

The prosody of focus projection: word stress and F0 patterns in Georgian

Lena Borise

Abstract

Based on experimental evidence, this paper shows that focus projection/percolation – the phenomenon by way of which prosodic prominence on a sub-constituent signals focus on the whole constituent – has a consistent prosodic realization in Georgian. The novelty of these findings lies in two properties of Georgian that have not been explored from the perspective of focus projection: it is a language with a dedicated focus position (linearly immediately preverbal) and one that does not rely on pitch accents in the expression of phrasal prosody (Skopeteas & Féry 2010; 2016). According to focus projection accounts (Selkirk 1984; Cinque 1993; Ladd 1996; Zubizarreta 1998, a. o.), utterances with narrow focus on the direct object are realized in the same way as broad focus utterances, since in all three cases prosodic prominence is realized on the direct object. In contrast, in utterances with narrow focus on the subject, the subject is the most prosodically prominent element, which means that the whole utterance has a different prosodic realization from that of broad focus contexts. This paper shows that the distribution of prosodic prominence in object- and subject-focus contexts in Georgian fits with this generalization. Specifically, the realization of utterances with narrowly focused objects does not differ from broad focus contexts in their F0 patterns and prominence of the stressed syllable, while narrowly focused subjects differ from subjects in broad focus utterances in both of these parameters.

Keywords: focus projection/percolation, word stress, syllable duration, F0, prosodic phrasing, Georgian.

1 Introduction

This paper shows that the predictions of focus projection accounts hold even in a language that is both syntactically and prosodically markedly different from languages like English, for which focus projection accounts were originally developed. The language is Georgian (Kartvelian). Syntactically, Georgian has a preverbal focus position, which means that all type of foci are realized in the same (linear) position: immediately preverbal (Skopeteas, Féry & Asatiani 2009; Asatiani & Skopeteas 2012).¹ Prosodically, the distribution of sentential prosodic prominence in a language like English relies on pitch accents (Pierrehumbert 1980; Selkirk 1984; Ladd 1996), but Georgian has been shown to rely on boundary tones and phrasing in its expression of phrasal prosody instead (Skopeteas & Féry 2010; 2016).

According to focus projection accounts, the prosodic realization of an utterance containing narrow focus on a (direct) object patterns together with the prosodic realization of broad focus, since, in both cases, the object is the most prosodically prominent constituent at the utterance level (Contreras 1976; Culicover & Rochemont 1983; Selkirk 1984; von Stechow & Uhmman 1986; Reinhart 1995; Cinque 1993; Zubizarreta 1998). In contrast, in utterances with narrow focus on the subject, the subject carries the most prosodic prominence, which means that such utterances are prosodically different from their string-identical broad-

¹ Note that this applies to narrow foci found in the preverbal domain – i.e. narrow foci found in the part of the utterance to the left of the finite verb must be left-adjacent to it. Narrow foci can also be found immediately postverbally in Georgian; there are no restrictions on the argument/adjunct status or thematic role with postverbal foci. There are no major semantic or pragmatic differences between preverbal and postverbal foci, but postverbal focus differs from preverbal both in its syntactic structure and prosodic realization. This type of focus is not discussed here. See Skopeteas and Fanselow (2010) for the discourse properties of postverbal focus, Skopeteas and Féry (2010), Skopeteas, Féry, and Asatiani (2018) for its prosodic realization, and Borise (2019) for the syntactic representation of postverbal focus.

focus counterparts. This is illustrated in (1), where boldfacing indicates the domain of focus, small caps mark constituents that are prosodically prominent, double underscoring marks constituents that are realized in the same way, and wavy underscoring marks those that are pronounced differently from each other, with respect to prosodic prominence at utterance level.

- (1) a. (What happened?)
MARY bought **A BOOK**. (broad focus)
- b. (What did Mary buy?)
 Mary bought **A BOOK**. (object focus)
- c. (Who bought a book?)
MARY bought a book. (subject focus)

Georgian allows for both OV and VO word orders in broad focus utterances. In those containing narrow foci, both subject and object foci surface (linearly) in the immediately preverbal position. This means that, unlike in English, both subject and object focus constructions have a broad-focus minimal pair that is linearly identical to the narrow focus construction.² Based on the paradigm in (1), the following predictions emerge for Georgian. An utterance containing a narrowly focused preverbal object should be realized in the same way as an SOV broad focus utterance, as in (2). In turn, an utterance with a narrowly focused preverbal subject would receive a different realization as compared to an SVO broad focus utterance, as in (3).

- (2) a. (What happened?)
Mariam-ma **C'IGN-I** **i-q'id-a**.
 M.-ERG book-NOM VER-buy-AOR.3SG
 'Mariami bought **A BOOK**.' (broad focus, SOV)
- b. (What did Mary buy?)
 Mariam-ma **C'IGN-I** **i-q'id-a**.
 M.-ERG book-NOM VER-buy-AOR.3SG
 'Mariami bought **A BOOK**.' (object focus)
- (3) a. (What happened?)
Mariam-ma **i-q'id-a** **C'IGN-I**.
 M.-ERG VER-buy-AOR.3SG book-NOM
 'Mariami bought **A BOOK**.' (broad focus, SVO)

² There is no reason to believe that the realizations of the subject in SOV and SVO would differ from each other; the comparison here is set up between SO_FV and [SOV]_F, and S_FVO and [SVO]_F, respectively, to hypothesize that foci that occupy the same linear position – immediately preverbal – can nevertheless have different prosodic realizations as compared to their thematic counterparts (subject, object) in a broad focus utterance.

Note also that the small cap notation is not, by itself, intended to claim that all constituents in small caps have the exact same prosodic realization – in particular, it is not intended to claim that narrowly focused subjects and narrowly focused objects are realized in the same way; in fact, as the results show, that is not the case in Georgian. Instead, the two pairwise comparisons that are set up here are (i) between the constituents with double underscoring and (ii) between the constituents with wavy underscoring.

b. (Who bought a book?)

MARIAM-MA i-q'id-a c'ign-i.
M.-ERG VER-buy-AOR.3SG book-NOM
'MARIAMI bought a book.' (subject focus)

As this paper shows, this prediction is borne out: in Georgian, the realization of narrowly focused objects matches that of objects in broad focus utterances, while narrowly focused subjects are realized differently from subjects in broad focus contexts. Therefore, there are two comparisons set up in this paper: one between the realizations of objects in the two contexts, and one between the realizations of subjects.³ This is schematized in Table 1.

Narrow focus on	Prosodic realization of	
	object	subject
	=	≠
Broad focus contexts	object	subject

Table 1. Prosodic realization of different types of foci in Georgian

Syntactically, preverbal foci in Georgian are found in situ, and adjacency with the verb is achieved via ‘altruistic’ movement of any intervening material (Borise 2019). This means that contexts with preverbal subject and object foci rely on different syntactic structures: while object foci are structural sisters to the verb, subject foci are found higher up in the syntactic tree, and may require ‘altruistic’ movement of intervening material in order to achieve adjacency with the verb (e.g., movement of the direct object in a transitive clause); see Section 2.2. While this syntactic difference is not reflected in the linear order, it is in the prosodic realization of foci.

Prosodically, Georgian has been described as a ‘phrase language’ (Skopeteas & Féry 2010; 2016) – i.e., a language that primarily relies on boundary tones and phrasing in its prosodic system as opposed to stress-aligned pitch-accents; see Section 2.3. The phenomenon of focus projection, in contrast, is commonly understood in terms of pitch accent alignment (Ladd 2008: 214). This paper, therefore, shows that even a ‘phrase languages’ behave in a way that is predicted by focus projection accounts, even though they rely on different acoustic cues when doing so. Two independent acoustic cues – prominence (duration) of the stressed syllable and the F0 contour on the constituent in question – are investigated here. Neither acoustic cue differentiates narrowly focused objects from objects in broad focus utterances, but they consistently set apart narrowly focused subjects from subjects in broad focus utterances.

This paper is structured in the following way. Section 2 provides the necessary background on Georgian and focus projection. Section 2.1 discusses the phenomenon of focus projection, Section 2.2 the syntax of focus in Georgian, Section 2.3 the prosodic system of the language, and, finally, Section 2.4 provides an overview of what is known about the prosody of focus in Georgian. Next, Section 3 reports on the results of a production study that investigated the prosody of different focus types in Georgian. Section 3.1

³ It is a separate question, not directly addressed here, whether the realizations of narrowly focused subjects and objects differ from each other. It is commonly thought that, in languages like English, the two are parallel, in that, in the respective contexts, they both carry nuclear pitch accents. Some empirical results, however, show that the acoustic realization of focus on subjects and objects may differ (Rump & Collier 1996; Xu & Xu 2005).

introduces the experimental design, and Section 3.2 reports on the prosodic properties of narrowly focused constituents: duration of the stressed syllable (Section 3.2.1), and F0 contours on focused constituents (Section 3.2.2). Finally, Section 4 provides a discussion, and Section 5 introduces some further directions of the current research.

2 Theoretical background and previous work

2.1 The phenomenon of focus projection

A sentence such as (4) below is ambiguous: in it, any of the nested bracketed constituents can be regarded as carrying focus. This means that (4) can be felicitously uttered in response to any question in (5), each of which selects for a focused constituent of different size. Examples like (4), therefore, serve as the basis for the idea of focus projection (percolation), also known as focus ambiguity between a constituent and a sub-constituent. This idea relies on the fact that, in terms of sentential prominence/stress, the replies to (a)-(c) in (5) would be identical: focus in them is manifested by sentential prominence/stress on the word SOCKS, regardless of the size of the focused constituent. This means that the prosodic pattern with prominence on the word SOCKS in (4) may be interpreted as characterizing broad focus, VP focus, or narrow focus on the direct object (or a subpart of the direct object). Prosodically, sentential stress is realized as an intonational pitch accent (Ladd 2008: 214).

(4) Nini (knit (a pair of (SOCKS))).

- (5) a. What did Nini do?
b. What did Nini knit?
c. A pair of what did Nini knit?

Focus projection has been analyzed as a phonological phenomenon (Newman 1946; Schmerling 1976; Gussenhoven 1983a; Truckenbrodt 1999; Büring 2006; Ladd 1980; 2008) or a syntactic one (Halliday 1968; Chomsky 1972; Jackendoff 1972; Contreras 1976; Culicover & Rochemont 1983; Selkirk 1984; von Stechow & Uhlmann 1986; Reinhart 1995; Cinque 1993; Zubizarreta 1998; Féry & Samek-Lodovici 2006). It has also been approached from a hybrid probabilistic syntax-phonology perspective (Calhoun 2010). While the proposed analyses differ, the set of data that they aim to account for is the same: the distribution and alignment of sentential stress, realized as a pitch accent, in string-identical utterances with different focus structures.

