

Effect of narrow focus on the tonal realization in Georgian

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Abstract

This article examines the prosodic correlates of focus in Georgian declarative sentences, based on speech production data. Georgian is an intonation language with flexible word order, and it is sensitive to information structure. Focus has an impact on duration but does not systematically change the tonal realization of the constituents. Most prosodic correlates of focus result from the interaction with prosodic phrasing.

Index Terms: prosody, production experiment, pitch accents, phrasing, focus.

1. Introduction

There is an agreement in the literature on intonation languages like English and German that there should be a strict one-to-one relationship between focus and prosodic prominence. It is expected that information structure is implemented in prosody, be it through accents, boundaries or other tonal phenomena. This correspondence has been elevated by a number of authors to the level of axioms, as for example [1], [2] and [3]. However, recent works on phonetic correlates of information structure in different languages show that not all prosodic events are directly mapped to concepts such as ‘topic’ and ‘focus’, but rather result from the interaction between information structure and syntax on the one hand and the mapping of syntactic phrases to prosodic constituents on the other, see [4], [5] and [6]. Beyond the general value of these observations, it is interesting to understand how prosodic events correlate with other aspects of grammar in particular languages. This paper contributes to this line of research and shows that the prosodic correlates of focus in Georgian are better understood if the discourse effects of syntax are taken into account. It is shown, for example, that focus has sometimes the effect of lowering a high pitch accent rather than raising it.

Lexical stress is at most weakly implemented in Georgian phonology. There is no consensus in the literature as to its position in the word. It is neither distinctive, nor culminative (polysyllabic words are reported to have more than one stressed syllables). This typological property is crucial, since it has been already observed that intonation languages may lack lexical stress, see [7] on French, and further research will reveal whether Georgian also belongs to this category. Georgian is an intonation language and uses pitch variations to express pragmatic meanings, see [9]. Two recent accounts on the intonation of Georgian declarative sentences ([9] and [10]) differ on the analysis of focus-related tonal events. [9] assumes that focus in Georgian is always expressed by pitch accents, while [10] assumes that prosodic phrasing is essential, and that all tonal movements are to be analyzed in term of their import to the prosodic phrasing. In the latter account, thus, focus is not always expressed by a change in tonal

implementation, but only in the cases where prosodic phrasing is changed, as well.

The choice of word order in Georgian is sensitive to information structure. In particular, focused constituents may surface either at the position that immediately precedes the verb (*ex situ focus*). Alternatively, postverbal constituents may be focused in situ, see [11] and [12].

The aim of this article is to critically examine the claims made by the previous accounts, by using experimental data from speech production. §2 presents the method of data collection, §3 presents the results from duration, §4 the results from tonal realization, and §5 the results on phrasing.

2. Method

The data presented here is part of a larger data set of Georgian utterances that we created for the study of the interaction between prosody and information structure. Native speakers were presented simple Georgian declarative sentences, one of which is illustrated in (1).

<i>nino</i>	<i>mamas</i>	<i>eloliaveba.</i>	(1)
Nino(NOM)	father(DAT)	cares	
‘Nino cares about the father.’			

They were instructed to memorize the sentences and to utter them as natural answers to context questions. The context questions were read by the instructor, a native speaker of Georgian. The questions manipulated the information structure of the answer, as shown in (2). (2a) elicits an broad focus answer and (2b) a narrow focus on the subject constituent.

<i>ra</i>	<i>xteba?</i>	(2a)
what(NOM)	happens	
‘What happens?’		

<i>mamas</i>	<i>vin</i>	<i>eloliaveba?</i>	(2b)
father(DAT)	who(NOM)	cares	
‘Who cares about the father?’			

The data set contained four word orders (SOV, SVO, OSV, OVS) presented in five contexts (all_F, VP_F, V_F, S_F, O_F), where subscripted F (for *focus*) identifies the constituent asked for in the context question. Since not all word orders were felicitous answers to the context questions, only some of the question/answer pairs were used (13 out of the 4×5=20 cells). We created four items in all 13 conditions. Each speaker was presented each condition in each item twice and hence produced 8 sentences per condition. Eight native speakers (all female, age range: 21-27, average: 23.5) participated to the experiment, which took place in Berlin, December 2007. All speakers had left Georgia only recently (0.6 to 3 years before the recordings).

