

Intonation of polar questions and the location of nuclear stress in Greek

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Abstract: The experimental findings presented in this paper suggest that morphology influences the location of sentence stress in Greek. The findings reveal a difference in the position of prosodic nucleus between plain polar questions and polar questions that start with the question particle *mipos*; the former align the main sentence stress with the verb, while in the latter the main sentence stress aligns with the right-edge prosodic boundary. Plain polar questions are string identical with declarative sentences. I argue that the lack of any other way of marking the plain polar question in the grammar of Greek forces the nucleus to appear on the verb: interrogativity is signaled by means of intonation alone and the verb, as the head of its prosodic phrase, carries the intonational morphological marker in polar questions. Moreover, the experimental data show that in Greek there is a requirement to align the nucleus with the right prosodic edge. In polar questions, where the nucleus has to align with the verb which is not phrase final, this requirement is satisfied through de-accenting. Words occurring after the nucleus-verb get de-accented even when they are discourse-new. The data show that, for Greek, the requirement to accent information-new words ranks lower than the morphological and the edge-alignment constraints and it is sacrificed to satisfy them.

Keywords: polar questions, nucleus, de-accenting, word order, question particle, pragmatics.

Languages: Greek, Hungarian, Turkish, Slavic, English, Dutch, German, Russian, Lai, Seri.

1. Introduction

In the last four decades or so a substantial body of work has shown the influence of syntactic, semantic, pragmatic, information structure, and phonological factors on both prosodic phrasing and accenting (for a variety of treatments see Bolinger 1972, 1985; Jackendoff 1972; Gussenhoven 1983, 1984, 1992, 1999; Nespor & Vogel 1986; Rochemont 1986; Selkirk 1984, 1995, 2000; Vallduví 1990; Steedman 1991, 2000a,b; Schwarzschild 1993, 1999; Truckenbrodt 1995, 1999; Ladd 1996; Roberts 1996; Büring 1997, 2001; Zubizarreta 1998; among many others). This body of research has revealed a great deal of cross-linguistic variation in the effects that the factors above have on phrasing and accenting. Despite this variation, there are some generalizations which hold for a good number of languages, especially so among European languages: (a) constituents representing new information carry pitch accents and those representing old or *given* information are not accented (see Ladd 1996 for exceptions); (b) utterances without any discourse-old material (known as *all-new* or *out-of-the-blue*) have all their constituents accented and their nucleus (also known as *sentence stress*, *nuclear stress*, or *nuclear pitch accent*, NPA) at the right edge. (c) the NPA is followed by discourse-old words which are de-accented in utterances with an early nucleus (for exceptions¹ to de-accenting see Bruce 1977; Elordieta 1997, 2003).

This paper discusses the intonational structure of polar (yes-no) questions in Greek. In particular, it addresses two characteristics of these questions which constitute puzzling exceptions to the generalizations mentioned above. First, the new polar questions, unlike all-new statements do not have their NPA at the right edge, but instead align it with the verb. Second, the syntactic object following the verb is de-accented, even though it is discourse new. The NPA location and de-accenting of post-nuclear material in all-new polar questions is not unique to Greek, but is common among Eastern European languages like Hungarian, Turkish and Slavic (for examples in these languages see Ladd 1996 and Grice et al 2000)

Turning our attention first to the unusual location of NPA, this has been attributed to a morphological requirement: it is claimed that the NPA serves as a lexically empty question particle which attaches to the verb (Ladd 1996; Baltazani 2002). The present paper provides evidence for this claim through a production experiment. Regular polar questions (plain polars) are compared to a special type of polar questions in Greek, which contain a lexically overt question particle *mipos*² ‘is it by any chance’ (mipos polars). The experiment results show that while in plain polars the NPA aligns with the verb, in mipos polars the NPA consistently aligns with the right edge of the utterance. I take this as strong support for the claim that NPA is a lexically empty question particle: as soon as an overt particle is present, the NPA no longer needs to serve as a morphological marker and it occupies its default position at the right edge.

Turning now to the de-accenting of all-new polar questions, let me first note that a seemingly similar phenomenon has been extensively discussed in the focus phrasing literature. This phenomenon—integration—involves non-typical nucleus location and de-accenting of discourse-new words in the Germanic languages (Fuchs 1976; Schmerling 1976; Gussenhoven 1983, 1992, 1999; Jacobs 1991, 1992; Uhmann 1991): discourse-new verbs can remain unaccented when they are adjacent to their accented syntactic object. The analysis for this irregular accenting pattern is based on syntactic structure: syntactic heads (verbs) can remain unaccented, even if they are discourse new, when their complement carries a pitch accent. However, such an analysis cannot account for the facts of Greek polar questions. First, in Greek it is the verb that carries an accent not the object. Second, as we will see, the verb nucleus can be followed by a string of de-accented words which do not form a syntactic constituent, therefore de-accenting is not based on syntactic structure. I argue in this paper that if we view de-accenting as the result of a purely phonological requirement for the elimination of post-nuclear accents we have an account which is simpler and which covers more empirical ground (for similar views on de-accenting in other languages see Truckenbrodt 1995, 1999; Büring 1997, 2001; Schwarzschild 1993, 1999).