Some of the earliest accounts of sentential stress placement are based on the Nuclear Stress Rule (NSR; Chomsky & Halle 1968), according to which the strongest stress in an utterance (in English or other VO languages) is located on the rightmost constituent. In the primarily phonological accounts, this later became formalized as the Focus-to-Accent (FTA) approach (Schmerling 1976; Gussenhoven 1983a, a.o. building on Chomsky 1972; Jackendoff 1972). Consider Gussenhoven's (1983a) Sentence Accent Assignment Rule, (SAAR), which exemplifies FTA; once the focus domain (which may be more than one lexical word) is established, a single stress is assigned within it based on SAAR: stress targets the Argument within the focus domain (as opposed to the Predicate or the Condition). In contrast, according to the focus projection accounts grounded in syntax (Contreras 1976; Culicover & Rochemont 1983; Selkirk 1984, a.o.), the fact that nuclear stress is found on the rightmost constituent is derived not from its utterance-final or thematic status but from rules that calculate the relative prominence of adjacent nodes in the syntactic structure. This idea was later brought to fruition in Cinque (1993) and Zubizarreta (1998), who suggested that it is the most deeply embedded constituent (i.e., in transitive clauses, the direct object) that carries sentence-level prosodic

prominence; this formulation of the nuclear stress rule allowed to account for the distribution of nuclear stress in both VO and OV languages.⁴

How is sentential stress assigned in utterances with focus domains of various sizes? According to SAAR, in a focus domain of any size, the Argument is stressed, which leads to focus ambiguity in recursive focus domains, as in (4). According to the syntax-based approaches, narrow focus on the direct object is realized in the same way as focus on the VP and broad focus, given that in all three scenarios prosodic prominence is realized on the most deeply embedded constituent, the direct object, and projected up the syntactic tree through a succession of embedding phrases. The size of the constituent carrying narrow focus thus ranges from the object alone to the projection that embeds it (VP), to vP, TP, and CP.⁵

In contrast with objects, narrow focus on the subject does not lead to focus ambiguity. This is because in these utterances the subject carries sentential stress/prominence, which is incompatible with broad focus. This is illustrated in (6) and (7): of the three questions in (7), only (e) can be felicitously answered with the utterance in (6). This is expected according to a phonological approach like SAAR: if the subject (an Argument) alone is the focus domain, it carries stress, which is incompatible with the stress pattern obtained if the whole utterance is a domain of stress. On the syntactic accounts, constituents other than the direct object and the projections on the clausal spine that recursively embed it – such as the subject – do not take part in the phenomenon of focus projection.

(6) **NINI** (knit (a pair of (socks))).

- (7) a. # What happened?
b. # What did Nini do?
c. # What did Nini knit?
d. # A pair of what did Nini knit?
e. Who knit a pair of socks?

There is not enough space here to do justice to the full range of approaches to focus projection. What is crucial for our purposes, though, is that there is agreement on the phonological facts: the prosodic realization of utterances with narrow focus on the object matches that of broad focus utterances, while that of utterances with narrow focus on the subject is markedly different from that of broad focus contexts.

The phonetic reality of focus projection has been subject to empirical scrutiny, with varying results. Several studies on English found no differences between the prosody of narrow focus on the object and broad focus, as focus projection accounts predict: in perception experiments, listeners did not reliably distinguish replies to questions eliciting broad or VP focus from object focus (Gussenhoven 1983b; Birch & Clifton Jr 1995; Welby 2003). On the other hand, Rump and Collier (1996), and Bishop (2010) found that listeners can reliably tell object focus from broad focus, and Breen et al. (2010) concluded the same based on the phonetic cues used in a production experiment. Similarly, in German, Baumann et al. (2006; 2007) found that speakers produce narrow focus on the object differently from broad focus, with variable

⁴ Alternatively, there is evidence that in some languages, sentential stress/prominence targets an element that is highest in a certain domain, such as a particular syntactic projection; cf. Szendrői (2001) on Hungarian, Kahnemuyipour (2004) on Persian, and Kratzer & Selkirk (2007) on German.

⁵ There is no agreement in the literature as to whether the focused constituent has to have the status of a syntactic head in order to be able to project; cf. Selkirk's (1984) seminal proposal for in favor of this hypothesis, and Büring's (2006) 'Unrestricted Vertical Focus Projection' theory for the opposite view.

patterns of upstep, downstep and duration. In contrast, in Greek (Gryllia 2009) and Hindi (Patil et al. 2008) narrow focus on the object and broad focus, in terms of their F0 contours, are not reliably different from each other. Overall, there seems to be agreement that, while broad focus and object focus utterances are identical with respect to the alignment and type of a pitch accent on the object, there may be differences in other acoustic cues, such as prenuclear accents, intensity and relative F0 values on various constituents, etc. Languages like Georgian, however, that do not rely on pitch accents in expressing information structure, are virtually unexplored from the point of view of focus projection.

2.2 The syntax of focus in Georgian

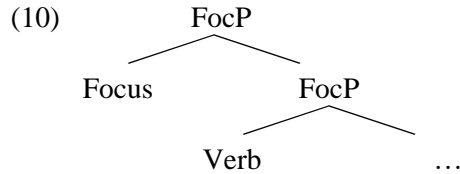
Georgian allows for considerable flexibility of word order, including both OV and VO in broad focus declaratives. Most contexts allow for OV or VO. OV is preferred in written styles, while in colloquial registers both are common (Vogt 1971; Skopeteas & Fanselow 2010). Following the majority of authors (Pochkhua 1962; Aronson 1982; Nash 1995; McGinnis 1997a; 1997b; Harris 2000; Boeder 2005), I am adopting the view that Georgian is underlyingly OV; cf. Skopeteas & Fanselow (2010) and Borise (2019) for more evidence. Georgian exhibits split case marking. In the present and imperfective tenses, subjects are marked by nominative and direct objects are marked by dative, while in the aorist, ‘active’ (transitive and unergative) subjects carry ergative, ‘inactive’ (unaccusative) subjects carry nominative, and direct objects carry nominative case. The structural position of the subject co-varies with case-marking: nominative subjects are generated in Spec, VoiceP, ergative in Spec, vP and dative in Spec, ApplP; they receive case in situ and do not undergo movement to Spec,TP. In turn, nominative and dative objects are generated within the VP; for details, see Legate (2008), Nash (2017), and Thivierge (2019).

Whenever a narrowly focused constituent appears in the preverbal domain in Georgian, it must appear in the immediately preverbal position, as shown in (8) and (9).⁶ This holds for all types of narrow foci, regardless of their argument/adjunct status or thematic role: those in replies to wh-questions, contrastive foci in corrective replies, and constituents modified by focus-inducing particles *only* and *even*.

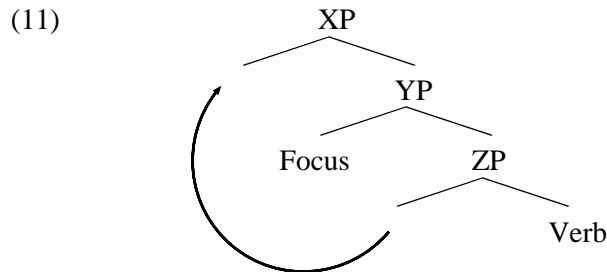
- (8) a. (‘Who cleaned the kitchen yesterday?’)
 Gušin **bebia** a-lag-eb-d-a samzareulo-s.
 yesterday grandma.NOM VER-clean-SF-SM-IPFV.3SG kitchen-DAT
 ‘Grandma cleaned the kitchen yesterday.’
 b. *Gušin **bebia** samzareulos alagebda.
 c. ***Bebia** gušin alagebda samzareulos.
- (9) a. (‘When did grandma clean the kitchen?’)
 Bebia **gušin** a-lag-eb-d-a samzareulo-s.
 grandma.NOM yesterday VER-clean-SF-SM-IPFV.3SG kitchen-DAT
 ‘Grandma cleaned the kitchen **yesterday**.’
 b. *Bebia **gušin** samzareulos alagebda.
 c. ***Gušin** bebia alagebda samzareulos.

⁶ As per fn. 1, Georgian also allows for narrow foci to appear in the immediately postverbal position, which is unlike most other verb-final languages. This type of focus is not discussed here. Note that wh-phrases (not addressed here) can only appear in the immediately preverbal position.

Syntactically, preverbal placement of narrow foci may be derived in more than one way. First, it may result from a Spec-Head configuration: the focused constituent and the verb become linearly adjacent after the former undergoes A-bar movement to the specifier of FocP, and the latter is attracted to Foc⁰ (Bhatt 1999 for Kashmiri; Karimi 2008 for Persian; Jayaseelan 2001 for Malayalam). This is shown in (10). FocP may be located anywhere between the left periphery and the left edge of the vP – above the thematic domain of the clause.



Second, focus-verb adjacency in Basque may be achieved with both elements in situ, and ‘altruistic’ movement removing the intervening material to the periphery of the clause (Arregi 2002 for Basque; cf. also Cheng & Downing 2012 for Zulu), as in (11).⁷



In Georgian, based on the syntactic tests detailed below, preverbal narrow foci are found in situ.⁸ First, narrowly focused constituents align with their broad-focus (in-situ) counterparts with respect to scope, which suggests that they, too, are found in situ. Specifically, quantified direct objects scope below the position of a low adverb such as *seldom*: the broad-focus utterance in (12) is more naturally interpreted as describing the situation in which a professor usually calls on more than three students (i.e., rarely calls on less than three; ADV > NUM), as opposed to one in which there are less than three students such that the professor rarely calls on them ([?]NUM > ADV). Had the narrowly focused object moved to a dedicated projection, such a projection would be above the thematic domain of the clause, and above the low adverb *išviatad* ‘seldom’; accordingly, the focused constituent would scope over (and linearly precede) the adverb. Such a configuration is ruled out.

- (12) Masc'avlebel-i išviatad sam-ze nak'leb st'udent'-s mo-u-c'od-eb-s.
 teacher-NOM seldom three-on less student-DAT PRV-VER-call-SF-PRS.3SG
 ‘The teacher seldom calls on fewer than three students.’ (ADV > NUM; [?]NUM > ADV)

Similarly, the narrowly focused constituent in (13) scope under the adverb *išviatad* ‘seldom’:

⁷ Alternative approaches to the syntax of preverbal focus in Basque have been put forward by Ortiz de Urbina (1989; 2002) and Elordieta (2001).

