its $\forall\neg$ interpretation as its sole meaning, has somehow been amalgamated as part of its semantics. In this case, language reserved the role of expressing $\forall\neg$ for the emphatic NPI "reducing" the potential for other potential candidates like *all* to be associated with this reading. Regardless however what interpretation someone takes, the result remains that the emphatic NPI was consistently associated with a wide scope which was our initial hypothesis.

Looking at the specifics of the wide scope and taking in account that the non-emphatic in Giannakidou (1998) is analyzed as an existential quantifier with a narrow scope with respect to negation, one can argue that for some scenarios in our TVJT, both the $\forall\neg$ and the $\exists\neg$ are both true. And in these cases we don't know which interpretation actually children employ and subsequently we cannot be certain that it is the emphatic that is at play in the mind of the participants. This applies in a scenario with e.g. 5 closed windows and with a stimulus like (111):

(111)   Dhen anikse KANENA parathiro.

     *neg closed.3 NPI     window*

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Assuming a ∀¬ reading we end up with an interpretation like (111') and with a ∃¬ an interpretation like (111''):

(111') She didn't open any window at all.

(111'') She didn't open some windows.

Truth-value-wise both interpretations are true with respect to a scenario with 5 closed windows. The second one however is a weak statement in this situation and our assumption is that participants wouldn't favour this interpretation. This however needs to be experimentally tested and as a next step we would need to establish this distinction by including the non-emphatic NPI in our design. Adding to this and in order to examine further the role of intonation on universal quantification, it would be useful to add more universal quantifiers like *every*. This one is a distributive but it would be worth observing whether this stays "unaffected" by prosody in the same sense that *all* stayed. Finally and even though there are no previous arguments in this direction, it could be interesting to see whether manipulating other prosodic aspects e.g. adding a short pause before the quantifier preceded by a H-.

A last point that needs to be discussed is the developmental perspective in this study and how it is related to the general literature on children's comprehension of ambiguous negative sentences that contain a quantifier. One of the main arguments (Musolino, 2000) in the previous decade was that in sentences ambiguous in the sense we describe above, children show a preference in the overt syntax (Isomorphism). This suggests that children

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in general do not show a preference to the result of covert movements like the one that the emphatic NPI undergoes in order to be interpreted above negation. In follow up studies (Gualmini, 2004) this has been debated and Musolino's results have been attributed to infelicity in his experimental design (in the sense that somehow the design motivated children to favour an interpretation based on the overt syntax). Our results for different reasons are in the same direction and do not confirm the Isomorphism hypothesis. If we adopt the account according which the wide scope reading of the emphatic is triggered by its lexical properties, this would have a "lighter" impact on Isomorphism. This would be just a lexical exception, still however a real one, to the whole hypothesis. If we attribute a more generalized functional role to prosody however, then we may assume that Isomorphism captures partially the linguistic reality and when prosody comes at play the scope dynamics may be different. As Musolino's point was made on a developmental level, one of the reasons we didn't test an adult population was that our intention was to compare our results with Musolino's in this perspective (apart from testing how Greek speaking treat emphatic NPIs). But in order to see our study beyond this perspective and test whether the observed behaviour in our experiment is adult-like or not, we will need to run the same experiment on an adult population. This will give us the opportunity to apply further prosodic manipulations on our items and uncover other aspects of the relation between the NPIs and scope.

Overall, looking back from where we started, this study shed light on our understanding of what are the scope properties of the Greek emphatics. We saw that these words interact highly with intonation and this interaction affects their scope properties.

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## 7.3    Licensing vs. Rescuing

I will start from two general observations about NPI licensing that the present findings tell us and then I will narrow down to more specific aspects of the experiments. Looking at the obtained hierarchy (sentential negation > very few > emotive factive/only > no licenser) we see that polarity licensing may not be a clear cut binary distinction between *licensing* vs. *not-licensing*. The observed pattern suggests that the dependency between an NPI licenser and an NPI licensee varies in term of strength. Some dependencies are stronger than others and we saw that in Greek this is regulated by the nature of the dependency (semantic vs. pragmatic). This should not be surprising and perhaps it may be a signal to reconsider the conception of our conception of (in)felicity or even ill-formedness. Being more specific, this is not a claim about a hypothetical inappropriateness of these criteria but merely a look from a gradient perspective. This means that, with respect to our judgments as native speakers some phenomena may not be either felicitous or infelicitous but perhaps more or less felicitous; the low and high ends of the scale are still retained, so some instances can definitely be identified as felicitous or infelicitous, but under the gradient approach, our descriptive power between the two points is increased.

This type of gradience with respect to how we perceive or recognize linguistic input is something we see in other levels, like the phonetics. As native speakers we are good in recognizing speech even when the channel through which the speech is travelling does not allow for a rich encoding. Telephone speech is one such an instance where the signal is poor compared to face to face speech. People still understand what is said but they would favor a speech signal were more frequencies and features would be available. This may not

be an exact match with what is happening in the case of the NPIs licensing (mainly because in the case of speech we are talking about more or less features whereas in the case of the NPIs we are talking about a qualitative difference between semantic vs. pragmatic licensing) however, it shows that a gradient instead of a binary approach on our linguistic judgments is generally applicable and occasionally it provides a more accurate description of language.

The second point we see is a qualitative difference between licensing as a semantic vs. a pragmatic dependency. In our data this was reflected on the low score for the *emotive factives* compared to the *sentential negation* and *very few* (I will come to *only* below). The question that arises here is why pragmatic licensing in Greek ends up being a "weak" condition compared to semantic licensing and is this something we should naturally expect? I believe that the explanation in this case lies both on the different nature of semantic and pragmatic licensing as well as on the properties of the Greek NPIs compared to e.g. the English NPIs.