The remainder of this paper is organized as follows: Section 2 presents some background information on the intonational structure of declaratives and polar questions in Greek. Section 3 presents the experiment and section 4 discusses the results and some of their implications for intonational phonology.

2. Intonation of declaratives and polar questions

I present the intonational structure of declaratives in Greek for two reasons. The first is to establish that the default location of NPA is at the right edge of the sentence. In other words, in “neutral”, all-new utterances where all words are new, all content words

carry a pitch accent and the last one carries the NPA. The second reason is to compare the intonational structure of declaratives to that of plain and mimos polar questions.

The prosodic labeling of the utterances that I present is based on the analysis of the prosodic and intonational structure of Greek developed in Arvaniti & Baltazani (2000), (2005) within the autosegmental/metrical framework of intonational phonology (Pierrehumbert 1980; Beckman and Pierrehumbert 1986; Ladd 1996) and the system created for the annotation of Greek spoken corpora based on that analysis, Greek ToBI (GRToBI).

In the GRToBI model, Greek has three prosodic levels like English (IP, ip, and Prosodic word), five pitch accents, L*+H, L+H*, H*, H*+L, and L*, and a rich inventory of phrase accent/boundary tone combinations. The bitonal L*+H is the most common pre-nuclear pitch accent, followed by a H*, H*+L, or L+H* nuclear pitch accent in declaratives. The typical declarative phrase accent/boundary tone combination is L⁻ L% (Arvaniti, Ladd & Mennen 1998; Arvaniti & Baltazani 2000, 2005; Baltazani 2002). Figure 1 shows a typical declarative sentence uttered in an *all new/broad focus* context, where no word carries narrow focus.

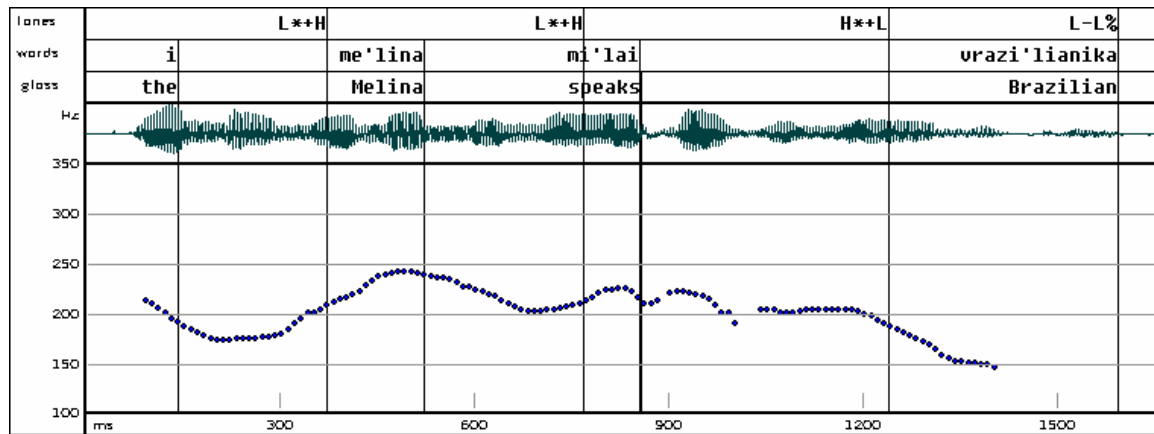


Figure 1. A typical declarative sentence uttered in an *all new/broad focus* context: *I Melina milai vrazilianika* ‘Melina speaks Brazilian’.

The utterance in Figure 1 illustrates the L*+H pre-nuclear pitch accents on the words *melina* and *milai*. These are realized phonetically as late rises with their peaks at the post accentual syllable, *na* for *melina* and *i* for *milai*. The last word, *vrazilianika*, carries the H*+L nuclear pitch accent which is realized as a fall from high pitch, with the fall being completed by the end of the accented syllable, *liá*. This nuclear pitch accent also illustrates the widespread lower scaling of the nuclear accent relative to previous accents described in Arvaniti and Godjevac (2003).

Polar questions are string identical to and only distinguished from declaratives by intonation. In polar questions, the typical nuclear pitch accent is a L*, with a H⁻ L% boundary (Ladd 1996; Baltazani & Jun 1999; Grice et al 2000; Arvaniti 2002; Baltazani 2002, 2003). Pre-nuclear pitch accents are the same type as those in declaratives, L*+H. Figure 2 illustrates the broad focus/all new pattern for polar questions.