⁸ Note that this is not the case for wh-phrases in Georgian, which, while also found in the immediately preverbal position, rely on a Spec-Head configuration (short movement of the wh-phrase, accompanied by movement of the verb) instead. See Borise (2019) for examples and discussion.

- (13) ('How many students does the teacher seldom call on?')
 Masc'avlebel-i išviatad **sam-ze nak'leb st'udent'-s** mo-u-c'od-eb-s.
 teacher-NOM seldom three-on less student-DAT PRV-VER-call-SF-PRS.3SG
 'The teacher seldom calls on **fewer than three students.**' (ADV > NUM; *NUM > ADV)

The fact that narrowly focused objects align with their counterparts in broad focus declaratives (which are found in situ) with respect to their scope properties suggests that narrowly focused objects also are found in situ. Similarly, narrow foci take narrow scope with respect to the material in the left periphery, which also signals absence of movement.

Another argument for the in-situ status of Georgian preverbal foci comes from weak cross-over (WCO) effects. Structurally, it is commonly assumed that WCO effects arise from overt or covert movement of a variable or quantified expression over a coindexed lexical item (Chomsky 1976). WCO effects are independently attested in Georgian between pronominal subjects and quantified objects, as shown in (14), where *each student* cannot be co-referential with the possessive pronoun. WCO effects are also reported by some speakers in constructions with wh-objects and subjects containing a co-indexed variable, as shown in (15), where the wh-phrase cannot have the same referent as the possessive pronoun.⁹

- (14) *Mis-ma_i p'ropesor-ma mo-u-c'-od-a [titoeul st'udent'-s]_i.
 3.POSS.SG-ERG professor-ERG PRV-VER-call-SM-AOR.3SG each student-DAT
 ('His_i professor called each student_i.')
- (15) %Mis-ma_i kmar-ma **vin_i** agh-u-c'er-a Giorgi-s?
 3.POSS.SG-ERG husband-ERG who.NOM PRV-VER-write-AOR.3SG G-DAT
 'Whose_i husband described her_i to Giorgi?'
 (Lit.:Her_i husband described whom_i to Giorgi?)

In contrast with examples in (14) and (15), preverbal narrow foci do not give rise to WCO effects, which suggests that they are not subject to movement, as shown in (16). On the standard assumption that the dedicated projection that the focused constituent and the verb would move to is above the base position of the subject, if (16) resulted from movement of the focused constituent (and movement of the subject *deida-misi* still higher up), it would lead to a WCO effect. The fact that no such effect arises suggests that no movement of the focused constituent takes place.

- (16) Deida-misi mxolod Nino-s xat'-av-s.¹⁰
 aunt.NOM-3.POSS.SG.NOM only N.-DAT paint-SF-PRS.3SG
 'Her_i aunt draws only Nino_i.'

Based on the evidence above, preverbal narrow foci in Georgian are found in situ. This means that the syntactic structures that underlie the derivation of narrow focus on a subject and object differ with respect to the amount of structure that lies between the narrowly focused constituent and the verb, as well as, possibly, the need for 'altruistic' movement. Narrow focus on the object does not require any altruistic movement: both OV and O_FV contexts rely on the same syntactic structure, as illustrated in (17):

⁹ See Amiridze (2006: 62) for the view that constructions of this type do not give rise to WCO effects.

¹⁰ When possessive pronouns are used with kinship names in Georgian, the order of the two elements is the opposite from that used in other contexts: noun-pronoun as opposed to pronoun-noun.

- (17) Gušin dila-s bebia [vp samzareulo-s a-lag-eb-d-a].
 yesterday morning-DAT grandma.NOM kitchen-DAT VER-clean-SF-SM-IPFV.3SG
 ‘Grandma cleaned the kitchen yesterday morning.’ / ‘Grandma cleaned **the kitchen** yesterday morning.’

In contrast, narrow focus on the subject of a transitive SOV clause would involve ‘altruistic’ movement of the direct object, resulting in an OS_FV structure, as shown in (18).¹¹

- (18) [CP Samzareulo-Si [VoiceP **bebia** [vp t_i a-lag-eb-d-a].
 kitchen-DAT grandma.NOM VER-clean-SF-SM-IPFV.3SG
 ‘**Grandma** cleaned the kitchen.’

Narrow focus on a subject of an intransitive clause, S_FV, would not involve ‘altruistic’ movement, but would still differ from O_FV contexts given that there would be more empty structure between the narrowly focused constituent and the verb.

This means that, even though both O_FV and S_FV are instantiations of preverbal focus, they rely on different syntactic structures: in O_FV and OV, the narrowly focused constituent and the verb are structural sisters. In contrast, in S_FV (and SV), the narrowly focused constituent and the verb are not the same projection, and, in transitive S_FV clauses, their adjacency results from ‘altruistic’ movement. As the remainder of this paper shows, prosodic structure is sensitive to the differences in syntactic structure that underlie the derivation of preverbal narrowly focused objects and subjects: O_FV contexts receive a prosodic realization that is identical to broad-focus OV contexts, while S_FV contexts systematically differ from their broad-focus SV counterparts. As discussed in Section 2.1 above, such dichotomy is predicted by focus projection accounts, both syntactic and phonological ones.

2.3 Prosodic make-up of Georgian

Georgian prosody is relatively well-studied. In this section, two prosodic dimensions of Georgian are considered: word stress and phrasal prosody.

The existence and placement of word stress in Georgian have long been debated. Analyses advocating for the existence of word stress in Georgian disagree on whether it targets the initial syllable, antepenult, or penult. There is consensus, however, that (i) in di- and trisyllabic words stress is initial, and (ii) in longer words, secondary stress may occur on one of the other loci – e.g., initial syllable if primary stress is taken to be penultimate (Ioseliani 1840; Dirr 1904; Janashvili 1906; Selmer 1935; Rudenko 1940; Akhvlediani 1949; Robins & Waterson 1952; Alkhazishvili 1959; Tschenkeli 1958; Gudava 1969; Vogt 1971; Tevdoradze 1978; Aronson 1982; Hewitt 1995). Authors also agree that the stress-like target on the antepenult/penult but not the initial syllable is marked by F0 (Chikobava 1942; Zhghenti 1958).

An alternative view is that Georgian only relies on phrasal prosody, similarly to what has been suggested for French (Vaissière 1983; Jun & Fougeron 1995). The view that the domain of stress assignment in Georgian is larger than a prosodic word goes back to Gorgadze’s (1912: 13) notion of ‘syntactic groups’, Marr’s (1925: 14) ‘accentual complexes’, and Zhghenti’s (1953: 162; 1963: 144) ‘rhythmic groups’ as domains of stress assignment in Georgian. Recently, the view that Georgian is a ‘phrase language’ – i.e.,

¹¹ I am adopting the view that constituents displaced via ‘altruistic’ movement undergo topicalization into the left (or right) periphery. Nothing hinges on the type of displacement involved or its landing site.

one that primary relies on boundary tones and phrasing as opposed to stress-aligned pitch-accents – has been advocated for by Skopeteas & Féry (2010; 2016) and Butskhrikidze (2016).

Experimental evidence demonstrates that Georgian has fixed initial stress, cued by syllable duration (Vicenik & Jun 2014; Borise & Zientarski 2018; Borise 2019). It has been shown that the initial syllable, in nominals of 2-6 syllables, is always characterized by significantly greater duration than all subsequent syllables, and this effect cannot be explained by other factors, such as initial strengthening (Borise, submitted). In accordance with these results, stress is taken to be initial in the current study.¹² In alignment with the ‘phrase language view’, though, the stressed syllable in the same study in (Borise, submitted) did not consistently carry a pitch accent. Similarly, different types of pitch accents do not systematically distinguish various informational-structural contexts (e.g., focused vs. given) (Skopeteas & Féry 2010; 2016). This means that, while there is evidence for initial word stress in Georgian, it does not take part in other phonological processes in the language (cf. Clements 2001; Hyman 2012).

Many rules of Georgian phrasal prosody have also been established, from the realization of neutral statements to that of questions and narrow focus (Tevdoradze 1978; Bush 1999; Müller 2005; Skopeteas, Féry & Asatiani 2009; 2018; Skopeteas & Fanselow 2010; Asatiani & Skopeteas 2012; Skopeteas & Féry 2010; 2011; 2016). Vicenik & Jun (2014) provide a detailed Autosegmental-Metrical (AM) analysis of Georgian prosody, determining the available levels of prosodic phrasing and inventory of F0 targets.

The smallest prosodic constituent in Georgian, according to Vicenik & Jun (2014), is the Accentual Phrase (AP), which corresponds to a prosodic word (defined as a lexical word plus clitics, such as postpositions or discourse particles). This is because prosodic words in Georgian carry final boundary tones, which means that they also form minimal prosodic phrases, such as APs. As part of the unmarked intonational pattern of all-new, broad-focus declarative utterances, each AP, except for the right-most one, carries a rising F0 contour. This is shown in Figure 1, with the gloss and translation of the example provided in (19); cf. also Skopeteas and Féry (2010) and Skopeteas, Féry & Asatiani (2009: 112).¹³

Vicenik & Jun (2014) analyze such examples as carrying a low pitch accent L* on the initial syllable of the AP, followed by a high final boundary tone on the final syllable, Ha (where ‘a’ stands for AP). Typically, downstep applies to each successive Ha. This neutral intonational contour is found in out-of-the-blue declaratives and broad-focus utterances, such as replies to a question *What happened?*

- (19) Giorgi-s mosc’on-s dzalian lamaz-i gogo Tbilisi-dan.
 Giorgi-DAT like-PRS.3SG very beautiful-NOM girl.NOM Tbilisi-from
 ‘Giorgi likes a very beautiful girl from Tbilisi.’

¹² Skopeteas & Féry (2010; 2016) adopt the view that “verbs bear secondary stress on the first syllable and primary stress on the antepenultima”. It is not uncommon for stress properties of different parts of speech, especially verbs and nominals, to differ; cf. similar bifurcations in stress properties in other languages of the Caucasus (Moroz 2014 on Dargwa; Kibrik, Kodzasov & Olovyanikova 1972 on Khinalug; Saadiev 1994; Authier 2009 on Kryz). The current study deals with nominals, like the study on word stress discussed in Borise (submitted) did; therefore, nothing in the current study hinges on the stress properties of verbs in Georgian.