In this article, a subset of the collected data is presented. The aim is to identify the effect of narrow focus on the tonal realization of the arguments. For this purpose, preverbal focus in S[O]_FV and [S]_FVO and postverbal argument focus in

SV[O]_F are examined; the same word orders in broad focus are used as a baseline.

3. Duration

Narrow focus has a significant effect on duration, which is observed in all comparisons. Table 1 presents the mean duration (and the standard error of the mean, SE) of the focused constituent, i.e., the object in S[O]_FV, the subject in [S]_FVO, and the object in SV[O]_F. A repeated-measures analysis of variance on the speaker-aggregated data gave a significant main effect of (broad vs. narrow) focus on duration ($F_{1,7} = 60.5$, $p < .001$), which reflects the fact that in all comparisons in Table 1 narrow focused constituents are significantly longer than the corresponding constituents in broad focus (S[O]_FV: $t_7 = 6.36$, $p < .001$; [S]_FVO: $t_7 = 5.26$, $p < .001$; SV[O]_F: $t_7 = 5.96$, $p < .001$). This finding reflects the prominence of narrow focused constituents and is in line with previous observations in other languages (see, e.g., [13], [14] and [15] on German). Furthermore, the analysis of variance reveals a significant main effect of word order ($F_{1,7} = 726.3$, $p < .001$), which results from the fact that initial constituents are generally longer than medial ones. Furthermore, final constituents show a final lengthening effect (S[O]_FV < [S]_FVO < SV[O]_F). This effect holds independently of focus and has been already observed for several languages (see summary in [15]). Crucially, the two factors do not interact significantly, i.e., there is evidence that word order influences duration but not that it influences the effect of focus on duration (the two effects are cumulative).

Table 1. Average noun duration (in msec)

	broad focus	narrow focus
S[O] _F V	281	315
[S] _F VO	284	336
SV[O] _F	355	385
average	307	345

4. Tonal realization

In the default realization of Georgian utterances, all non-final p-phrases are realized with rising contours, see [10]. This pattern is illustrated in Figure 1, and shows the F_0 excursion of the SOV sentence in (2) elicited in broad focus. Both subject and object in Figure 1 are realized with a rising contour starting with a low tone (L) around the end of the first syllable and reaching a high tone target at the right edge of the constituent.

nona bebos emudareba. (2)
 Nona(NOM) grandmother(DAT) begs
 ‘Nona begs for the grandmother.’

In the next subsections, the question is examined whether the baseline pattern illustrated in Figure 1 can be changed under the influence of a narrow focus, and if the answer to this question is positive, how does this happen.

4.1. Preverbal focus in S[O]_FV

Observations on the prosody of intonation languages like German and Greek show that the rising contour of the object is changed into a nuclear falling accent when it is in focus. Bi-syllabic words in Georgian are stressed on the penultima, hence a nuclear high accent on this syllable would result to a falling contour in the object constituent. However, manual inspection of our data did not confirm this expectation: the object, even in focus, was generally accompanied by a rising tonal contour, which we analyze as a high boundary tone.

Empirical evidence comes from the observation of the relation between the first H-target (in the subject) and the second L (i.e., the F_0 -minimum within the object) in Figure 1. In broad focus, the F_0 -minimum was reached in average at the 8th percentile of the second syllable of the object, while in narrow focus on the object, the F_0 -minimum was aligned with the 11th percentile of the second syllable of the object in average (this difference is not significant in a paired-samples two-sided T -test). The observation that the F_0 -minimum was always reached at the beginning of the second syllable reflects the fact that the pitch contour of the first syllable was falling and the contour of the second syllable was rising (both in broad as well as in narrow focus).