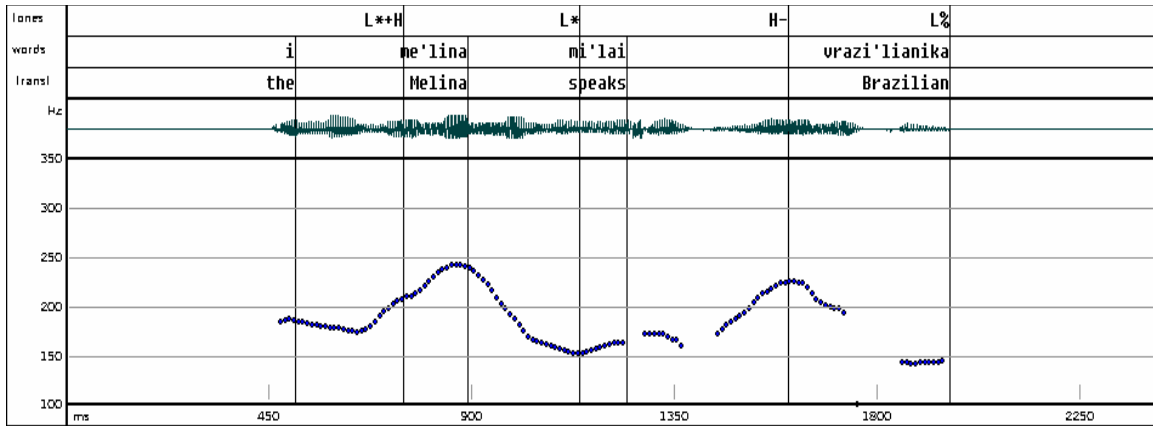


Figure 2: A broad focus/all new polar question. *I Melína milái vraziliánika?* ‘Does Melina speak Brazilian?’

The question in Figure 2 is *I Melína milái vraziliánika?* (the Melina speak-3s Brazilian) ‘Does Melina speak Brazilian?’ This question can be uttered at the beginning of conversation, without any preceding context. The L*+H prenuclear pitch accent on the first word, *melína*, is identical in polars and declaratives and it is the typical pre-nuclear pitch accent across all sentence types in Greek. After this word, both the type of tonal events and their anchoring points are different in polars and declaratives. To begin with, the L* nuclear pitch accent is realized as a trough which aligns with the stressed syllable *lá* of the verb *milái*. The syntactic object *vraziliánika* carries no pitch accent, and is de-accented, because it is post-nuclear. The H- tone, which in this utterance is aligned with the stressed syllable of the object *-líá*, is a phrase accent (Arvaniti in press; Arvaniti *et al.* ms.; Baltazani and Jun 1999; Grice, Ladd, and Arvaniti 2000). The phrase accent of Greek polar questions shows two distinct patterns of alignment, depending on the position of the nucleus. Specifically, if the nucleus of the question is *not* on the final word of the utterance, the H- aligns with the stressed syllable of the final word. If the nucleus is on the final word, the H- and L% are realised at the right edge of the utterance. As it is noted in all the studies of the Greek (East European for that matter) polar question, the peak of this H- phrase accent, despite its acoustic salience, does not make the word on which it occurs focused or prominent to the native ears although it probably does to the ears of West Germanic listeners. The final L% boundary tone is nicely illustrated here as a low plateau spanning the final syllable.

It is worth emphasizing that the syntactic object in Figure 2, the word *vraziliánika*, encodes discourse-new information and as such it should carry a pitch accent. In English, for example, an utterance like the one in Figure 2 would have its nucleus on the syntactic object *Brazilian*. This kind of de-accenting is a relatively rare phenomenon cross-linguistically. The closest analog to it are the so-called *integration* examples found in the Germanic languages (for English, cf. Fuchs 1976; Schmerling 1976; for Dutch and German, cf. Gussenhoven 1983, 1992, 1999; Jacobs, 1991, 1992; Uhmann 1991), as shown in (1) (examples from Buring 2003, capitals indicate NPA):

- (1) a. (news headline) *JOHNSON died*
 b. (all new) *I went to IRELAND*

c. *Ich bin nach IRLAND gefahren.* (German)
 I am to Ireland driven
 'I drove to Ireland'

The Dutch and German examples are the closest one can get to the Greek NPA-placement and de-accenting in polar questions, but the two phenomena are not parallel. In the Germanic cases it is usually the verb that remains unaccented when its syntactic object is accented, which allows for a syntactic account of the phenomenon (i.e. a pitch accent on the syntactic argument allows the syntactic head to remain accent-less). In Greek the verb attracts the nucleus and, in simple SVO utterances, the object remains unaccented. More generally, regardless of the word order, anything that comes after the verb nucleus is unaccented. However, it is not easy to explain the de-accenting syntactically, because often the words following the verb do not form a syntactic constituent. Instead, unlike the Germanic de-accenting, the Greek de-accenting seems to be a purely phonological requirement to de-accent post-nuclear material, given that the nucleus must align with the verb. The Germanic facts will not be discussed further. An illustration of the Greek de-accenting described here is given in the example that follows, in Figure 3.

Figure 3 shows a long polar question, which contains a main and a subordinate clause: *I Melína milái vraziliánika otan pái sti vrazilía?* 'Does Melina speak Brazilian when she goes to Brazil?' Despite its length, this utterance displays the same intonational structure as the simple utterance in Figure 2. In the utterance in Figure 3 the only pitch accents are the pre-nuclear L*+H on *Melína* and the L* on the verb *milái*. The H-L% boundary is realized on the last word *vrazilía*, with the H aligning with the stressed syllable and the L% appearing at the edge of the utterance. Between the L* and the H, there are no pitch accents. There is F₀ interpolation between the NPA and the phrase accent, with the pitch slowly rising until the last stressed syllable, at which point there is a sharp rise to the H-target.