¹³ The acoustic data used for illustrating the prosodic patterns of Georgian comes from author’s fieldwork in Georgia.

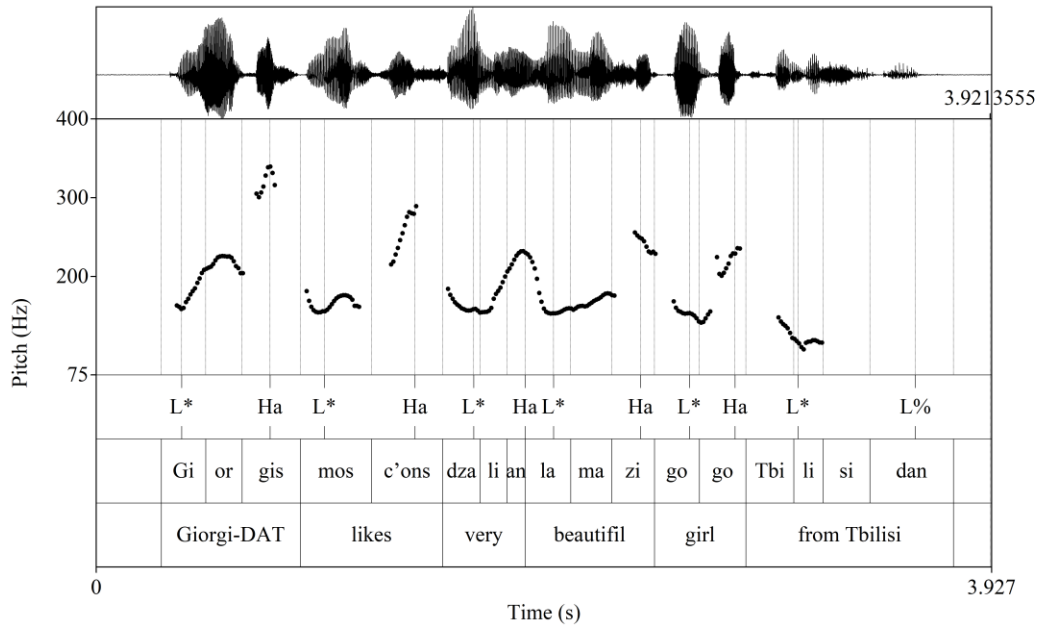


Figure 1. Typical broad-focus intonation in Georgian; each word is an AP with overall rising intonation; downstep applies to each successive high final boundary tone Ha (Borise 2017: 92).

The initial AP of an utterance, instead of the rising realization, may carry a falling F0 contour, which consists of a high pitch accent H* followed by a low AP-boundary tone La. Skopeteas & Féry (2016), based on experimental results, analyze this falling contour as a semantically vacuous variation on the rising contour. There are also complex pitch accents LH* (F0 rise within the initial syllable) and L+H* (rise with a delayed peak), and a complex AP-boundary tone L+Ha.

A prosodic constituent larger than an AP, Intermediate Phrase (ip), is found in several environments. One is wh-questions: wh-phrases, regardless of their length, carry a (rising-)falling F0 contour which also encompasses the immediately following verb. In Vicenik & Jun's (2014) analysis, the resulting prosodic constituent is an ip, which carries a H- or L- final boundary tone. This is illustrated in Figure 2, with the gloss and translation of the example provided in (20); note that a boundary tone of a larger prosodic constituent overrides that of a lower one, instead of both being realized. Larger syntactic constituents, such as nominals and their modifiers, may also (optionally) form ips instead of individual APs.

- (20) Romel-i dzalian didi vašli da-u-var-d-a Mariam-s?
 which-NOM very big apple PRV-VER-fall-SM-IPFV.3SG M.-DAT
 'Which very big apple fell onto Mariami?'

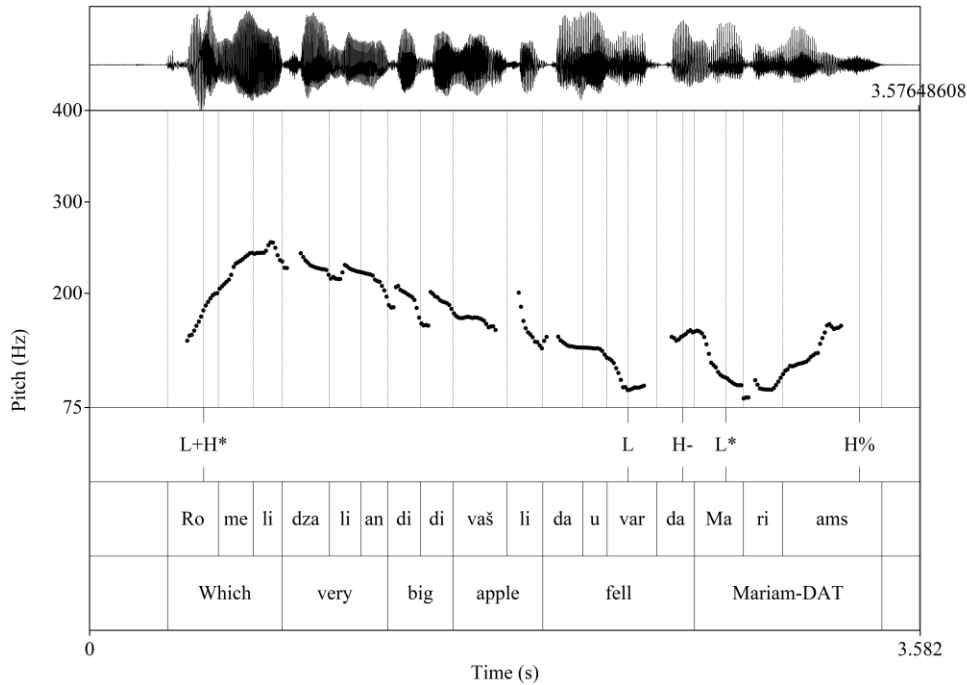


Figure 2. Typical intonational contour of a wh-question.

Both yes/no- and wh-questions have a distinct prosodic realization, which includes a specific tonal low-high contour realized on the predicate, with the low target (phrase accent L) rigidly aligned with the penultimate syllable of the predicate, and followed by a high F0 target (Ha/H-) on the ultima (Bush 1999; Müller 2005; Borise 2017).

The largest prosodic constituent, an Intonational Phrase (IP), corresponds to a clause and carries a final low boundary tone L%, as shown in Figure 1. Other possible IP-boundary tones include H% and HL%, which appear in questions.

The properties of Georgian prosodic phrasing, established here, are based on phonetic phenomena, such as the distribution and alignment of F0 targets in different types of utterances. As far as they have been analyzed, these phenomena do not provide consistent evidence with respect to the phonology-syntax interface – i.e., they do not allow for straightforward mapping of prosodic phrases onto the recursive syntactic structure. On the contrary, the fact that every prosodic word in Georgian forms an AP, and the lack of F0 targets that would consistently mark larger syntactic constituents, obscures the correspondence between prosodic and syntactic structure. That is not to say that the prosodic structure of Georgian does not reflect the syntactic structure – rather, that this relationship may be more complex and indirect than in some better-studied languages. Because a full account of the interaction between the syntactic and prosodic structures in Georgian is still to be established, no account of this interaction in focus contexts is offered here. Instead, the current conclusions are couched in terms of phonetic cues that phrasal prosody relies on, and it is shown that their distribution is consistent with the predictions of focus projection accounts – despite the fact that the cues themselves (boundary tones instead of pitch accents) differ.

2.4 Prosodic realization of focus in Georgian

The prosodic realization of narrow focus in Georgian has received considerable attention in the literature. F0 contours that characterize various focus contexts have been investigated instrumentally. This section provides an overview of existing work, paying particular attention to the detected asymmetries between narrow focus on subjects and objects, and discusses the motivation for the current study.

One of the first experimental studies that investigated the prosodic realization of focus in Georgian was conducted by Alkhazishvili (1959), who suggested that a Georgian sentence can be divided into “subject” and “predicate” phrases, which can be roughly equated with topic and focus/comment, respectively. The “predicate”, in Alkhazishvili’s terms, includes the verb and the immediately preverbal focused constituent, while the “subject” includes all other material in a clause, as illustrated in (21)-(22).

- (21) [“Subject” Giorgi-m] [“Predicate” pex-i ar ga-a-ndzr-i-a].
 G-ERG foot-NOM NEG PRV-VER-move-SM-AOR.3SG
 ‘Giorgi didn’t move’ (Alkhazishvili 1959: 373)
- (22) [“Predicate” **Omarashvil-ma** da-i-xsn-a] [“Subject” gač’irvebi-dan samartal-i].
 O-ERG PRV-VER-save-AOR.3SG hardship-from court-NOM
 ‘**Omarashvili** led the court out of the difficult situation.’ (Alkhazishvili 1959: 380)

According to Alkhazishvili’s results, the two phrase types receive different prosodic realizations: within “subject” phrases, each word is characterized by rising prosody, while “predicate” phrases carry a (rising-) falling pitch contour. A falling F0 contour notwithstanding, Georgian speakers perceive “predicate” phrases as more prominent than “subject” ones. Recall that Vicenik and Jun (2014) also observe that the intonational pattern characteristic of out-of-the-blue declaratives is a rising F0 contour that applies to each AP, as in Figure 1, while preverbal focus contexts are characterized by a shallow falling or rising-falling tune over the focused constituent and the verb.

Many important generalizations about the prosodic realization of information structure in Georgian were established in the series of papers on the prosody and syntax of information structure in Georgian by Skopeteas, Asatiani, Féry, and Fanselow. Skopeteas, Féry, and Asatiani (2009) show that even though Georgian has considerable freedom of word order, it is restricted by information-structural factors, such as the requirement for narrowly focused expressions to appear in the immediately preverbal position; they are also the first to note the existence of postverbal focus in Georgian. In turn, Skopeteas and Féry (2010) investigate the prosody of three focus contexts: S_FVO, SO_FV and SVO_F. They show that, in all contexts, the narrowly focused constituent has significantly greater duration than the corresponding constituent in a string-identical broad-focus utterance.¹⁴ Though not tested for significance, there is a trend in the data that goes in the same direction as the one discovered in the current study: on average, a narrowly focused subject is 53ms longer than a subject in broad focus conditions (282ms vs. 335ms), while this difference is smaller for narrowly focused preverbal objects (35ms; 279ms vs. 314ms). With respect to the F0 properties, Skopeteas and Féry (2010) found narrowly focused preverbal objects, SO_FV, to have the same rising F0 contour as objects in broad focus conditions, as in the current study, with no significant differences in the realization

¹⁴ Number of syllables per constituent or syllable structure of the stimuli are not reported.

of the object in the two conditions.¹⁵ Subjects in both SOV and S_FVO conditions were found to have both rising and falling contours, with falling contours less frequent than rising in both conditions, and even less frequent in S_FVO than in SOV (10/64 vs. 16/64, respectively). These results were not corroborated in the current study, however, where the falling contour on narrowly focused subject contrasted with the rising one on subjects in narrowly broad focus conditions.