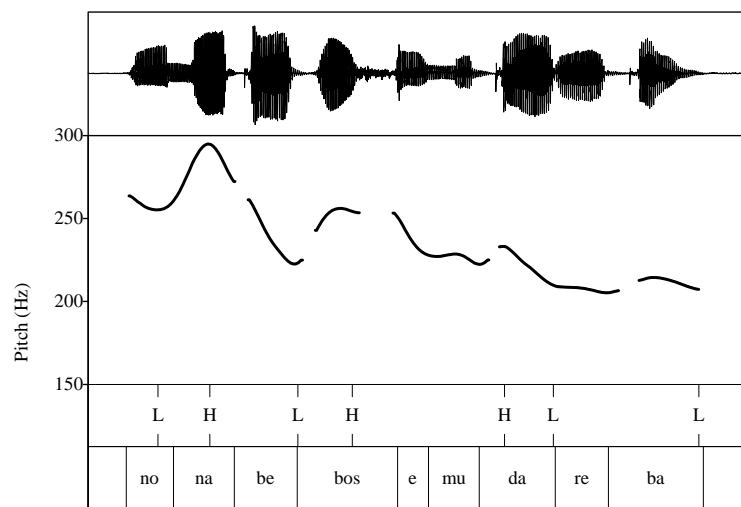


Figure 1: Rising pattern of non-final p-phrases (item 4, speaker LEL).

Though the local tonal pattern of the object is identical in broad and narrow focus (fall in the first syllable and rise in the second, we find a slight difference in the pitch range of the first part of the contour Table 2 presents the average values of the first high target (F_0 -maximum) of the utterance (which was always realized within the second syllable of the subject constituent, see Fig. 1), and the average values of the subsequent low target (F_0 -minimum) that was reached within the second syllable of the object constituent. The observed pitch range expansion in narrow focus is significant ($t_7 = 6.32$, $p < .001$). Note that the F_0 -maximum is realized within the subject constituent, hence this pitch expansion cannot be accounted for as a pitch effect on the constituent in focus.

Table 2. Average F_0 of tonal targets in SOV (in Hz).

	F_0 -max (subject)	F_0 -min (object)	range
broad focus	264	190	74
narrow focus (O)	269	182	87

4.2. Preverbal focus in $[S]_F VO$

In the SVO order in broad focus, the initial constituent of the clause appears with two alternative tonal realizations: either with a rising (see Figure 2a) or with a falling contour (see Figure 2b). We investigate in this section whether this alternation is influenced by focus. We may assume that the falling pattern in Figure 2b occurs more frequently when the subject is narrowly focused. (The same alternation occurs in the initial constituent in the SOV, see Section 5.) In other intonation languages, the change in the direction of a pitch accent on an initial narrowly focused constituent goes together with deaccenting of postnuclear material. But there is no systematic postnuclear deaccenting in Georgian. Instead all constituents following the narrow focus are fully intonated.

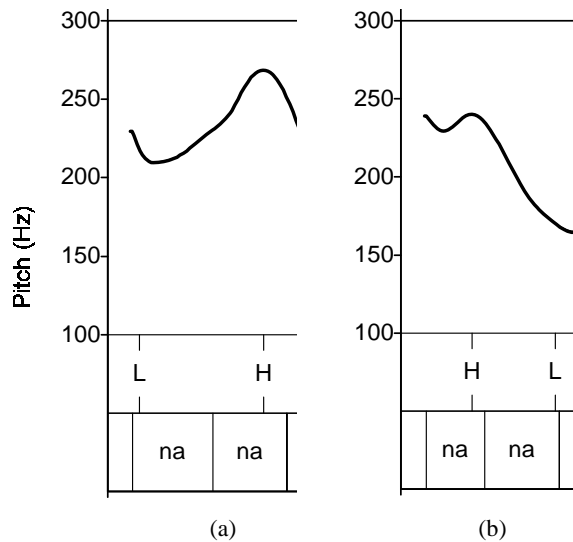


Figure 2: Falling (HL) vs. rising (LH) contour of the initial constituent nana ‘Nana(NOM)’ in SVO, broad focus (item 3, both produced by speaker NIN).