On a first level it can be argued that there is a certain degree of subjectivity and not automaticity in the case of the pragmatic reasoning. By this I mean that, considering that the negative component of the emotive factives arises via implicature, to some extend it depends on whether or not the individual actually makes this inference and at which frequency. These are hard questions to answer with an acceptability judgment task (and this is why this study should be extended) but even the fact that we pose them -while we don't for the semantic reasoning – this tells us something about the emergence of the implicature in these cases and the subsequent access to its negative load. Probably enough

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we are not talking about a conversational implicature that is purely context-depended and indeed it highly depends on the individual whether it will go through or not. The implicature in the case of the emotive factives could be described as relatively expected one, if it is derived, but not to the extent of being a conventionalized one. This said, it would be relatively expected that someone from "X regrets that …" immediately and without relying on the context infers "X would rather not …" but it wouldn't be bizarre if he doesn't. In this perspective, my view here is that these implicatures contain a certain degree of individuality, they are negotiable and they are subjectively derived. Therefore, their emergence is not guaranteed and this renders them a "weak" licenser. What I have just described is not the case for semantic licensing. The properties of the semantic licensers that are responsible for licensing NPIs are part of the logical meaning of these licensers and are always there. Subsequently, we expect the process in this case not to be negotiable or rely on individual reasoning, but rather it will emerge automatically as a constraint of the language per se. Due to its necessity and independence of meta-reasoning, I consider semantic licensing a "stronger" condition.

It should be point out that in the Greek data we see a further division within the semantic licensers, namely the comparison between *sentential negation* and *very few*. A quick thought is that this result suggests that negation is the prototypical NPI licenser and confirm the diachronically argued link between negation and NPI licensing. Going beyond that however, this result illustrates a difference in terms of negativity as the Zwarts – Giannakidou Hypothesis suggests: *sentential negation* obeys to all four DeMorgan laws whereas *very few* obeys to three of them. This renders sentential negation "more negative"

and perhaps the Greek NPIs are sensitive to these properties. Taking this path of "negativity" and following the categorization in Xiang et el based on Atlas, in our data we also see the difference between explicit negation that is morphologically marked (sentential negation) and explicit negation that is not morphologically marked (very few). But we don't see this distinction in the American English data at least in the acceptability judgment task. Someone might argue that during the whole process it is not only the licensers but the properties of the licensees as well that are involved in people's judgments. By that I mean that one of the differences between the Greek and the English NPIs is that only the first ones participate in negative concord and are not inherently negative (Giannakidou, 1998). English is not a negative concord language and in the case of two negative expressions in a sentence we have double negation reading. Furthermore, the Greek are "strict" NPIs meaning that, compared to their Spanish or Italian counterparts that participate in negative concord structures, the Greek NPIs require the presence of sentential negation in these structures (whereas the former don't). Taking in account these observations, one could say that it is not unexpected to see differences between the Greek and the American English results based on the properties of the NPIs.

Finally, returning to the results about *only*, at this point we can say that the mixed profile of this operator does not favor NPI licensing in Greek. Similarly to the above explanation about the difference between the Greek and the English data, I would argue about the "strict" profile of the Greek NPIs being responsible about the low score for *only*. Their requirement for the presence of negation is either not fully satisfied or the concurrent positivity and negativity is problematic for the Greek NPIs. This however can only

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motivate further research with other licensers and languages: it will be very interesting to test further pragmatic licensers that are syntactically more similar to the structures that contained the emotive factives. More specifically, we could use modals that allow for the NPI to be contained in an embedded clause just like the one with the emotive factives. It would also be a challenge to explore any differences that might be related to different NPI properties across languages following Giannakidou (2006) typology on NPIs.

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# APPENDIX A – EXPERIMENTAL STIMULI

**Experiment 1 – test items**

 Η Μελίνα δεν δήλωσε κανένα μάθημα.

 *neg register.1 npi    course*

"She didn't register for some course or other / She didn't register for any course at all."

Non-scalar context:

Melina participated in a summer school for Teaching English during July. The system was a bit different in this summer school and in order to get a certificate in the end, the only thing she had to do was to volunteer for a number of tasks.

Scalar Context:

Mary is a first year undergraduate and at her university it is obligatory for the first-years to register for at least one course in the first quarter. Otherwise they lose the quarter.  Mary however is renowned for forgetting about everything. The result in her case was to lose the quarter.

 Η Μαρίζα δεν διαβάζει κανένα μήνυμα.

*the Mariza neg read.3     npi       message*

"Mariza doesn't read some message or other. / Mariza doesn't read any message at all."

Scalar context:

Mariza is of in her 90s and she has just started using a mobile phone. At the moment, she can only make or receive calls but she has no clue about texting. Her family has already sent 10 texts to her but she has no idea!


Non-scalar context:

Mariza has a wide screen new Samsung and she uses it for everything, even for reading novels. Her sister often becomes judgmental on her using her mobile phone all the time, and from time to time criticize her. Their mother however, who knows that Mariza is using her Samsung for reading novels as well, defended her.


Η Μαίρη δεν έλαβε κανένα μήνυμα.

*the Mary neg received.3 npi message*

"Mary didn't receive some message or other. / Mary didn't receive any message at all."


Scalar Context

John and Mary are a couple in love. John goes abroad for a while and promises to Mary that every day he will be sending to her at least one text. John knows that this is important for their relationship, otherwise Mary gets very sad. However, things didn't go as planned, John didn't keep his promise and Mary got very sad.