Further, based on experimental results, Skopeteas and Fanselow (2010) show that contrastive foci can be realized both preverbally and postverbally. With respect to the prosodic realization of exhaustivity, Skopeteas and Féry (2011) conclude that it is signaled by pitch expansion combined with increased duration and breathy voice on the first (stressed) syllable of the exhaustively focused constituent. Finally, Skopeteas and Féry (2016) report on several instrumental studies and address a number of topics. They conclude that utterance-initial constituents in broad-focus contexts may carry variable F0 contours (2010), and that narrowly focused constituents are characterized by greater duration of stressed syllables as compared to broad-focus contexts (both reminiscent of the results in Skopeteas and Féry). They also provide a detailed investigation of F0 contours characteristic of preverbal foci (utterance-initial and utterance-medial ones), as well as postverbal foci.

As the above shows, many key properties of the prosodic realization of focus in Georgian have been addressed in the literature. However, the existing generalizations are based on experimental techniques that did not involve (semi-)spontaneous speech production. Skopeteas, Féry, and Asatiani (2009) used read speech in their investigation of the interaction between word order and F0 contours, and instructed the participants “to put emphasis on the information under question” (Skopeteas, Féry & Asatiani 2009: 110). Skopeteas and Féry (2010; 2011; 2016) asked the participants to memorize the sentences to be used as responses for the experimental questions. At the same time, it has been well-documented that the prosodic characteristics of read speech are considerably different from those of spontaneously produced speech (Lieberman et al. 1985; Howell & Kadi-Hanifi 1991; Ayers 1994; Hedberg & Sosa 2008; Nakamura, Iwano & Furui 2008), which means that the conclusions drawn from non-spontaneously produced speech may not be applicable to (semi-)spontaneous speech, the mode of language production that is, arguably, most used by speakers. As shown in the next section, the differences between the current results and those reported in previous studies are correlated with the difference in production mode.

The existing work on the prosody of information structure in Georgian also contains conflicting analyses. For instance, Skopeteas & Féry (2010) conclude that preverbal narrowly focused subjects are phrased separately from the rest of the clause, (S_F)(VO), while preverbal narrowly focused objects are prosodically grouped together with the verb, (S)(O_FV). According to the conclusions in Asatiani & Skopeteas (2012), though, all preverbal focused constituents are prosodically grouped with the verb, and separated by a prosodic boundary from the material preceding the focus+verb prosodic unit: X(Y_FV). Finally, Skopeteas & Féry (2016) propose that preverbal foci are phrased separately from the verb and grouped together with the preceding material: (XY_F)V.

These two issues – the fact that the existing conclusions are based on non-spontaneous speech and the availability of incompatible analyses – provided the motivation for the current study. In contrast with most previous studies, the participants in the current experiment were asked to provide their own responses to

¹⁵ The only small but significant difference between the two contexts was the steepness of the fall from the Ha of subject in SOV/SO_FV (steeper in SO_FV). Because the Ha belongs to the pre-focal constituent, though, this difference does not constitute a difference in the realization of the object in the two contexts.

questions based on picture prompts, which led to greater naturalness of the data. A single acoustic cue, lack of a high final boundary tone between two constituents, is taken to signal prosodic grouping. According to the results reported here, preverbal subject foci are prosodically grouped with the verb, (S_FV), but preverbal object foci are separated from it by a high final boundary tone: (O_F)(V).

3 Methodology and results

3.1 Stimuli and design

Eight native speakers of Georgian participated in the study: two males (M3, M4) and six females (F6-F11). All speakers were natives of Tbilisi, with a complete or in-progress university degree, with the age range 20-35 y.o, mean age 26.8 y.o. The recordings were performed in Tbilisi, Georgia, using a Shure SM10A (head-worn, close-range) microphone and a Zoom H4n recorder. All data was recorded at a sampling rate of 44.100 Hz and 16 bits per sample.

The participants were presented with picture prompts that appeared on a laptop screen. Each prompt was accompanied by a statement introducing the main participant of the event in the picture, and a question about it. The statement and the question were also provided as an embedded pre-recorded soundtrack, with a native speaker of Georgian reading out the statement and the question, in order to make answering the question on the screen more natural. A sample picture prompt is provided in Figure 3, with the accompanying statement and question (transliterated) in (23). The participants were asked to listen to the statement and question, and answer the question based on what they see in the picture. They were instructed to speak clearly and use natural intonation but avoid single-word replies.¹⁶

ეს მეზადურია.
რა დაიჭირა მეზადურმა შარშან ზაფხულში?



Figure 3. Sample picture prompt.

- (23) Es mebaduri-a. Ra da-i-č'ir-a mebadur-ma
 DEM fisherman.NOM-be.3SG what PRV-VER-catch-AOR.3SG fisherman-ERG
 šaršan zapxul-ši?
 last_year summer-LOC
 'This is a fisherman. What did the fisherman catch last summer?'

¹⁶ Crucially, the participants were not instructed to provide full-sentence replies, or to use the same word order as the one used in the question. In fact, as discussed in Section 3.2, the participants employed considerable variability in word orders. While the wh-words in the prompts uniformly appeared immediately before the verb, focused constituents in the participants' replies surfaced both before and after the verb.

The semi-spontaneous design of the study allowed speakers to have a certain degree of freedom in their responses while maintaining some control over the lexical and phonological variables.¹⁷ The stimuli were designed in such a way as to capture possible syntactic and/or prosodic variability between different constituents carrying focus. Thirty verbs (14 transitive, 9 unergative, and 7 unaccusative) were used in the study;¹⁸ based on the verbs, thirty situational statements were built. Personal names (*Mariami, Giorgi*, etc.) and common nouns (*a fisherman, children*, etc.) were used as subjects and direct objects. A temporal adjunct was added to each situational statement, in order to provide additional segmental material that may buffer the focal material from phrase-initial or -final prosodic processes. In order to maximize the likelihood of collecting responses with easily analyzable F0 contours, lexical items containing no or few voiceless segments were used. However, naturalness of the stimuli was taken to be no less important than the phonetic make-up, and some better fitting lexical items containing voiceless segments were chosen over fully voiced counterparts that were a poorer contextual fit. A sample situational statement is given in (24):

- (24) Mebadur-ma da-i-č'ir-a zvigien-i šaršan zapxul-ši.
fisherman-ERG PRV-VER-catch-AOR.3SG shark-NOM last_year summer-LOC
'The fisherman caught a shark last summer.'

Each of the situational statements was then turned into five questions, aimed at eliciting broad focus over the whole reply, as in (25), narrow focus on the direct object (26), subject (27), and the VP (28), and contrastive focus on one of the constituents (subject, object, or the verb)¹⁹; in (29), contrastive focus on an object is exemplified. Please see the Appendix for the full summary of stimuli.

- (25) **Ra** **mo-xd-a** šaršan zapxul-ši?
what PRV-happen-AOR.3SG last_year summer-LOC
'What happened last summer?'
- (26) **Ra** da-i-č'ir-a mebadur-ma šaršan zapxul-ši?
what PRV-VER-catch-AOR.3SG fisherman-ERG last_year summer-LOC
'What did the fisherman catch last summer?'
- (27) **Vin** da-i-č'ir-a zvigien-i šaršan zapxul-ši?
what PRV-VER-catch-AOR.3SG shark-NOM last_year summer-LOC
'Who caught a shark last summer?'
- (28) **Ra** **ga-a-k'et-a** mebadur-ma šaršan zapxul-ši?
what PRV-VER-do-AOR.3SG fisherman-ERG last_year summer-LOC
'What did the fisherman do last summer?'

¹⁷ Cf. Beckman's (1997: 7) definition of spontaneous speech as 'speech that is not read to script'. Provided that the participants were not completely free in their responses, but instead guided by the picture prompts, this type of production is semi-spontaneous.

¹⁸ No significant interaction between verb type (transitive, unergative, unaccusative) and prosodic realization of focus or word order employed was subsequently detected; therefore, different verb types are discussed together in the remainder of the paper.

¹⁹ In the list of stimuli, each situation was consecutively chosen to exemplify contrastive focus on the verb, subject, or object. Contrastive focus on the verb was meant to elicit a reply that corrects the verb (e.g. *dance* vs. *sing*). Because the utterances with contrastive focus on the verb were verb-initial, unlike all other contexts, they were subsequently excluded from the analysis.

- (29) **Rvapexa** da-i-č'ir-a mebadur-ma šaršan zapxul-ši?
 octopus.NOM PRV-VER-catch-AOR.3SG fisherman-ERG last_year summer-LOC
 'Did the fisherman catch **an octopus** last summer?'

The resulting set of questions equaled 134 (14 transitive x 5 + 9 unergative x 4 + 7 unaccusative x 4), but only 110 questions were used in the experiment, for two reasons: some of the pre-recorded questions included disfluencies (false starts, throat clearing, etc.), and some were rejected by the participants as unnatural. The final set was randomized, and each speaker provided replies to 110 questions, each uttered once. After eliminating disfluent replies from the participants (due to pauses, errors, repetitions, throat clearing etc.), the final dataset contained 817 replies.

3.2 Results

Since the participants provided spontaneous replies to the experimental questions, there was considerable variability in sentence structures used, which led to the dataset employed in the current study being smaller than the total number of responses. Eliminated utterances included single-word replies (produced despite the instructions), complex paraphrases, utterances with nouns modified by adjectives and demonstratives, etc. The final counts of test words are provided in Sections 3.2.1 and 3.2.2.

In the final dataset, narrowly (non-contrastively) focused objects appeared both preverbally and postverbally with almost equal frequency. The picture is different for contrastively focused objects: they were placed almost exclusively postverbally.²⁰ In turn, both non-contrastively and contrastively focused subjects were found exclusively in the immediately preverbal position. It is unclear what these two tendencies (no preverbal contrastively focused objects, no postverbal focused subjects) are due to: Georgian has been reported to have a preference for preverbal placement of contrastively focused constituents (Skopeteas & Fanselow 2010), and postverbal narrowly focused subjects occur in the elicitation setting, as well as in the literature.

