

Perception of “tonal focus” in Greek

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Abstract

The present paper reports on the way tonal correlates of focus impact its identification in Greek simple declaratives. The material was based on 4 utterances with different focus placement. Manipulation of the F0 contour and duration of the original utterances resulted in a list of 18 utterances, repeated 10 times each, and presented randomly to each of 10 informants. The informants were asked to indicate what part of each utterance bore focus. The results showed that: (1) F0 is the most reliable parameter for focus perception, especially the rate of tonal rise/fall, (2) duration expansion is not sufficient for focus perception, and (3) combining F0 and duration affects successful focus identification.

Key words: Greek, focus, tonal structure, tonal movement, perception

Introduction

Traditionally, tonal rise, longer duration and increase of intensity have been considered as correlates of focus. The so called focal accent, meaning tonal rise, was suggested as the main correlate of focus by Bruce (Bruce 1977) based on the assumption that the element in focus is given prosodic prominence by adding a focal accent rise after the word accent fall, performing the local tonal range expansion in order to be more contrastive as global tonal structure compression is being performed (Botinis et al. 2000, Baumann et al. 2006).

According to the results of our previous studies of focus production, local tonal expansion and global tonal compression are not observed in most cases so clearly (Nikolaenkova 2009). F0 rise does not seem to be an obligatory cue for focus production, which agrees with the observations made by Heldner for the case of focus perception in Swedish (Heldner, 1998). A parameter that was suggested to be more reliable for focus identification is the slope, the rate at which the tone falls.

The present research was aimed at testing F0 as well as duration expansion, which are widely accepted as tonal correlates of focus perception.

Methodology

The speech material for the present study consists of a Greek declarative sentence “i me-LI-na MA-lo-ne ti-MA-na-mu” (Melina was arguing with my mother). For the scope of the experiment, different focus placement was elicited by instructing the speaker to answer

questions designed to elicit focus placement on the desired sentence element. Four focus conditions were elicited: neutral, S-focus, VP-focus and O-focus. A female native speaker of Greek, in her late twenties, was recorded producing the utterances seated in a sound treated room at the University of Athens Phonetics Laboratory. The speech material was recorded to computer disk using the PRAAT software package.

For the needs of the present experiment three series of manipulations on the originally recorded material have been made: pitch contour manipulation, duration manipulation and combination of both.

The first set of pitch manipulated stimuli was based on flattened natural pitch contour manipulation, either neutral or with naturally produced focus (see Figures 1, 2).

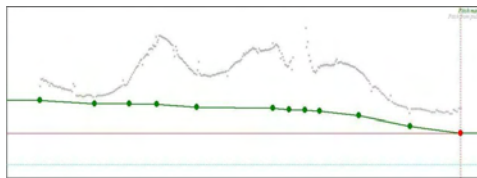


Figure 1. Pitch flattening trace with neutral focus placement.

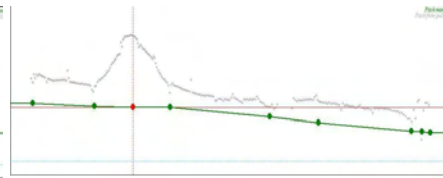


Figure 2. Pitch flattening trace with S focus placement.

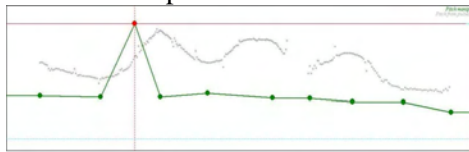


Figure 3. Pitch manipulation trace with S focus placement on basis of flattened O focus contour.

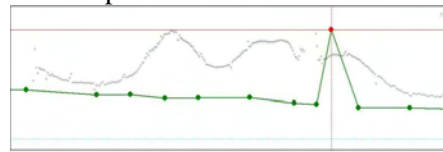


Figure 4. Pitch manipulation trace with O focus placement on basis of flattened V focus contour.

On the basis of the flattened pitch contour, a pitch rise-fall on stressed syllable nucleus was simulated for Subject, Verb and Object focus elicitation (see Figures 3, 4).

In each manipulation pitch range has been expanded in accordance with the pitch peak range of naturally produced focus. As a result of manipulating pitch, 6 utterances (3 based on flattened neutral contour and 3 based on flattened focused production) have been used.

The set of manipulations with duration included stimuli where the element in focus got stressed syllable duration expanded by 2 periods equally for consonant (liquid or nasal) and vowel (approx. 30 ms in total). The

expansion was made by duplicating two naturally produced periods from the middle of the respective sound.

The third set of stimuli consisted of utterances involving both pitch range expansion and stressed syllable duration expansion.

The experiment was based on an exclusively designed computer application. It was calling the 18 WAV files organizing them in 10 sets with different order of stimuli every time. Each listener was instructed to mark the most prominent element if any, while there was also an option “none”. All the options were visualized in four interactive buttons. The time interval between the stimuli was 1,5 sec giving no return or break option – missed stimuli were ignored. The listeners could only take breaks between the sets.

The perception test yielded 1800 responses (18 utterances x 10 repetitions x 10 listeners).

Results

The results showed that F0 expansion had the best total identification rate amounting to 92,67% (see Table 1) in case of manipulating the flattened neutral pitch contour. This rate was higher than the one obtained with similar manipulation on naturally focused contour (79%). Such difference in perception rates may be indicating other tonal parameters present in natural stimuli.

Table 1. Successful focus identification in relation to the parameters used for tonal manipulation.

Total Results – Parameters						
Parameter	F0	Duration	F0 on Focus	Duration on focus	F0 and Duration	Natural
Matching	278	36	237	15	273	139
% Success	92,67%	12,00%	79,00%	5,00%	91,00%	46,33%

Table 2. Successful focus identification in relation to focus placement.

Total results - Focus placement			
Focus type	Subject	VP	Object
Matching focus type	369	326	283
% Success	61,50%	54,33%	47,17%

It is worth mentioning that duration expansion did not contribute to successful focus identification having low identification rates (see Table 1). However in combination with F0 local expansion it had impressively high perception rate being 100% identified by most informants. Some of our informants even showed preference to this combination having even lower rates of 80% in cases of F0 expansion alone.

Furthermore the perception experiment confirmed that focus placement on Subject is much better perceived than placement on Object and Verbal Phrase (see Table 2).

Conclusions

According to the results of the present study, local tonal expansion combined with global compression especially in the post-focus area being widely acknowledged as focus-indicator by several investigators (e.g. Botinis et al. 2000, Botinis 2003, Xu 2005) has the highest impact on successful focus identification for Greek.

Close ties between F0 change and duration revealed also by our previous production studies (Nikolaenkova 2009) have been reconfirmed also by the perception data which showed not only high identification rating but also preference by some speakers.

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