Non-scalar context

Mary comes from a very rich family and her friends are very rich as well. It was her birthday yesterday and traditionally she receives very expensive gifts. Her friends usually buy for her Louis Vuitton handbags or jewellery. They don't keep it as simple as an SMS text to send their wishes. Therefore, they send expensive gifts, not simple ones:

<u>Η Μαρίνα δεν μάζεψε κανένα μολύβι.</u>

*the Marina neg clean.3 npi       pen*

"Marina didn't pick up* some pen or other. / Marina didn't pick up* any pen at all."

*in the sense of "cleaning a room of X"

Scalar context:

Marina is a naughty little girl and her room is always a mess. She usually throws all the pens around and her parents get really angry. Her mother warned her that if this time she doesn't pick up at least on pen from the floor, she won't have chocolate in the afternoon. Well, it turned out that Marina didn't have chocolate in the afternoon.

Non-scalar context:

Marina's room is a total mess primarily because of her dresses that are all over the place. This is the most important source of the whole mess and yesterday she spent all her efforts to clean the room of her dresses.

<u>Η Μιλένα δεν πέρασε κανένα μάθημα.</u>

the Milena neg passed.3 npi course

"Milena didn't pass some course or other. / Milena didn't pass any course at all."

Scalar context:

Milena attends the Medical School at the University of Thessaloniki. In order to qualify for the

second quarter, she needs to pass at least one course during the first quarter. It seems however that Milena did not qualify for the second quarter.

Non-scalar context:

Milena joined an educational schema that is not course-based. Instead, she has to go through some creativity tasks regarding poetry and painting, without of course being graded. That said, this is not a strict schema in the traditional basis and participants feel quite relaxed.

Η Ρηνούλα δεν μάντεψε κανένα νούμερο.

*the Renula neg guessed.3 npi     number*

"Renula didn't guess*  some number or other. / Renula didn't guess any number at all."

*in the sense of "guess correctly"

Scalar context:

Renula plays a game where she has to guess correctly 5 numbers in order to win. In order to qualify to the next round though, she only needs to guess correctly at least one. It turned out that she didn't manage to qualify to the next round.

Non scalar context:

Renula had to pay a fine to the State and she had to calculate it herself. As it was only one number, she didn't leave it at chance and calculate it after some hard thinking.

**Experiment 2**

Η Μελίνα δεν δήλωσε κανένα μάθημα.

Η Ρηνούλα δεν μάντεψε κανένα νούμερο.

Η Μιλένα δεν πέρασε κανένα μάθημα.


Η Μαρίνα δεν μάζεψε κανένα μολύβι.

Η Μαίρη δεν έλαβε κανένα μήνυμα.

Η Μαρίζα δεν διαβάζει κανένα μήνυμα.


**Experiment 3 – test items**


Δεν έσπασε όλα τα αυγά

*neg broke.1 all the eggs.*

"She didn't break all the eggs."


Δεν έσπασε ΟΛΑ τα αυγά.

*neg broke.3 all the eggs.*

"She didn't break all the eggs."


Δεν έσπασε ΚΑΝΕΝΑ αυγό.

*neg broke.3 npi egg.*

"She didn't break any eggs at all."

Δεν έφαγε όλα τα hot dog.

*neg ate.3 all the hot dogs*

"She didn't eat all the hot dogs."

Δεν έφαγε ΟΛΑ τα hot dog.

*neg ate.3 all the hot dogs*

"She didn't eat all the hot dogs."

Δεν έφαγε ΚΑΝΕΝΑ hot dog.

neg ate.3 npi hot dog

"She didn't eat any hot dog at all."

Δεν άνοιξε όλα τα παράθυρα.

*neg opened.3 all the windows*

"She didn't open all the windows."

Δεν άνοιξε ΟΛΑ τα παράθυρα.

*neg opened.3 all the windows*

"She didn't open all the windows."

Δεν άνοιξε ΚΑΝΕΝΑ παράθυρο.

*neg opened.3 npi window*

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"She didn't open any windows at all."

Δεν έπλυνε όλα τα πιάτα.

*neg washed.3 all the plates*

"She didn't wash all the plates."

Δεν έπλυνα ΟΛΑ τα πιάτα.

*neg washed.3 all the plates*

"She didn't wash all the plates."

Δεν έπλυνε ΚΑΝΕΝΑ πιάτο.

*neg washed.3 npi plate*

"She didn't wash any plates at all."

Δεν άνοιξε όλους τους φακέλους.

*neg opened.3 all the envelopes*

"She didn't open all the envelopes."

Δεν άνοιξε ΟΛΟΥΣ τους φακέλους.

*neg opened.3 all the envelopes*

"She didn't open all the envelopes."

Δεν άνοιξε ΚΑΝΕΝΑΝ φάκελο.

*neg opened.3 npi envelope*

"She didn't open any envelopes at all."

Δεν έφαγε όλα τα γλυκά.

*neg ate.3 all the candies*

"She didn't eat all the candies."

Δεν έφαγε ΟΛΑ τα γλυκά.

*neg ate.3 all the candies*

"She didn't eat all the candies."

Δεν έφαγε ΚΑΝΕΝΑ γλυκό.

*neg ate.3 npi candy*

"She didn't eat any candy at all."

Δεν έσπασε όλα τα μπουκάλια.

*neg broke.3 all the bottles*

"She didn't broke all the bottles."

Δεν έσπασε ΟΛΑ τα μπουκάλια.

*neg broke.3 all the bottles*

"She didn't broke all the bottles."

Δεν έσπασε ΚΑΝΕΝΑ μπουκάλι.

*neg broke.3 npi bottle*

"She didn't break any bottles at all."


Δεν έφαγε όλα τα ροδάκινα.

*neg ate.3 all the peaches*

"She didn't eat all the peaches."