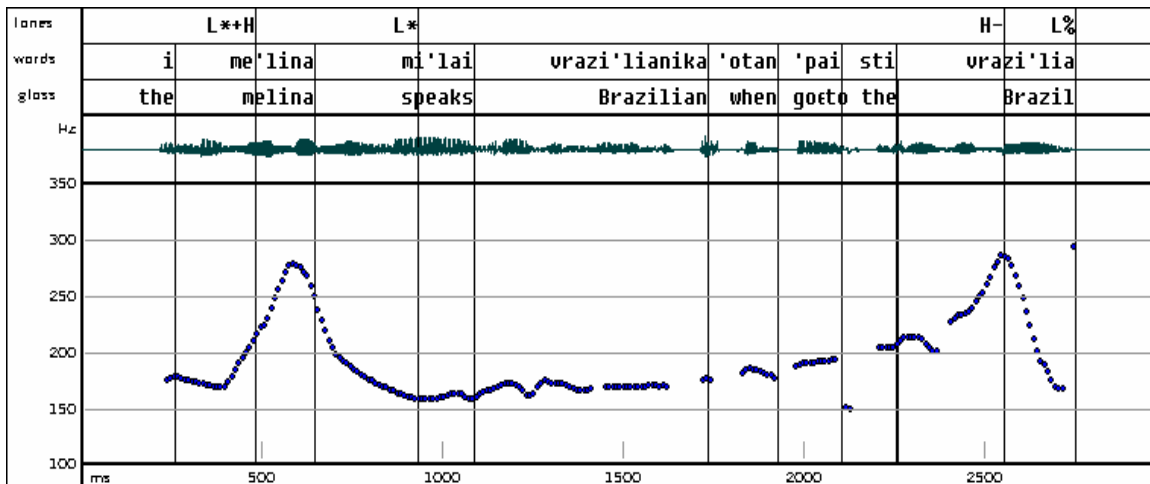


Figure 3. A long polar question, which is contains a main and a subordinate clause: *I Melína milái vraziliánika otan pái sti vrazilía?* 'Does Melina speak Brazilian when she goes to Brazil?'

All of the phrase *vrazilíanika otan pái sti vrazilía* ('...Brazilian when she goes to Brazil') is unaccented even though it is new. This phrase is by no means a syntactic constituent and de-accenting is the result of a purely phonological process: the words are de-accented because they come after the nucleus. Greek is a relatively free word order language and depending on the permutation of the constituents, any combination of them can be found after the verb and get de-accented, as we will see in section 3.

The location of NPA on the verb in polar questions probably indicates the illocutionary type of the sentence. Instead of a lexical question particle, Greek uses a L* tone. Ladd 1996, describing this phenomenon in Greek remarks that the NPA alignment with the verb serves as a question marker (Ladd 1996: ch 6). If indeed NPA alignment with the verb is some sort of morphological marker, it makes sense to align it with the verb. In languages with a lexically overt morphological marker this attaches to or appears on the verb, e.g. in Turkish and Russian, (Ladd 1996), in Lai, a Tibeto-Burman language, (Kathol 2003) and in Seri (Marlett and Moser 2000), among others.

So far, the claim that the nuclear tone in Greek polar questions serves as a question particle has not been submitted to experimental verification, to my knowledge. A production experiment was designed to test this claim and this is presented in section 3.

To complete the description of the melodies of polar questions, the remainder of this section presents Greek plain yes-no questions with narrow focus on the subject, the verb, and the object. Ten speakers produced polar questions with SVO word order and narrow focus on the subject, the verb, and the object in a part of the experiment not presented in the current paper. Three F₀ measurements were taken per syllable in the produced utterances and the average across speakers was used to create a rough graphic approximation of the pitch tracks for each question type.

Figure 4 shows these approximations: question with focus on the subject (squares), verb (circles), and object (triangles). The produced question was *o manólis mazévi lemónia* 'Is Manolis picking lemons?' In all three question types the nucleus is again a L* pitch accent and it aligns with the stressed syllable in the focus word—*nó* of the subject (point A in Figure 4), *zé* of the verb (B) and *mó* of the object (C). In the subject focus and verb focus questions the post-nuclear words are de-accented. There is no such de-accenting in the object focus questions since the nucleus is the last word. The salient H phrase accent is aligned with the last stressed syllable for the subject focus and verb focus questions. For the object focus question the H phrase accent is pushed to the right because the nucleus occupies the last stressed syllable. The H phrase accent is also realized much lower than in the other two types since there is no time for a big pitch excursion. Notice that the verb focus question contour has the same shape as the neutral question since the nucleus is aligned with the verb in both. An interesting question that is left open for now is whether there are differences in the realization of the pitch accent (i.e., in alignment or scaling) between neutral and verb focus polar questions.