The final dataset was used to analyze the prosodic properties of focus marking on subjects and objects: the duration of the stressed syllable and the F0 contour spanning the narrowly focused constituent.²¹ The prosodic data obtained was annotated in Praat (Boersma & Weenink 2019); average duration and F0 of each syllable, as well as F0 at four fixed points in a syllable (left edge, 1/4, 2/4, 3/4) were measured using a modified Praat script by Elvira-García (2014); before that, the correct syllabification was established with three native speakers of Georgian.²² The syllable duration results are presented and discussed in Section 3.2.1, and F0 results are addressed in Section 3.2.2.

²⁰ Only two preverbal contrastively focused objects were attested. Given that such a small number would not allow for making statistical generalizations, these examples were discarded from the statistical analysis.

²¹ There likely are other acoustic correlates of focus marking in Georgian, such as e.g. intensity, pause duration, voice quality, vowel quality, etc.; they are not considered here for the reasons of space. One of the most likely prosodic cues of narrow focus is the F0 contours on the given constituents in the same clause; cf. the Skopeteas & Féry's (2010) results for F0 properties of subjects in object focus contexts. Given the semi-spontaneous nature of the study, though, there was substantial variability in the non-focus parts of utterances produced by the participants (e.g., the given material was produced in the right or left periphery, or dropped altogether). For this reason, systematic comparison of the F0 contours on given material in narrow focus contexts, in this study design, was not feasible.

²² In Praat, the following settings were used for the F0 analysis: pitch range 75-500 Hz for the female speakers and 50-450 Hz for the male speakers, voicing threshold = 0.6, octave jump cost = 0.6.

The duration of initial syllables in nouns that occupy the same position in string-identical clauses, but with different focus properties was compared. Preverbal narrowly focused subjects and objects were analyzed separately. In the corresponding contexts in which narrow focus did not equal to the subject or object (e.g. broad focus contexts), the constituent of interest was still preverbal. The F0 contours spanning subjects and objects were also considered separately. Because F0-focus marking on subjects turned out to affect the final Ha on the narrowly focused constituent, the continuation of the F0 contour on the following verb was also considered. Therefore, the strings analyzed were OV and SV; other segmental material that preceded or followed these strings was trimmed off. For example, (24) can be used as a response to (25)-(29); accordingly, SV strings *mebadurma daič'ira* ‘the fisherman caught’ can be extracted from a broad, VP, subject, object and contrastive object focus utterances and compared to each other.

3.2.1 Duration of the stressed syllable

The acoustic effect of stress, such as duration, may become more prominent if a word carries narrow focus. The increase in duration of the stressed syllable under narrow focus has been documented for English (Xu & Xu 2005), Dutch (Cambier-Langeveld & Turk 1999), Swedish (Heldner & Strangert 2001), German (Braun & Ladd 2003; Baumann et al. 2007; Kügler & Genzel 2009), and Arabic (De Jong & Zawaydeh 2002), and greater duration of the stressed syllable onset and coda under narrow focus has been observed in Dutch (Hanssen, Peters & Gussenhoven 2008).²³ The picture is more complex in Georgian. As the results below show, narrowly focused preverbal subjects – but not objects – are marked by greater duration of the stressed (initial) syllable, as compared to broad focus contexts.

The total counts of items in the dataset used for duration measurements are provided in Table 2. The numerical discrepancy between objects and subjects is due to several factors. First, only the subject condition includes intransitive sentences. Second, the participants were free to choose a preverbal or postverbal focus construction in their response. While they placed narrowly focused objects preverbally and postverbally with almost equal frequency, narrowly focused subjects occurred exclusively preverbally.²⁴

Table 2. *The dataset used for the investigation of the duration of the stressed syllable under different focus conditions.*

Test word	Syllable count	n	Total
subject	3 σ	211	306
	4 σ	95	
object	1 σ	4	90
	2 σ	16	
	3 σ	30	
	4 σ	7	
	5 σ	33	

Different total counts of n-syllabic items are due to the fact that the participants were, to a degree, free to choose what lexical items to use. With respect to syllable duration, the statistical analysis was based on a

²³ On the other hand, there is also work suggesting that the acoustic cues that are used for the realization of word stress and those that are used for the prosodic realization of narrow focus are orthogonal (due to their functional load). In particular, Vogel, Athanasopoulou & Pincus (2016) show, for Spanish and Greek, that word stress is cued primarily (though not exclusively) by F0, while contrastive focus is cued primarily (though not exclusively) by duration.

²⁴ The reason for such skewing is unclear, given that postverbal narrowly focused subjects are attested in the literature (e.g. Skopeteas & Fanselow 2010) and in an elicitation setting. Cf. also discussion in Section 3.2.

mixed-effects model, with SYLLABLE COUNT as a random factor, which means that these discrepancies do not affect the results. Statistical analysis of the syllable duration data was performed using the `glmer` function in the `lme4` package for R (R Core Team 2017). For subjects and objects, a mixed-effects model with DURATION (of the initial syllable) as the dependent variable, FOCUS TYPE as the fixed factor and random factors SPEAKER, ITEM, CLAUSE SUBTYPE (such as, e.g. SVO, SV, XSV for subjects) and SYLLABLE COUNT (with a random intercept for each of those predictors, but no random slopes) was run. In the model, the broad focus condition acted as the intercept and was taken to be the baseline that other types of focus are compared with.

With respect to subjects, the duration of the stressed (initial) syllable was significantly greater in narrowly focused ones (non-contrastive and contrastive; $p=0.03$, $\beta=0.07$, $t=2.12$ and $p=0.01$, $\beta=0.12$, $t=2.51$, respectively) than in subjects in broad focus utterances.²⁵ This is shown in Figure 4 and Table 3. There was no significant difference between narrowly focused subjects and subjects in other contexts tested (utterances with object focus, contrastive and non-contrastive, and VP focus).

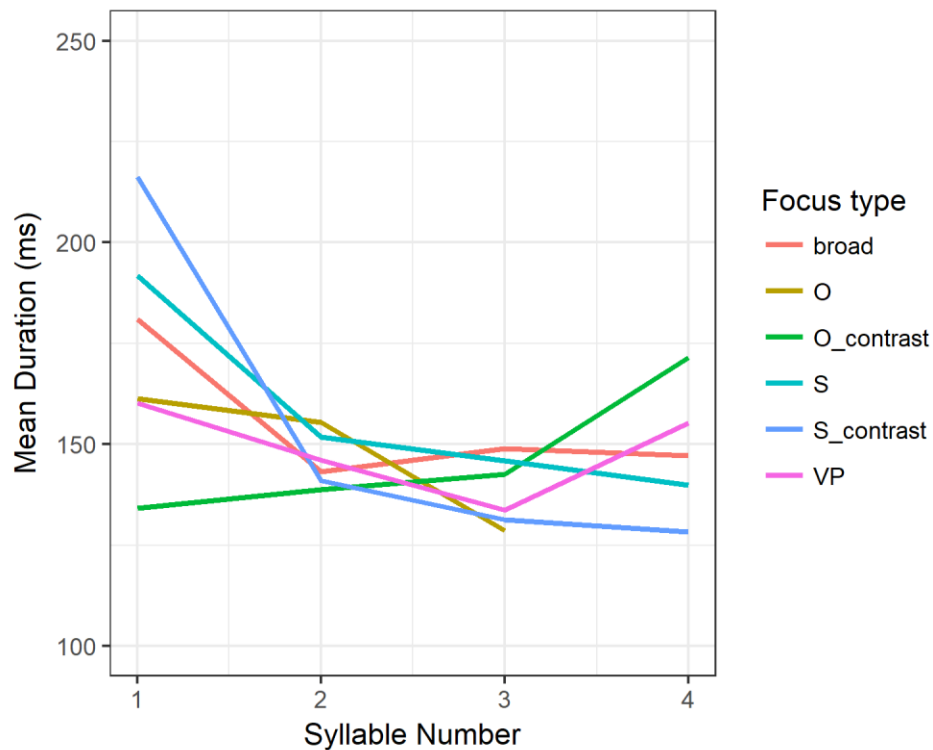


Figure 4. Average syllable durations in subjects in utterances with different focus types; the initial syllable is stressed.

²⁵ Within each focus type, there was no significant difference between the durations of the initial syllable in utterance-initial and non-initial stimuli – i.e., those in which some pre-focal material was trimmed off and in those that there was none. This applies to both subjects and objects, with the only exception of objects in the VP focus condition: here, there was a significant difference between initial and non-initial objects ($p=0.04$, $\beta=-0.24$, $t=-2.11$). Since VP-focus is not an object of investigation in the paper, and is provided mainly for context, this difference is not consequential.

Table 3. Average durations of the initial (stressed) syllable in subjects in utterances with different focus types; asterisks mark values significantly different from the broad focus condition.

Focus type	n	1 st σ , ms
broad	83	181
O_F	14	161
O_{CF}	7	134
S_F	95	192*
S_{CF}	34	216*
[VP]_F	73	160

In contrast, in preverbal objects there were no significant differences between the durations of stressed syllables in utterances with different focus types (broad focus, narrow focus on the object or the VP). Most importantly for our purposes, there was no difference between narrowly focused objects and objects in broad focus conditions ($p=0.24$, $\beta=-0.05$, $t=-1.17$). This is shown in Figure 5 and Table 4. Note that the test contexts did not include subject focus, since all focused subjects in the dataset were preverbal. Similarly, contrastively focused objects were exclusively postverbal, and not considered here. These two factors lead to there being fewer information-structural contexts tested for objects than for subjects.