Δεν έφαγε ΟΛΑ τα ροδάκινα.

*neg ate.3 all the peaches*

"She didn't eat all the peaches."


Δεν έφαγε ΚΑΝΕΝΑ ροδάκινο.

*neg ate.3 npi peach*

"She didn't eat any peaches at all."


Δεν έσπασε όλους τους υπολογιστές.

*neg broke.3 all the computers*

"She didn't break all the computers."


Δεν έσπασε ΟΛΟΥΣ τους υπολογιστές.

*neg broke.3 all the computers*

"She didn't break all the computers."

Δεν έσπασε ΚΑΝΕΝΑΝ υπολογιστή.

*neg broke.3 npi computer*

"She didn't break any computers at all."


Δεν έσπασε όλα τα βάζα.

*neg broke.3 all the windows*

"She didn't break all the vases."


Δεν έσπασε ΟΛΑ τα βάζα.

*neg broke.3 all the windows*

"She didn't break all the vases."


Δεν έσπασε ΚΑΝΕΝΑ βάζο.

*neg broke.3 npi window*

"She didn't break any vase at all."


**EXPERIMENT 4 – test items**


Κανένα σούπερ μάρκετ δεν το έφερε ποτέ.
*npi       super market   neg it brought ever*
"No super market ever brought it."

Καμία προεδρική ομιλία δεν περιείχε ποτέ ψέματα.
*npi presidential speech neg contained ever lies*
"No presidential speech ever contained lies."

Κανένας φοιτητής δεν βγήκε ποτέ έξω.
"No student ever went out."

Κανένας νέος σκηνοθέτης δεν χρησιμοποίησε ποτέ ειδικά εφε.
"No young director ever used special effects."

Κανένας πελάτης του ΟΤΕ δεν είχε ποτέ την ευκαιρία να δει ένα τέτοιο κινητό.
"No new Verizon customer ever had the chance to see such a new mobile phone."

Κανένας πολιτικός από την Αθήνα δεν είπε ποτέ την αλήθεια.
"No politician from Athens ever told the truth."

Κανένας μετεωρολόγος δεν υπήρξε ποτέ απολύτως ακριβής.
"No weatherman has ever been totally accurate."

Κανένα σπίτι στην οικοδομή της Σοφίας δεν έβαλε ποτέ χριστουγεννιάτικα λαμπάκια.
"No house at Sofia's block ever put Christmas lights."

Κανένα ορεκτικό που σέρβιρε δεν περιείχε ποτέ κρέας.
"No appetizer he served ever had meat in it."

Κανένας νέος μάγειρας δεν έκανε ποτέ λάθος.
"No new cook ever made a mistake."

Καμία νοσοκόμα δεν είχε ποτέ ελεύθερο χρόνο.
"No nurse ever had free time."

Κανένα μέλος δεν την νίκησε ποτέ σε αγώνα.
"No member ever won at a game."

Κανένας γνωστός  δεν κατάφερε ποτέ να το βρει.
"No acquaintance ever managed to find it."

Κανένας ορειβάτης από την Γαλλία δεν κατάφερε ποτέ να την κατακτήσει.
"No mountaineer from France ever manage to conquer it."

Κανένα αθηναϊκό εστιατόριο  δεν είχε ποτέ τον αυθεντικό.
"No Athenian restaurant ever had the original one."

Κανένας φίλος μου δεν κατάφερε ποτέ να φάει.
"No friend of mine ever managed to it eat."

Καμία ερώτηση πολλαπλής επιλογής δεν μπέρδεψε ποτέ τους μαθητές.
"No question of multiple choice ever confused the students."

Κανένας μουσικός δεν απέσπασε ποτέ καλές κριτικές.
"No musician ever received good critic."

Κανένα πάρτυ της Μαρίας δεν έγινε ποτέ χωρίς αυτό.
"No party organized by Mary ever took place without this."

Κανένας ειδικός ερευνητής δεν πήρε ποτέ χρηματοδότηση.
"No expert research ever got funding."

Κανένας τουρίστας δεν πήρε ποτέ αυτοκίνητο για να πάει σε κάποιο αξιοθέατο.
"No tourist ever bought a car to visit a monument."

Κανένας πίνακάς του δεν είχε ποτέ ακρυλικά χρώματα.
"No painting of his ever got acrylic paint."

Κανένας πολιτικός αναλυτής δεν έκανε ποτέ έγκυρες προβλέψεις.
"No political analyst ever made accurate predictions."

Κανένας φοιτητής Ρώσικης Φιλολογίας δεν κατάφερε ποτέ να το τελειώσει.
"No student of Russian Philology ever managed to finish it. "

Κανένας αθλητής στην κατηγορία του δεν κατάφερε ποτέ να τον κερδίσει.
"No athlete in his category ever managed to win him."

Κανένας μαθητής δεν είχε ποτέ τέλεια αποτελέσματα.
"No student ever had perfect results."

Κανένας φίλος του δεν του εμπιστεύεται ποτέ κάτι.
"No friend of his ever trust him for anything."

Κανένα φόρεμα που της αγόραζε άλλος δεν της άρεσε ποτέ.
"No dress bought by someone else ever fell within her preferences."

Καμία γάτα δεν γλύτωνε ποτέ από την αγκαλιά της.
"No cat ever escaped her hands."

Ελάχιστες νοσοκόμες είχαν ποτέ ελεύθερο χρόνο.
"Very few nurses ever had free time."

Ελάχιστα ορεκτικά που σέρβιρε περιείχαν ποτέ κρέας.
"Very few appetizers that he served ever had meat in them."

Ελάχιστα μέλη της ομάδας την νίκησαν ποτέ σε αγώνα.
"Very few members of the team ever beat her in a game."