Concentrating on the distribution of the patterns in Figure 2, we found 16 out of 64 utterances in $[SVO]_F$ in which the highest F_0 measurement of the initial constituent occurred within the first syllable, i.e., 25%. In $[S]_F VO$, early alignment of the F_0 -maximum occurred in only 10 out of 64 utterances, i.e., 15.6%. This distribution contradicts the hypothesis that

the early alignment of the H-target (and a subsequent falling pattern) can be motivated by narrow focus (see Section 5).

4.3. Postverbal focus in $SV[O]_F$

The postverbal realization of focus was often associated with a particular prosodic pattern, documented in [10], and called ‘super-low’. The first syllable of the focused constituent was realized with a steep fall that reached a low target in the intonation contour. The second syllable was not further lowered resulting hence in a low and flat intonational realization of the focused word, see Figure 3. This pattern occurred more frequently when the last constituent was in narrow focus (39 out of 64 tokens, 61%) than in broad focus (28 out of 64 tokens, 44%).

We assume that the super-low tone is the result of the very strong tendency of high tone downstepping in Georgian, especially on the last constituent of the sentence. Upstep of high tones occurs only rarely. The realization of a super-low tone can be considered as a mean of emphasizing a tone. Since the focused word cannot be made prominent by raising its high tone, the high tone is lowered.

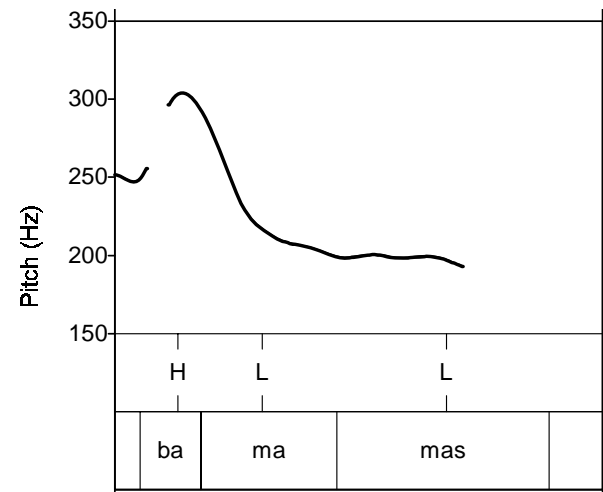


Figure 3: ‘Super-low’ pattern in final focus ($SV[O]_F$) (item 1, speaker LEL); the figure presents the last syllable of the verb eloliaveba ‘cares’ and the object mamas ‘father(DAT)’ (see lexical material in (1)).

5. Prosodic phrasing

Section 4 has shown that there were only weak tonal correlates of narrow focus in our data. $S[O]_F V$ shows the same tonal pattern with $[SOV]_F$ but with a pitch range expansion (Section 4.1). In $[S]_F VO$, we observed a (non-expected) increase of the rising LH pattern in comparison to the broad focus. In $SV[O]_F$, the occurrence of a ‘super-low’ tonal pattern is more frequently attested than in broad focus.

In [10], it was shown that the essential effect of focus in Georgian lies in prosodic phrasing. And we claim here that the properties of prosodic phrasing account for the correlates of focus identified in the previous sections. Prosodic phrasing is determined by constituent structure. The canonical word order is verb-final. As a result, non-verb-final orders are derived by syntactic movement. In line with the syntactic facts, we found an asymmetry in the phrasing preferences for the SOV and SVO orders in broad focus: while the canonical order is preferably phrased as $(SOV)_P$ or $(S)_P(OV)_P$, the derived order is phrased as $(SV)_P(O)_P$.