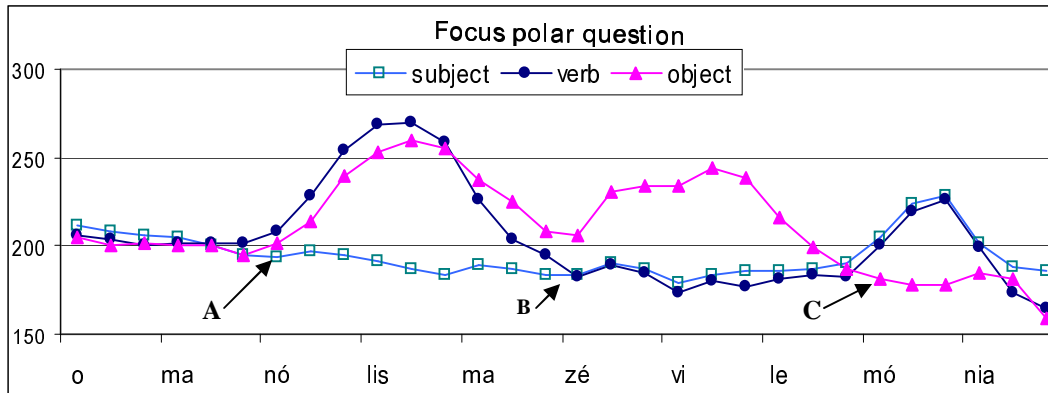


Figure 4. Polar questions with focus on the subject (squares), verb (circles) and object (triangles). The question is *o manólis mazévi lemónia* ‘Is Manolis picking lemons?’

3. Production experiment:

3.1 Aim

This experiment tests the claim that the nuclear tone in Greek polar questions serves as a question particle. Evidence for this claim comes from a special kind of polar question in Greek which contains the lexically overt question particle *mipos* (mipos polars). A pilot mini-experiment with my own production of *mipos* polars showed that the intonational structure of *mipos* polars is quite different from that of plain polars: In *mipos* polars the NPA appears at the right edge, which is the unmarked NPA position in Greek, also found in all-new, broad focus declarative statements, as has already been mentioned. The hypothesis for the experiment is that polar questions will have a nucleus in the unmarked position, the right edge, only if the overt question particle *mipos* is present. Otherwise the nucleus will align with the verb. If the hypothesis is confirmed it will strongly support the claim that the nucleus serves as a lexically empty question particle in plain polars.

One further question that this experiment explores is whether in fact the NPA is always located on the right edge in *mipos* questions or whether the nucleus position changes depending on the word order. Many analyses of NPA location maintain that stress assignment obeys either syntactic constraints, thus placing the nucleus on the syntactically most deeply embedded constituent (for example Selkirk 1986; Steedman 1991; Cinque 1993), or semantic structure constraints (for example Jackendoff 1972; Rooth 1985; Krifka 1991). To explore this question this experiment investigates all six permutations of a simple sentence containing a subject, a verb, and an object. If it turns out that NPA aligns with the right edge regardless which constituent occupies the right edge, this will be strong indication that NPA is assigned according to prosodic and not syntactic or semantic criteria (see also, among many others, Truckenbrodt 1995, 1999; Frota 2000; Selkirk 2000; Elordieta, Frota, Prieto and Vigário 2003). To keep the experiment balanced, plain polars and *mipos* polars were examined in all six word orders.

3.2 Method and materials

Mini dialogues were constructed with a lead-in context followed by a polar question, as in (2). The aim of the context was to trigger the all-new broad focus

intonation in the polar question that followed. The experimenter read the lead-in context and participant read the polar question.

(2) A (*sto tilefono*): *Nai?*

(on-the telephone) yes

‘(on the telephone): Hello?’

B: *kiria deli kalimera sas. O gianis theli na erthi sinema?*

Mrs Deli good-morning yours the John wants to come cinema

‘Good morning Mrs Deli. Does John want to come to the cinema?’

The utterances were recorded in a quiet room directly on computer disk. In the original experiment, there were eight different questions constructed involving both all-new, broad focus and narrow focus contexts. In this paper I only present the all-new, broad focus questions. There were two all-new questions presented in six permutations of constituent order: SVO, SOV, VSO, VOS, OVS, OSV, and in both polar question types, plain and *mipos*. Sixteen speakers repeated each question twice. Each speaker read only one version (either plain or *mipos*) of each question. This was done to avoid a possible influence of one melody on the other. The experiment resulted in a corpus of 48 tokens of plain polars and 48 tokens of *mipos* polars. The speakers were all students of an introductory linguistics class at the University of Ioannina, Greece, ranging in age between 18 and 22 years. They participated in the experiment for class credit.

3.3 Results

In this section I present first the quantitative results of the location of NPA across speakers, word orders, and question type in section 3.3.1 and then the differences in intonational structure between the two polar question types in section 3.3.2.