Ελάχιστα σπίτια στην οικοδομή της Σοφίας έβαλαν ποτέ χριστουγεννιάτικα λαμπάκια.
"Very few houses in Sofia's block ever put Christmas lights."

Ελάχιστοι μετεωρολόγοι υπήρξαν ποτέ απολύτως ακριβείς.
"Very few weathermen have ever been absolutely accurate."

Ελάχιστοι νέοι μάγειρες έκαναν ποτέ λάθος.
"Very few new cooks ever made a mistake."

Ελάχιστοι φίλοι μου κατάφεραν ποτέ να φάνε.
"Very few friends of mine ever managed to eat it."

Ελάχιστοι ορειβάτες από την Γαλλία κατάφεραν ποτέ να την κατακτήσουν.
"Very few mountaineers from France ever manage to conquer it."

Ελάχιστοι γνωστοί της 'Αννας κατάφεραν ποτέ να το βρουν.
"Very few of Anna's acquaintances ever manage to find it."

Ελάχιστοι μουσικοί απέσπασαν ποτέ καλές κριτικές.
"Very few musicians ever got good critics."

Ελάχιστα αθηναϊκά εστιατόρια είχαν ποτέ τον αυθεντικό.
"Very few Athenian restaurants ever had the original one."

Ελάχιστες ερωτήσεις πολλαπλής επιλογής μπέρδεψαν ποτέ τους μαθητές.
"Very few multiple choice questions ever confused the students."

Ελάχιστοι πολιτικοί αναλυτές έκαναν ποτέ έγκυρες προβλέψεις.
"Very few political analysts ever made accurate predictions."

Ελάχιστα πάρτυ της Μαρίας έγιναν ποτέ χωρίς αυτό.
"Very few Maria's parties ever took place without it."

Ελάχιστοι ειδικοί ερευνητές πήραν ποτέ χρηματοδότηση.
"Very few expert researchers ever got funding."

Ελάχιστοι τουρίστες πήραν ποτέ αυτοκίνητο για να πάνε σε κάποιο αξιοθέατο.

"Very few tourists ever bought a car to visit a monument."

Ελάχιστοι κριτικοί του βρήκαν ποτέ ελαττώματα.
"Very few critics ever found a flaw on him."

Ελάχιστοι πίνακές του είχαν ποτέ ακρυλικά χρώματα.
"Very few of his paintings ever had acrylic paint."

Ελάχιστα φορέματα που της αγόραζε άλλος της άρεσαν ποτέ.
"Very few dresses bought by someone else ever fell within her preferences."

Ελάχιστοι αθλητές στην κατηγορία του κατάφεραν ποτέ να τον κερδίσουν.
"Very few athletes in his category ever manage to win him."

Ελάχιστες γάτες γλύτωναν ποτέ από την αγκαλιά της.
"Very few cats ever escaped her hands."

Ελάχιστοι φοιτητές Ρώσικης Φιλολογίας κατάφεραν ποτέ να το τελειώσουν.
"Very few students of Russian Philology ever manage to finish it."

Ελάχιστοι μαθητές είχαν ποτέ τέλεια αποτελέσματα.
"Very few students ever had perfect results."

Ελάχιστοι φίλοι του του εμπιστεύονται ποτέ κάτι.
"Very few friends of his ever trust him with anything."

Ελάχιστοι πολιτικοί από την Αθήνα είπαν ποτέ την αλήθεια.
"Very few politicians from Athens ever told the truth."

Ελάχιστοι νέοι σκηνοθέτες χρησιμοποίησαν ποτέ ειδικά εφέ.
"Very few new directors ever used special effects."

Ελάχιστοι φοιτητές βγήκαν ποτέ έξω.
"Very few students ever went outside."

Ελάχιστα σούπερ μάρκετ το έφεραν ποτέ.
"Very few super markets ever brought it."

Ελάχιστοι πελάτες του OTE είχαν ποτέ την ευκαιρία να δουν ένα τέτοιο κινητό.
"Very few Verizon's customers ever had the opportunity to see such a mobile phone."

Ελάχιστες προεδρικές ομιλίες περιείχαν ποτέ ψέματα.
"Very few presidential speeches ever contained lies."

Μόνο νοσοκόμες είχαν ποτέ ελεύθερο χρόνο.
"Only nurses ever had free time."

Μόνο ορεκτικά που σέρβιρε περιείχαν ποτέ κρέας.
"Only appetizers that he served ever had meat in them."

Μόνο μέλη της ομάδας την νίκησαν ποτέ σε αγώνα.
"Only members of the team ever beat her in a game."

Μόνο σπίτια στην οικοδομή της Σοφίας έβαλαν ποτέ χριστουγεννιάτικα λαμπάκια.
"Only houses in Sofia's block ever put Christmas lights."

Μόνο μετεωρολόγοι υπήρξαν ποτέ απολύτως ακριβείς.
"Only weathermen have ever been absolutely accurate."

Μόνο νέοι μάγειρες έκαναν ποτέ λάθος.
"Only new cooks ever made a mistake."

Μόνο φίλοι μου κατάφεραν ποτέ να φάνε.
"Only friends of mine ever managed to eat it."

Μόνο ορειβάτες από την Γαλλία κατάφεραν ποτέ να την κατακτήσουν.
"Only mountaineers from France ever manage to conquer it."

Μόνο γνωστοί της 'Αννας κατάφεραν ποτέ να το βρουν.
"Only of Anna's acquaintances ever manage to find it."

Μόνο μουσικοί απέσπασαν ποτέ καλές κριτικές.
"Only musicians ever got good critics."