The effect of focus on prosodic phrasing is a preference for phrasing focused constituents separately. The interaction of focus and word order is illustrated in Figure 4 that displays the average pitch contour of the verb and the object in the SVO order, both in broad focus and in SV[O]_F. In broad focus, the average measurements showed a raising of the value at the right edge of the verb, a high tone position which can be interpreted as a high boundary tone. This is the result of the preference for (SV)_P(O)_P when the object is in focus. This pattern is not available when the subject is in focus, in which case the given part of the sentence (VO) forms a single p-phrase. The raising of the average contour at the right edge of the verb is even larger when the object is in focus.

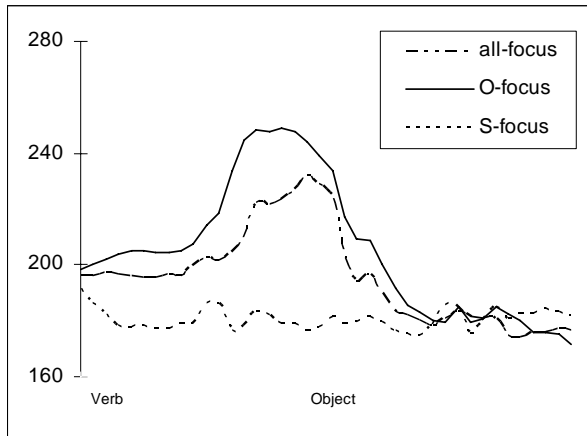


Figure 4: Averages of F_0 measurements in the SVO order (measurements of ten equal intervals per syllable).

In the light of the focus effects on phrasing, the finding in section 4.2 can be accounted for. Assuming that the LH contour creates a prosodic boundary at the right edge of the constituent, the preference for focus to form a separate p-phrase explains why the LH pattern is more frequently attested when the subject is narrow focused. The results of section 4.1 are slightly different. The sequence SOV is realized as (SOV)_P or (S)_P(OV)_P. When the object is focused, the latter realization is realized more often. This results to an effect on the alignment of the H-target in the subject constituent that is similar with the observations in the SVO order: the highest F_0 measurement of the initial constituent occurred within the first syllable in 22 out of 64 utterances, i.e., 34% in [SOV]_F and in 28 out of 64 utterances, i.e. 44% in S[O]_FV. Prosodic breaks between S and O are in line with this observation. The average of observed breaks is 14.4 msec in [SOV]_F and 23.8 msec in S[O]_FV. We assume that the increase in the pitch of the H-target in Table 2 relates to this difference in phrasing.

6. Conclusion

This paper has examined changes in the tonal patterns of Georgian sentences in broad focus and in sentences with a narrow focus on the subject or on the object. A default tonal pattern was identified in which preverbal subject and object both had a rising contour (HL), and in which downstep of a sequence of high tones was predominant. In broadly focused SOV sentences, the object and the verb were phrased together, and the subject was integrated into this phrase. Alternatively, the subject was phrased individually. In S[O]_FV, default phrasing could be preserved, but there was a preference for the [OV] portion of the sentence to be phrased together. In

[S]_FVO sentences, when the initial subject was narrowly focused, it was more often realized with a rising contour (speaking for a high prosodic boundary) than when it was part of an broad focus pattern. While many intonation languages deaccent postnuclear constituents, Georgian applies a different strategy. It keeps all accents, and applies downstep throughout. Finally, in SV[O]_F, the final narrowly focused constituents was often realized with a ‘super-low’ tone, conveying an inverted prominence, a strategy also found in broad focus. When it was realized tonally at all, focus was not accompanied by an extra high tone, as in most intonation languages, but rather with an extra low tone. The final focus was also occasionally separated from the preceding verb by a clear high boundary tone on the final syllable of the verb, showing a tendency of the focused constituent to be phrased individually.

In sum, Georgian shows different tonal properties from English, German, Greek and other intonation languages. More research is necessary to understand how it implements focus, for instance in longer sentences, or in different syntactic contexts. The issue of the lexical accent has to be resolved, since it is not clear at this stage whether Georgian really has lexical accents, or whether tones are just correlates of phrasing, like they are in Indian languages or in West Greenlandic, for instance. In which case, Georgian would be a ‘phrase language’ rather than an ‘intonation language.’

7. References

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