3.3.1 NPA location across word orders in plain polars and *mipos* polars

Figure 5 shows NPA location in plain polar questions. The horizontal axis shows word order and the vertical one the percentage of tokens having a nucleus aligned with the subject, the verb, or the object of the utterance. Across word orders, the NPA aligns with the verb in 85% of the tokens. Changes in word order affect nucleus location very little. For SVO, OSV and OVS, 100% of the tokens show NPA on the verb. In the SOV order 87.5% of the tokens have a verb nucleus, while 12.5% have an object nucleus. In the VSO order 75% of the tokens have a verb nucleus, while 25% have an object nucleus. In the VOS order 50% of the tokens have a verb nucleus, while 25% have a subject nucleus and 25% an object nucleus. The VOS order is an intriguing case. In this order, the nucleus is aligned with the verb only half the time and for a quarter of the tokens the nucleus appears on the subject which is on the right edge. This tendency is discussed in section 4.

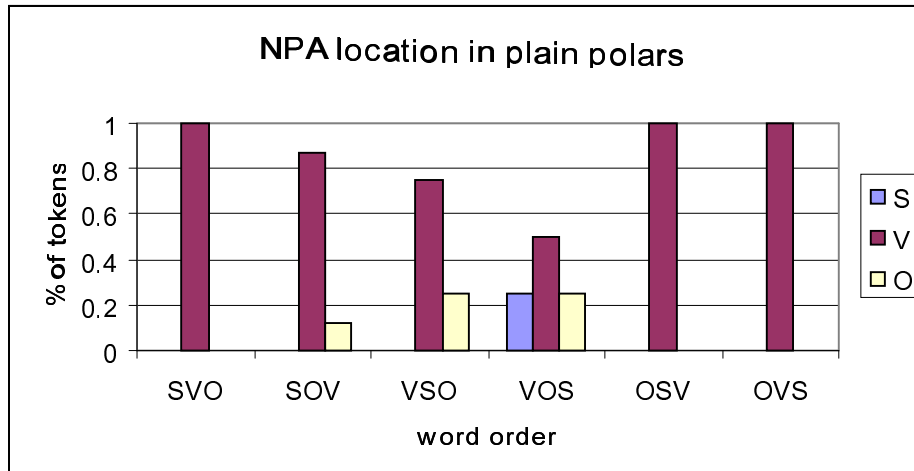


Figure 5. The location of nucleus is shown in plain polar questions across for the six possible word orders.

Figure 6 shows NPA location in *mipos* questions. Across word orders, the NPA aligns with the right edge in *mipos*-polars for 75% of the tokens, regardless of which constituent is utterance-final. A more detailed look at the results reveals that in some word orders the percentage of NPAs that align with the right edge is quite high while in others it is less so. For SVO and OSV 100% of the tokens show NPA on the utterance-final constituent. For the VSO order, 74% have their NPA on the utterance-final constituent, while 13% each have their NPA on the object and the subject respectively. For the OSV order, 88% have their NPA on the utterance-final constituent, while 12% have their NPA on the *mipos* word. For the OVS order, 62.5% have their NPA on the utterance-final constituent while 37.5% have their NPA on the object. For the VOS order, which once more behaves differently from the other orders, the NPA appears on the utterance-final constituent only for 25% of the tokens, while for the majority of the tokens, 62.5%, the NPA is on the object and for 12.5% the NPA is on the verb.

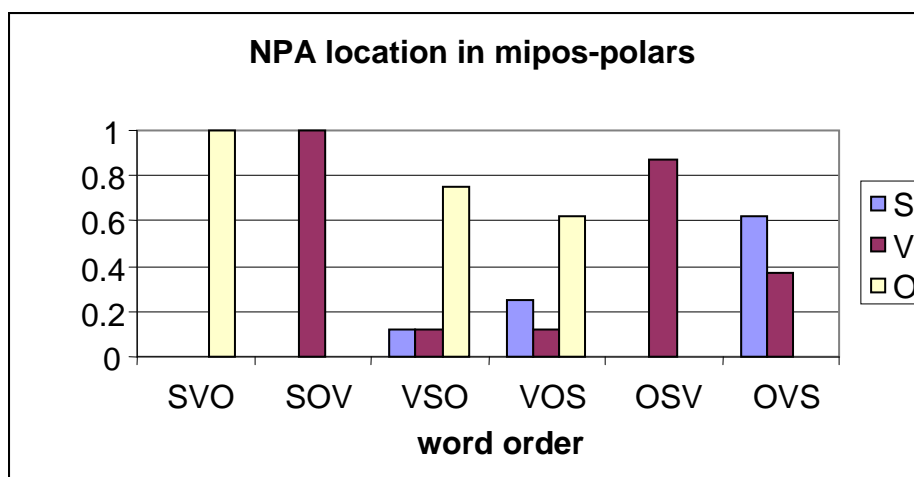


Figure 6. The location of nucleus is shown in *mipos* polar questions across word orders.

These results are discussed in section 4. The following section presents the intonational structure of plain and mipos polars.

3.3.2 The intonational differences between plain polars and mipos polars

Figure 7 shows a plain polar utterance produced in the experiment. *Vrike I Maria kamia kali tomata?* (found-3s the Maria any good tomato) ‘Did Maria find any good tomatoes?’ It has the structure described in section 2. The L* NPA aligns with the verb, which is the first word of the utterance, and all following words are unaccented. The utterance has the characteristic combination of H-L% tones at the boundary.