Μόνο αθηναϊκά εστιατόρια είχαν ποτέ τον αυθεντικό.
"Only Athenian restaurants ever had the original one."

Μόνο ερωτήσεις πολλαπλής επιλογής μπέρδεψαν ποτέ τους μαθητές.
"Only multiple choice questions ever confused the students."

Μόνο πολιτικοί αναλυτές έκαναν ποτέ έγκυρες προβλέψεις.
"Only political analysts ever made accurate predictions."

Μόνο πάρτυ της Μαρίας έγιναν ποτέ χωρίς αυτό.
"Only Maria's parties ever took place without it."

Μόνο ειδικοί ερευνητές πήραν ποτέ χρηματοδότηση.
"Only expert researchers ever got funding."

Μόνο τουρίστες πήραν ποτέ αυτοκίνητο για να πάνε σε κάποιο αξιοθέατο.
"Only tourists ever bought a car to visit a monument."

Μόνο κριτικοί του βρήκαν ποτέ ελαττώματα.
"Only critics ever found a flaw on him."

Μόνο πίνακές του είχαν ποτέ ακρυλικά χρώματα.
"Only of his paintings ever had acrylic paint."

Μόνο φορέματα που της αγόραζε άλλος της άρεσαν ποτέ.
"Only dresses bought by someone else ever fell within her preferences."

Μόνο αθλητές στην κατηγορία του κατάφεραν ποτέ να τον κερδίσουν.
"Only athletes in his category ever manage to win him."

Μόνο γάτες γλύτωναν ποτέ από την αγκαλιά της.
"Only cats ever escaped her hands."

Μόνο φοιτητές Ρώσικης Φιλολογίας κατάφεραν ποτέ να το τελειώσουν.
"Only students of Russian Philology ever manage to finish it."

Μόνο μαθητές είχαν ποτέ τέλεια αποτελέσματα.
"Only students ever had perfect results."

Μόνο φίλοι του του εμπιστεύονται ποτέ κάτι.
"Only friends of his ever trust him with anything."

Μόνο πολιτικοί από την Αθήνα είπαν ποτέ την αλήθεια.
"Only politicians from Athens ever told the truth."

Μόνο νέοι σκηνοθέτες χρησιμοποίησαν ποτέ ειδικά εφέ.
"Only new directors ever used special effects."

Μόνο φοιτητές βγήκαν ποτέ έξω.
"Only students ever went outside."

Μόνο σούπερ μάρκετ το έφεραν ποτέ.
"Only super markets ever brought it."

Μόνο πελάτες του OTE είχαν ποτέ την ευκαιρία να δουν ένα τέτοιο κινητό.
"Only Verizon's customers ever had the opportunity to see such a mobile phone."

Μόνο προεδρικές ομιλίες περιείχαν ποτέ ψέματα.

"Only presidential speeches ever contained lies."

Μόνο νοσοκόμες είχαν ποτέ ελεύθερο χρόνο.
"Only nurses ever had free time."

Έχω σοκαριστεί που οι κριτικοί του βρήκαν ποτέ ελαττώματα.
"I am shocked that critics ever found a flaw on him."

Ο Βασίλης ήταν έκπληκτος που τουρίστες πήραν ποτέ αυτοκίνητο για να πάνε σε κάποιο αξιοθέατο.
"Bill was amazed that tourists ever bought a car to go and see a monument."

Ήταν άξιο απορίας που ειδικοί ερευνητές πήραν ποτέ χρηματοδότηση.
"It was surprising that expert researcher ever got funding."

Μου κάνει εντύπωση που τα πάρτυ της Μαρίας έγιναν ποτέ χωρίς αυτό.
"I was amazed that at Maria's parties ever took place without it."

Μου έκανε εντύπωση που οι πολιτικοί αναλυτές έκαναν ποτέ έγκυρες προβλέψεις.
"I was amazed that political analysts ever made accurate predictions."

Μου κάνει εντύπωση που κάποιοι φοιτητές Ρώσικης Λογοτεχνείας καταφέρνουν ποτέ να το τελειώσουν.
"I was amazed that some Russian Literature students ever managed to finish it."

Μου έκανε εντύπωση που αθλητές της κατηγορίας του κατάφεραν ποτέ να τον κερδίσουν.
"I was amazed that athletes in his category ever manage to win him."

Μου κάνει εντύπωση που οι φίλοι του του εμπιστεύονται ποτέ κάτι.
"I amazed that his friends ever trust him with anything."

Μου έκανε εντύπωση που μια γάτα γλύτωσε ποτέ από την αγκαλιά της.
"I was amazed that a cat ever escaped her hands."

Μου έκανε εντύπωση που κάποιοι μαθητές είχαν ποτέ τέλεια αποτελέσματα.
"I was amazed that some students ever had perfect results."

Μου έκανε εντύπωση λοιπόν που κάποια φορέματα που της αγόρασα της άρεσαν ποτέ.
"I was amazed thus that some dresses I ever bought for her fell within her preferences."

Ο Βασίλης έμεινε έκπληκτος που τα σούπερ μάρκετ το έφεραν ποτέ.
"Bill was surprise that super markets ever brought it."

Του Γιάννη του έκανε εντύπωση που οι φοιτητές βγήκαν ποτέ έξω.

"John was amazed that student ever went outside."

Οι ψηφοφόροι απόρησαν που οι προεδρικές ομιλίες περιείχαν ποτέ ψέματα.
"The voters were surprise that presidential speeches ever contained lies."

Οι νέοι σκηνοθέτες ήταν τυχεροί που χρησιμοποίησαν ποτέ ειδικά εφέ.
"The young directors were luck that they ever used special effects."