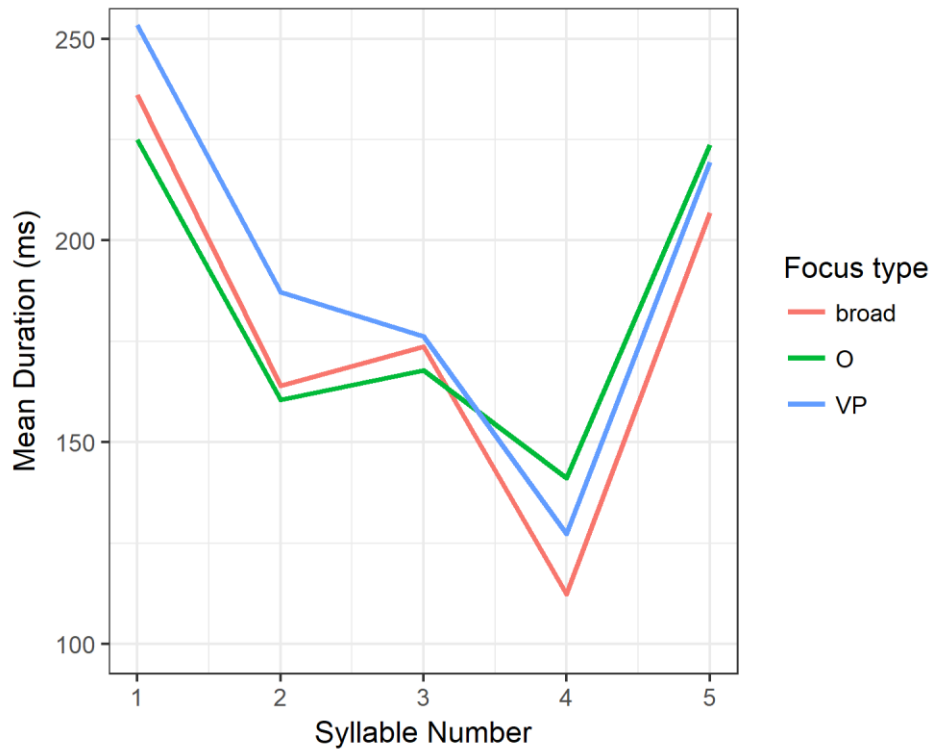


Figure 5. Average syllable durations in objects in utterances with different focus types; the initial syllable is stressed.

Table 4. Average durations of the initial (stressed) syllable in objects in utterances with different focus types.

Focus type	n	1 st σ, ms
broad	25	236
O_F	24	225
[VP]_F	41	254

To sum up, the results above show that the durational properties of the stressed (initial) syllable in Georgian are correlated with the expression of focus only in a subset of preverbal focus conditions: greater duration of the stressed syllable, as compared to broad focus contexts, was found only in narrowly focused preverbal subjects – but not objects. In theoretical terms, such distribution of focus prominence is predicted by focus projection accounts: the realization of a narrowly focused object is not different from that of an object in a broad focus utterance, while the realization of a narrowly focused subject is markedly different from that of a subject in a broad-focus context.

3.2.2 F0 values

In order to analyze the F0 contours typical of narrow focus, F0 was measured in each test word at four points per syllable (left edge, 1/4, 2/4, 3/4). A problem for comparing individual test words, however, lay in variable syllable count: since F0 targets can be both left- and right-aligned in a prosodic domain, aligning words of unequal syllable count by either edge can obscure generalizations about the location of F0 targets. To illustrate, in a language that carries F0 targets at both edges of a word/phrase (on boldfaced syllables in (30)), aligning stimuli of varying syllable count by either edge would not allow to capture the distribution of F0 targets:

- (30) a. σσσσ b. σσσσ
 σσσσ σσσσ
 σσσσσσ σσσσσσ

Georgian, too, carries intonational F0 targets on the penult and ultima, and may also intonationally mark the left edge (Vicenik & Jun 2014; Borise 2017; 2019). To obviate the alignment problem, each test word/AP was reduced to the three syllables that may carry F0 targets: the initial syllable, penult and ultima. Word-medial syllables, the loci of tonal interpolation, were discounted.²⁶

Consequently, each resulting test word in the dataset contained only the initial syllable (coded ‘1’), penult (coded ‘-2’) and ultima (coded ‘-1’) of the original word. The dataset introduced in Section 3.2.1 was used for the analysis of F0 properties too, though here each test word was accompanied by a the following verb, in order to allow for the analysis of the F0 contour that spans both constituents. Thus, SV strings were reduced to six syllables: S1, S-2, S-1, V1, V-2, V-1; e.g. an utterance *Mariami sadilobda* ‘Mariami had dinner’ was reduced to (Ma)_{S1} (a)_{S-2} (mi)_{S-1} (sa)_{V1} (lob)_{V-2} (da)_{V-1}.

Because the stimuli had to be at least three syllables long, mono- and disyllabic test words were discounted. This led to 21 test words from the object dataset being discarded (none of the subjects). The total counts of the stimuli are provided in Table 5. As before, the discrepancy between the counts of SV and

²⁶ This technique is borrowed from Skopeteas & Féry (2016); note that they used three right-edge syllables in their analysis, as opposed to two syllables used here. The decision to discount the was made based on the fact that no durational or F0 effects were found on the antepenult in previous studies (Alkhazishvili 1959; Borise & Zientarski 2018; Borise 2019).

OV strings is due to the fact that SV ones include intransitive sentences, and VO but not VS constructions were used by the participants (and are not considered here).

Table 5. *The dataset used for the investigation of the F0 properties of different focus conditions.*

String	Test word	n
SV	subject	306
OV	object	70

Based on the available literature (Skopeteas & Féry 2010; 2016; Vicenik & Jun 2014), the F0 property that may signal narrow focus in Georgian is the absence of a high boundary tone between the preverbal focused constituent and the verb. Therefore, F0 properties of syllables S-1 and O-1 in SV- and OV-strings, respectively, are the most informative ones, since they are the ones that may or may not carry the final high boundary tone Ha. The mid-syllable F0 value (1/2 into the syllable) for each S-1 and O-1 syllable was used in the statistical analysis, given that F0 peaks in Georgian are most frequently aligned with the middle point of a syllable. The analysis of the F0 values was performed using a mixed effects model, with the `glmer` function in the `lme4` package for R (R Core Team 2017). For the SV and OV clause types, a model with the dependent variable F0_1/2 (of the syllable of interest), fixed factor FOCUS TYPE and random factors SPEAKER, ITEM, and CLAUSE SUBTYPE was run; the broad focus condition acted as the intercept.

As the results below show, narrow focus on preverbal subjects, both contrastive and non-contrastive, is manifested by a lack of a high final boundary tone Ha on the subject. The same is not true of preverbal narrowly focused objects, which are separated from the verb by a high boundary tone, just like in broad focus contexts.

First, consider the prosodic realization of subjects in SV strings with various focus types, as summarized in Figure 6 and Table 6. Here, the F0 realization of the final syllable of subjects in subject focus contexts, both non-contrastive and contrastive, is significantly different from that of preverbal subjects in broad focus utterances ($p < 0.001$, $\beta = -0.11$, $t = -5.54$ and $p < 0.001$, $\beta = -0.19$, $t = -7.04$, respectively). None of the other contexts significantly differ from the intercept (broad focus). Note also that there is a qualitative difference in the F0 contours that span narrowly focused subjects and those in broad focus utterances: the former carry a falling F0 contour, while the latter have a (falling-)rising one.

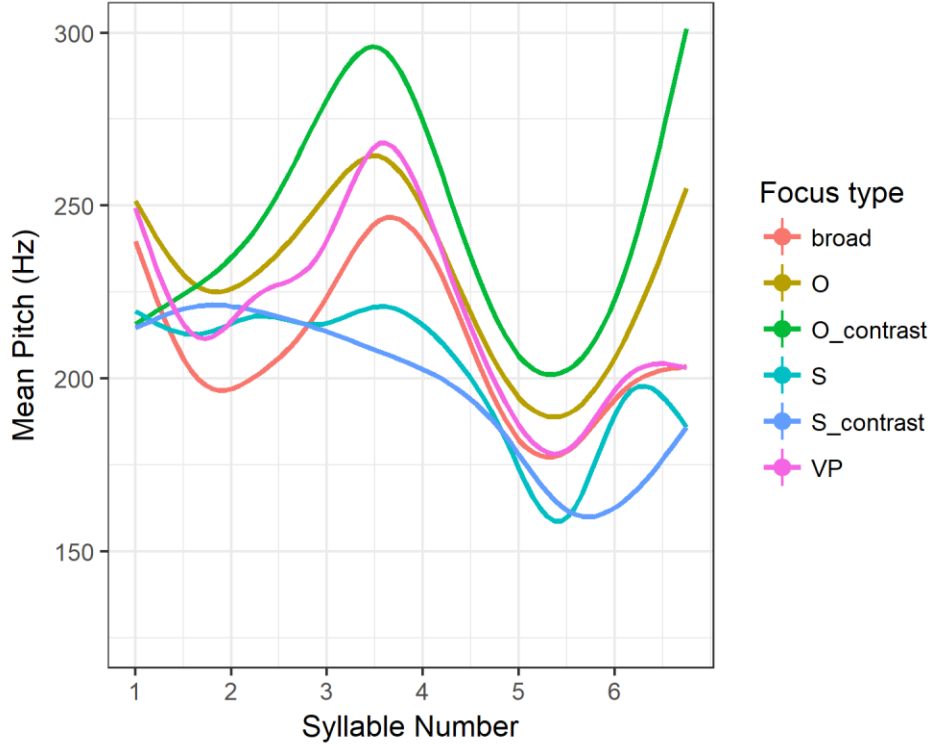


Figure 6. Averaged F0 contours in SV strings with various focus types, with each word reduced to three syllables (1=S₁, 2=S₂, 3=S₁, 4=V₁, 5=V₂, 6=V₁), smoothed at 0.2. On the x-axis, each tick marks the onset of a syllable.

Table 6. Averaged F0 values for the syllables of interest (S₁) in SV strings with various focus types; asterisks mark values significantly different from the broad focus condition.

Focus type	n	S ₁ , Hz
broad	83	248
O_F	14	272
O_{CF}	7	312
S_F	95	221*
S_{CF}	34	210*
[VP]_F	73	267

In turn, Figure 7 and Table 7 provide a summary of the F0 properties of OV strings with different focus properties. As already noted in Section 3.2.1, OV strings are considered in fewer focus contexts given that narrowly focused subjects were exclusively preverbal, and, as such, not found in OV strings. Similarly, contrastively focused objects, O_{CF}, were found only postverbally. As is clear from Figure 7, all three remaining focus conditions considered – broad focus, [VP]_F and O_F – closely align in their prosodic realization: in particular, in all of them, there is a high boundary tone between the preverbal object and the verb, with the heights of the F0 peaks being nearly identical across the three conditions.²⁷ There was no

²⁷ The absolute values of final Ha reach up to 250-300Hz for preverbal subjects (SV strings), but only up to 180-190Hz for preverbal objects (OV strings). This is due to downstep, as described in Section 2.1: each successive Ha in Georgian is lower than the preceding one. SV-strings in the dataset were both utterance-initial and non-initial, while OV-strings

significant difference between the F0 values on the final syllable of narrowly focused objects and those in broad focus conditions ($p=0.99$, $\beta=-0.0002$, $t=-0.005$).