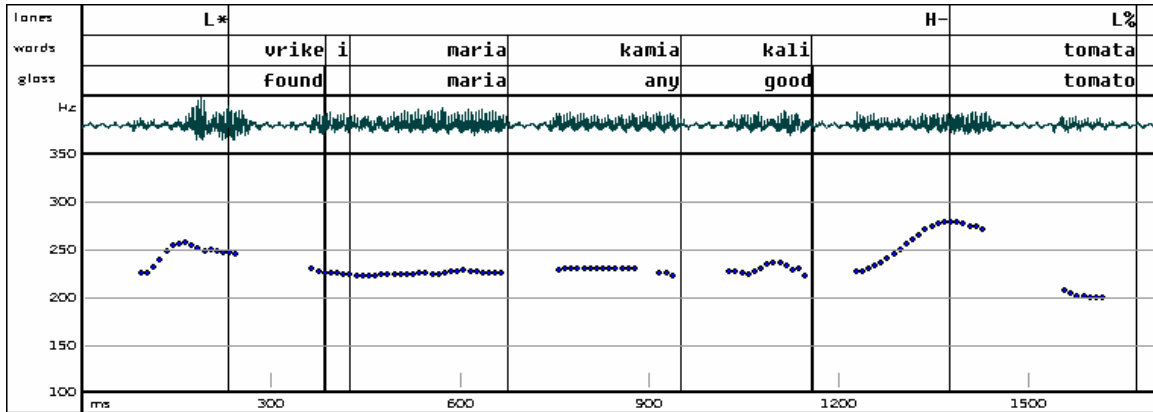


Figure 7. A plain polar utterance produced in the experiment. *Vrike I Maria kamia kali tomata?* ‘Did Maria find any good tomatoes?’

Figure 8, on the other hand, shows a neutral mipos polar utterance produced in the experiment corresponding to the plain polar utterance presented in Figure 6. This utterance is *Mipos vrike I Maria kamia kali tomata?* (Mipos found-3s the Maria any good tomato) ‘Did Maria find any good tomatoes?’ The L* nucleus here is on the object—the last word in the utterance.

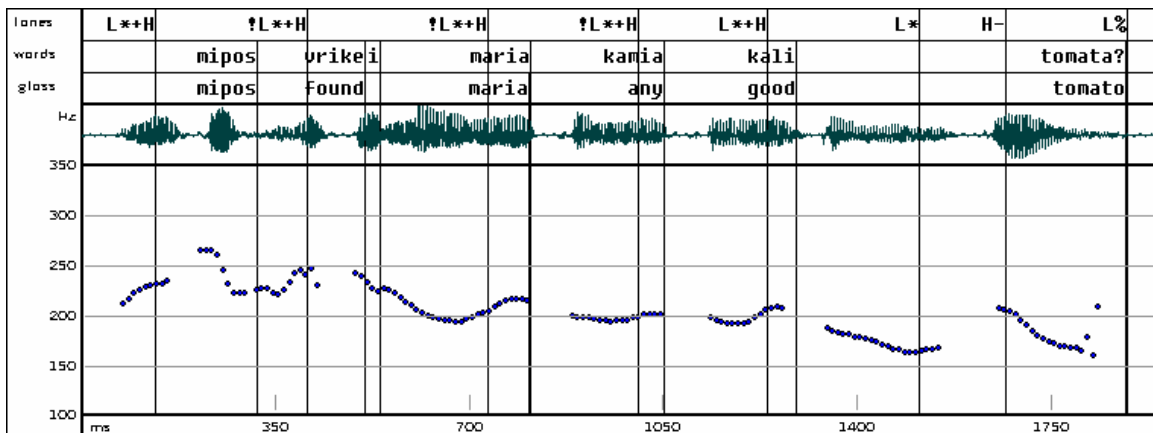


Figure 8. This mipos polar question, *Mipos vrike I Maria kamia kali tomata?* ‘Did Maria find any good tomatoes?’, illustrates the downstep pattern which characterizes this type of utterance.

The type of nuclear accent and edge tones in *mipos* polars are the same as in plain polars. There are two main intonational differences between plain and *mipos* polars. First, the location of the L* NPA in *mipos* polars is not the verb but the last word in the utterance. Second, the L*+H pre-nuclear pitch accents in *mipos* polars are downstepped. Unlike English, where it is claimed that downstep is triggered by bitonal accents (e.g. Beckman & Pierrehumbert 1986; Pierrehumbert 1980) in GRTToBI it is claimed that downstep is not triggered by bitonal accents. This claim is based on the fact that in the GRTToBI corpus there are many sentences with consecutive L*+H accents but no downstep. Further evidence comes from utterances like the one shown in Figure 8 above: the pitch accents on the second, third and fourth words are downstepped in relation to each other, but the fifth one is not downstepped. Among the utterances produced for this experiment, this pattern of lack of downstepping after a series of downstepped pitch accents occurs for 25% of the tokens. It is not clear why some of the pitch accents are downstepped while others are not. An examination of the experimental utterances shows that this pattern does not have to do with phonetic reasons such as the length of the words or the number of syllables intervening between consecutive pitch accents. For example in the utterance in Figure 8 there is one syllable distance between the first two pitch accents on the words *mipos vrike* and the same distance between the fourth and fifth pitch accents on the words *kamià kali* and yet the second pitch accent is downstepped in the first pair but not in the second pair. Also there does not seem to be any meaning difference between the downstepped and the non downstepped accents. The data in this experiment do not shed any light on the reasons behind the downstepping mechanism and this question is left open.