Ο κόσμος απόρησε που οι πολιτικοί από την Αθήνα είπαν ποτέ την αλήθεια.
"People were surprise that politicians from Athens ever told the truth."

Οι πελάτες του ΟΤΕ έμειναν έκπληκτοι που είδαν ποτέ ένα τέτοιο κινητό.
"Verizon's customers were amazed that they ever saw such a mobile device."

Ήταν άξιο απορίας που οι νοσοκόμες είχαν ποτέ ελεύθερο χρόνο.
"It was amazing that nurses ever had free time."

Μου έκανε εντύπωση που κάποια σπίτια στην οικοδομή της Σοφίας έβαλαν ποτέ χριστουγεννιάτικα λαμπάκια.
"I was amazed that some flats in Sofia's buildings ever put Christmas lights."

Ο Γιάννης απόρησε που οι μετεωρολόγοι υπήρξαν ποτέ απολύτως ακριβείς.
"John was surprised that weathermen ever were absolutely accurate."

Μου έκανε εντύπωση που κάποιοι μάγειρες έκαναν ποτέ λάθος.
"I was amazed that some cooks ever made a mistake."

Είναι παράξενο που τα ορεκτικά που σέρβιρε είχαν ποτέ κρέας.
"It was bizarre that the appetizers ever had meat in them."

Είναι άξιο απορίας που μέλη της ομάδας την νίκησαν ποτέ σε αγώνα.
"It was surprising that members of the team ever beat him in a game."

Η 'Αννα έμεινε έκπληκτη που κάτι γνωστοί της κατάφεραν ποτέ να το βρουν.
"Anna was amazed that some acquaintances ever manage to find it."

Μου κάνει εντύπωση που τα αθηναϊκα εστιατόρια είχαν ποτέ τον αυθεντικό.
"I was amazed that Athenian restaurants ever had the original."

Ο δάσκαλος απόρησε που οι ερωτήσεις πολλαπλής επιλογής μπέρδεψαν ποτέ τους μαθητές.
"The teacher was surprised that multiple choice questions ever confused the students."

Είμαι έκπληκτος που κάτι φίλοι μου κατάφεραν ποτέ να φάνε.
"I am amazed that some friends of mine ever manage to eat it."

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Μου έκανε εντύπωση που ορειβάτες από την Γαλλία κατάφεραν ποτέ να την κατακτήσουν.
"I was amazed that mountaineers from France ever managed to conquer it."

Μου κάνει εντύπωση που οι μουσικοί απέσπασαν ποτέ καλές κριτικές.
"I am amazed that some musicians ever got good critics."

Οι φοιτητές Ρώσικης Φιλολογίας κατάφεραν ποτέ να το τελειώσουν.
"Students of Russian Literature ever manage to finish it."

Οι γάτες γλύτωναν ποτέ από την αγκαλιά της.
"The cats ever escaped from her hands."

Οι μαθητές είχαν ποτέ τέλεια αποτελέσματα.
"The students ever had perfect results."

Τα φορέματα που της  αγόραζε άλλος της άρεσαν ποτέ.
"The dresses that someone else would buy for her ever fell within her preferences."

Οι πολιτικοί από την Αθήνα είπαν ποτέ την αλήθεια.
"Politicians from Athens ever told the truth."

Οι φοιτητές βγήκαν ποτέ έξω.
"Students ever went outdoors."

Οι πελάτες του ΟΤΕ είχαν ποτέ την ευκαιρία να δουν ένα τέτοιο κινητό.
"Verizon's customers ever had the chance to see such a mobile phone."

Οι νέοι σκηνοθέτες χρησιμοποίησαν ποτέ ειδικά εφέ.
"The new directors ever used special effects."

Οι προεδρικές ομιλίες περιείχαν ποτέ ψέματα.
"Presidential speeches ever contained lies."

Τα σούπερ μάρκετ το έφεραν ποτέ.
"Super markets ever brought it."

Τα μέλη της ομάδας την νίκησαν ποτέ σε αγώνα.
"Member of the team ever beat her in a game."

Τα σπίτια στην οικοδομή της Σοφίας έβαλαν ποτέ χριστουγεννιάτικα λαμπάκια.
"Flats in Sofia's building ever put Christmas lights."

Οι νέοι μάγειρες έκαναν ποτέ λάθος.

"Young cooks ever made a mistake."

Τα ορεκτικά που σέρβιρε περιείχαν ποτέ κρέας.
"The appetizers he served ever contained meat in them."

Οι νοσοκόμες είχαν ποτέ ελεύθερο χρόνο.
"Nurses ever had free time."

Οι μετεωρολόγοι υπήρξαν ποτέ απολύτως ακριβείς.
"Weathermen have ever been absolutely accurate."

Τα αθηναϊκα εστιατόρια είχαν ποτέ τον αυθεντικό.
"The Athenian restaurants ever had the original one."

Κάτι γνωστοί της 'Αννας κατάφεραν ποτέ να το βρουν.
"Some of Anna's acquaintances ever managed to find it."

Οι μουσικοί απέσπασαν ποτέ καλές κριτικές.
"Musicians ever got good critics."

Οι ερωτήσεις πολλαπλής επιλογής μπέρδεψαν ποτέ τους μαθητές.
"Multiple choise questions ever confused the students."

Ορειβάτες από την Γαλλία κατάφεραν ποτέ να την κατακτήσουν.
"Mountaineers from France ever manage to conquer it."

Οι φίλοι μου κατάφεραν ποτέ να φάνε.
"My friends ever managed to eat it."

Οι τουρίστες πήραν ποτέ αυτοκίνητο για να πάνε σε κάποιο αξιοθέατο.
"Tourists ever bought a car to visit a monument."

Οι πολιτικοί αναλυτές έκαναν ποτέ έγκυρες προβλέψεις.
"Political analysts ever made accurate predictions."

Τα πάρτυ της Μαρίας έγιναν ποτέ χωρίς αυτό.
"Maria's party ever took place without it."

Οι ειδικοί ερευνητές πήραν ποτέ χρηματοδότηση.
"Special researchers ever got funding."

Οι κριτικοί του βρήκαν ποτέ ελαττώματα.
"Critics ever found a flaw on him."

# APPENDIX B - EXPERIMENTS 1&2 MALE RESULTS

**Male data**

We used data from 12 male participants excluding 3. Two were excluded because they produced partial data and one because Praat did not capture property his signal (possibly due to very low frequency).

## Experiment 1 – Scalar vs. non-scalar

**Pitch**

When we compared all the data including male and female we found a main effect of scalarity ($F_{(1,154)}= 85,039$, $p<0,001$), tonal target ($F=11,61$, $p<0,001$) as well as an interaction between Scalarity*Gender ($F=71,574$, $p<0,001$). The interaction between tonal target and gender was also significant but this is expected since each group naturally uses different frequency range.

In terms of pitch the mean differences between male and female participants with respect to the two tonal targets (/e/, /n/) in the two conditions (scalar, non-scalar) are the following:

| condition | tonal target | mean difference |
|---|---|---|
| SCALAR | e | 94.385 |
| | n | 83.164 |
| NON-SCALAR | e | 35.179 |
| | n | 34.976 |

Pairwise comparisons show that all the differences are significant at <0,001.

Regarding the results only from the male participants we find no main effect of scalarity (F(1,71) = 1,008, p=0,3), a main effect of tonal target (F=7.289, p<0.009) and no interaction between the two is not significant (p=0.4).

**Duration**

In terms of duration the mean differences between the two genders are shown below:

| condition | tonal target | mean difference |
|---|---|---|
| SCALAR | e | 14.931 |
| | n | 5.706 |
| NON-SCALAR | e | 10.119 |
| | n | 3.567 |

Pairwise comparisons show that the difference with respect to the scalar /e/ is significant (p<0.001), as well as to the scalar /n/ (p<0.002) and the non-scalar /n/ (p>0.001). The difference with respect to the non-scalar /n/ is not significant (p=0.1).

Regarding the results only for male participants there is no main effect of scalarity (F(1,71)=0.122, p=0.7), there is a main effect of tonal target (F=16.201, p<0.001) and no interaction between the two (p=0.6).

**Intensity**

In terms of duration the mean differences between the two genders are shown below:

| condition | tonal target | mean difference |
|---|---|---|
| SCALAR | e | 6.574 |
| | n | 5.619 |
| NON-SCALAR | e | 2.399 |
| | n | 3.399 |

Regarding the results only for male participants there is no main effect of scalarity $(F(1,71)=0.131, p=0.7)$, there is a main effect of tonal target $(F=17.333, p<0.001)$ and no interaction between the two $(p=0.7)$.

**Experiment 2 – Focus**

**Pitch**

When we compared all the data including male and female we found a main effect of focus $(F(1,154)= 83,502, p<0,001)$ and of tonal target $(F=4,435, p=0,03)$. The interaction between Focus*Gender was significant $(F=79,332, p<0,001)$

In terms of pitch the mean differences between male and female participants with respect to the two tonal targets (/e/, /n/) in the two conditions (focus, non-focus) are the following and are significant:

| condition | tonal target | mean difference |
|-----------|--------------|-----------------|
| FOCUS | e | 83.468 |
| FOCUS | n | 78.139 |
| NON-FOCUS | e | 34.014 |
| NON-FOCUS | n | 34.976 |

Looking only at the results from the 12 male participants with respect to the pitch we find no main effect of focus ($F(1,71)=0.319$, $p=0.5$), a main effect of tonal target ($F=6.159$, $p<0.01$) and no interaction between the two factors ($F=0.852$, $p=0.3$)

**Duration**

When we compare all the data, (male and female) we find a main effect of focus ($F=8,069$, $p=0.005$) and a main effect of tonal target ($F=111,922$, $p<0,001$). The interaction between the focus and gender is also significant ($F=7,876$, $p=0,005$). The mean differences between male and female participants with respect to the two tonal targets (/e/, /n/) in the two conditions (focus, non-focus) are the following:

| condition | tonal target | mean difference |
|---|---|---|
| FOCUS | e | 25.681 |
| | n | 3,145 |
| NON-FOCUS | e | 16,756 |
| | n | 2,935 |

When we look at the male population we find a main effect of tonal target ($F_{(1,71)}=16.201$, $p<0.001$) and no main effect of Focus ($F=0.122$, $p=0.7$) as well as no interaction between the two ($F=0.162$, $p=0.6$)

**Intensity**

Comparing the data from both male and female we observe a main effect of Focus ($F=13,542$, $p<0.001$) and main effect of tonal target ($F=36,961$, $p<0,001$). The interaction between Focus and Gender is also significant ($F=21,374$, $p<0,001$). The mean differences between male and female participants with respect to the two tonal targets (/e/, /n/) in the two conditions (focus, non-focus) are the following:

| condition | tonal target | mean difference |
|---|---|---|
| FOCUS | e | 6,234 |
| FOCUS | n | 4,385 |
| NON-FOCUS | e | 3,990 |
| NON-FOCUS | n | 1,591 |

Measuring intensity for the male participants only we find no main effect of Focus $(F(1,71)=0.832, p=0.3)$, no main effect of tonal target $(F=0.1, p=0.9)$ and no interaction between the two factors $(F=0.3, p=0.5)$