4. Discussion and Conclusion

This study of the intonational structure of Greek polar questions is illuminating in two respects. First, it sheds more light on the factors that affect the location of NPA. So far in the literature, the NPA location has been argued to be regulated by pragmatic, semantic/syntactic, or phonological factors. The experimental findings in this paper suggest that it is also possible for morphology to exert influence on what word NPA aligns with. The difference in the position of nucleus between plain and *mipos* polars provides strong evidence that what forces the NPA to appear on the verb in plain polars is the lack of any other way of marking the question in the grammar of Greek: there is no segmental difference between declaratives and polars, no syntactic marking (like for example the subject verb inversion and the insertion of the auxiliary ‘do’ in English), no difference in word order. Interrogativity is signaled by means of intonation alone and since the verb is in some sense the ‘head’ of its phrase in polar questions, it is the verb that carries the intonational morphological marker.

Second, the experimental results also offer supporting evidence for the claim that the ‘default’ NPA position is the edge of a prosodic constituent in Greek as it is in many languages (e.g., Truckenbrodt 1995, 1999; Zubizarreta 1998; Frota 2000; Selkirk 2000; Büring 2001; Büring and Gutiérrez-Bravo 2001; Elordieta, Frota, Prieto and Vigário 2003). The requirement to align the NPA with a prosodic constituent edge is satisfied differently across languages. In some languages the NPA has to align with the word exactly at the right or the left edge of a prosodic constituent and syntactic movements are used to change deviant utterances (e.g. Catalan and Italian, cf. Vallduví 1990 and

Zubizarreta 1998 respectively). In other languages syntactic movement is not available or not preferred and the prosodic phrasing changes instead in many ways: prosodic boundaries are inserted next to the focus word so that it aligns with an edge; or a prosodic boundary is inserted to the left of the focus word and dephrasing follows it (e.g., Korean, cf. Jun 1993).

The experimental data show that in Greek the edge alignment requirement is satisfied through de-accenting when other requirements force the NPA away from the edge of the phrase. All this happens at the cost of an interface requirement between phonology and pragmatics, the requirement for discourse-new words to carry accents. The Greek data show that this requirement ranks lower than the morphological and the edge-alignment constraints and it is sacrificed to satisfy them.

One more issue that I would like to comment on is the relation between word order, intonation structure, and pragmatics. The experimental results indicate that depending on what the word order is, the percentage of utterances with NPA on the verb (for plain polars) or at the right edge (for mimos polars) differs. It is not yet clear what the basis for that difference is, however some trends are clear. In plain polar questions, verb initial orders, VSO and VOS, have the lowest percentage of NPA-verb alignment. This might reflect a preference to de-accent as few discourse-new words as possible and in verb initial orders the number of de-accented words is maximized. On the other hand, in mimos polar questions the subject final orders, VOS and OVS have the lowest percentage of NPA alignment with the edge. Perhaps this reflects preference to use the most unmarked word orders for all-new utterances. The most unmarked word order in Greek, at least for declaratives, is SVO, in the sense that it is compatible with NPA alignment on any of the sentence constituents (Keller & Alexopoulou 2001). The interesting study in Keller & Alexopoulou (2001) examined the relation between accent placement and word order in Greek. Experimental evidence in that study suggests that an NPA on an utterance final subject is more appropriate for narrow focus on the subject but not for an all-new utterance in declarative sentences. More empirical evidence is necessary on the relation among word order, intonation structure, and pragmatics across sentence types.

Finally, the study of polar questions in Greek makes clear that in order to develop a comprehensive typology of intonational structure, we need to examine the intonation of different sentence types cross-linguistically in connection with the location of NPA and the accent status of discourse-new and discourse-old elements. The experimental results suggest that we cannot sustain a broad characterization of accentability: while in some languages accentability seems to be regulated by syntactic/pragmatic factors, in other languages more parameters (such as morphology) come into play and these will be more easily uncovered if sentence types other than declaratives are explored.

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¹ In Swedish and Basque, apparently instead of de-accenting, there is pitch range reduction after focus. I thank an anonymous reviewer for bringing these exceptions to my attention.

² According to Greek dictionaries the word *mipos* in polar questions adds connotations of doubt and ignorance. According to the Oxford Greek-English Dictionary, *mipos* can be translated in English ‘by any chance; happen’: *mipos ksereis pu ine* ‘[do you happen to know/do you know by any chance] where he is?’

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