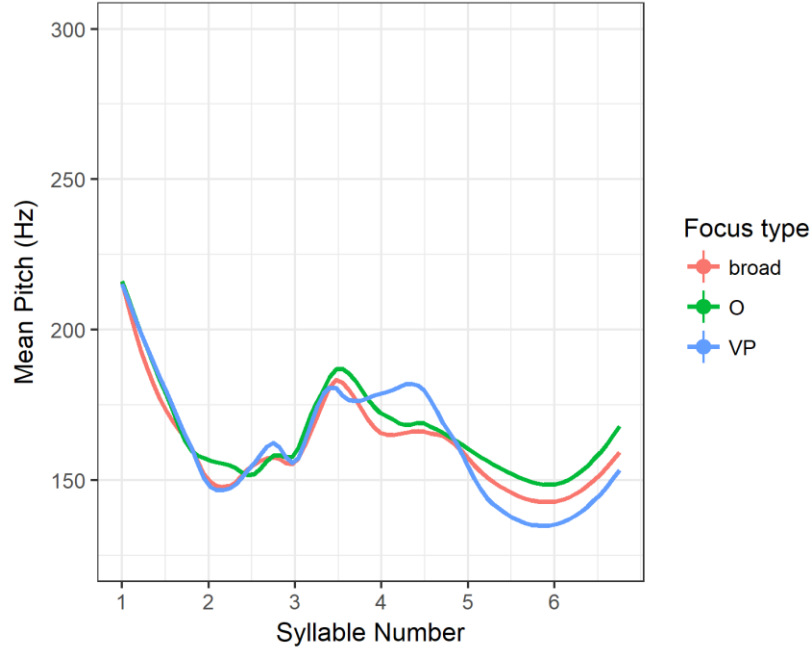


Figure 7. Averaged F0 contours in OV strings with various focus types, with each word reduced to three syllables (1=O₁, 2=O₂, 3=O₃, 4=V₁, 5=V₂, 6=V₃), smoothed at 0.2. On the x-axis, each tick mark marks the onset of a syllable.

Table 7. Averaged F0 values for the syllables of interest (O-1) in OV strings with various focus types.

Focus type	n	O ₁ , Hz
broad	20	187
O_F	20	190
[VP]_F	30	188

To sum up, preverbal narrowly focused subjects, both contrastive and non-contrastive ones receive a markedly different realization from subjects in broad focus contexts. The latter are characterized by a (falling-)rising contour, consistently marked by a high final boundary tone, which is the expected F0 contour on constituent in broad focus utterances, as established in Section 2.1. In contrast, narrowly focused subjects carry a falling F0 contour, with no consistent evidence for a final Ha; the lack of the AP-final boundary tone, in turn, signals prosodic grouping with the following verb. The behavior of objects is markedly different. Narrowly focused preverbal objects, just like preverbal objects in broad focus (and VP-focus) contexts, carry a high final boundary tone, and are not prosodically integrated with the following verb. These F0 results align with the syllable duration results discussed in the preceding section: both phenomena

were exclusively non-initial. This means that OV-strings are more consistently subject to downstep, which is reflected in the average F0 values of the Ha. With respect to SV-strings, within each focus type, there was no significant difference between average F0 values on S₁ in utterance-initial and non-initial subjects.

identify contexts with narrowly focused preverbal subjects as distinct from subjects found in broad-focus utterances, and identify narrowly focused preverbal objects as aligning with objects in broad focus conditions.

4 Discussion

The current results allow for making generalizations that have implications for our understanding of the syntax and prosody of focus marking. Let us recap the main findings. The duration of the initial (stressed) syllable is correlated with narrow focus on subjects, in that the initial syllable of a narrowly focused subject is longer than that in a broad focus context. The same generalization does not apply to narrowly focused preverbal objects: their prosodic realization aligns with that of broad focus utterances, with the focused constituent and the verb separated by a high boundary tone. Similarly, the F0 contour that spans narrowly focused subjects is significantly different from that found on subjects in broad focus contexts: in the former, the subject is prosodically grouped with the verb, while in the latter it is separated from it by a high final boundary tone. In turn, narrowly focused objects align in their F0 properties with objects in broad focus contexts. Therefore, both prosodic phenomena, duration of the stressed syllable and the F0 contour, are used to mark subject focus contexts as distinct from broad focus ones, but neither differentiates object focus contexts from broad focus ones.

The fact that the realization of narrow focus on the object, but not the subject, patterns together with that of broad focus is expected from the point of view of focus projection accounts. Recall that, according to these accounts, broad focus and object-focus contexts have the same prosodic realization, which is manifested as prosodic prominence on the object. Depending on the analytical framework, this may be due to the e.g. Argument status of the object (Gussenhoven 1983a) or the fact that it is the most deeply embedded constituent (Cinque 1993). In contrast, in subject focus contexts subjects are the most prosodically prominent constituents. Consequently, the prosody of subject focus contexts is incompatible with broad focus. Therefore, the results obtained here are consistent with the notion of focus projection.

These results, however, do not necessarily show that the prosodic realization of broad focus and object focus are completely identical. Instead, they only show that there is no systematic difference between the two contexts with respect to the two phenomena considered here, the duration of the stressed syllable and the F0 contour. These acoustic cues are among the most likely ones to be correlated with the expression of focus, but not the only ones. Other acoustic cues, such as intensity and duration of words and silences between them (Breen et al. 2010), types and absolute value of other F0 targets (Skopeteas & Féry 2010), and realization of the given parts of the utterance (Patil et al. 2008) may also take part in marking narrow focus; cf. also Ladd's (2008: 254) notion of phonetic emphasis. Therefore, it is not implausible that a difference between the prosodic realizations of broad foci and object foci in Georgian may lie in these other factors, which remain to be investigated.

One of the main contributions of the current study is that it demonstrates that even a language that does not rely on pitch accents in its expression of information structure, such as Georgian, still adheres to the notion of focus projection, albeit relying on different acoustic means, such as boundary tones and the prominence of the stressed syllable. That is to say, Georgian uses these acoustic cues to represent the same prosodic patterns (prominence on the object or subject) that accent languages such as English rely on pitch accents for.

The other contribution of this study is that it detects a contrast between the prosodic realization of subjects and objects in a language with a dedicated preverbal focus position – that is, it shows that the

principle of focus projection (object focus utterances realized like broad focus ones, subject focus utterances realized differently from broad focus ones) hold even in a language where subject and object foci are found in the same linear position. This demonstrates, based on a novel set of facts, that the principle of focus projection is not affected by factors like linear order of arguments – instead, it is only sensitive to structural and thematic factors; cf. the seminal proposal by Cinque (1993). At the same time, recall from Section 2.2 that, syntactically, narrow foci in Georgian are found in situ. Accordingly, even though linearly found in the same position, object foci are sisters to verbs, while subject foci are merged higher in the syntactic tree and, in a transitive clause, require ‘altruistic’ movement of the direct object in order to achieve adjacency with the verb. The difference between the realization of preverbal narrowly focused subjects and objects, therefore, is consistent with the fact that they are also realized in different syntactic positions.

The syllable duration and F0 results discussed here contrast with some of those discussed in the literature. Skopeteas and Féry (2010; 2016) report greater duration of the whole word or the stressed syllable to be a consistent correlate of narrow focus for both preverbal subjects and objects. There is even more variability with respect to the prosodic phrasing/F0 results. For example, Skopeteas & Féry (2010) concluded that preverbal narrowly focused subjects are phrased separately from the following material, (S_F)(VO), while preverbal narrowly focused objects are integrated with the verb, (S)(O_FV). In contrast, Skopeteas & Féry (2016) found both subject and object narrow foci to be phrased separately from the following verb: (XY_F)V. Several factors are likely to have contributed to the discrepancy between the studies. The set-up of the experiment (memorizing replies prepared by the experimenters vs. producing semi-spontaneous replies) could have made utterance production more or less consistent with spontaneous language production. This may explain a more internally consistent realization of narrowly focused subjects in the current study than that obtained in e.g. Skopeteas & Féry (2010). Another factor, relevant for determining prosodic phrasing, may be rooted in selecting the acoustic cues that it relies on. Skopeteas & Féry (2016) aimed to bring together F0 targets, prosodic breaks, and phonation as evidence for prosodic phrasing. In contrast, in the current study, the presence of the final boundary tone was taken to be decisive for phrasing, following Vicenik & Jun (2014). Because languages vary in the number and relative weight of cues for prosodic phrasing (Choi, Hasegawa-Johnson & Cole 2005; Yang et al. 2014, a.o.), and it is unclear how these cues interact in Georgian, a more conservative approach, based on the distribution of boundary tones alone, was adopted here.

5 Further directions

An important open question that this paper did not consider is the interaction between prosodic phrasing and syntactic phrasing in narrow focus contexts. The main reason for that is our poor current understanding of the general principles of syntax-prosody interface in Georgian. Recall that Georgian presents evidence for each word acting as an AP, based on the presence of Ha, but does not provide consistent F0-based evidence for higher-level prosodic phrasing (larger than AP but smaller than IP). Establishing the general principles of syntax-prosody interface in Georgian is beyond the scope of the current paper, but the hope is that, once these principles are established, they will accommodate the current results.

One issue that should be addressed in the syntax-prosody account of Georgian focus is that of the interaction between prosodic phrasing and syntactic phrasing. In particular, it may seem counterintuitive that a narrowly focused subject has a closer connection with the following verb (the two form a single prosodic phrase), while a narrowly focused object is separated from the verb by a prosodic boundary. That is to say, given that the object has a closer syntactic connection with the verb (structural sisterhood) than the subject, it may seem like a conundrum that prosodic and syntactic phrasing misalign in preverbal focus

contexts: $[_{XP}OV]$ vs. $(O)_{\varphi}(V)_{\varphi}$, $[_{YP}S[_{XP}V]$ vs. $(SV)_{\varphi}$. Such mismatches between prosodic and syntactic phrasing are not uncommon, and usually result from there being an independent prosodic constraint that outranks the constraints that ensure matching between prosodic and syntactic phrasing (Selkirk 2011). The solution to this apparent conundrum is likely to be related to the hypothesis, discussed above, that prosodic phrasing in Georgian, as manifested by the presence of final boundary tones, is primarily a phonetic phenomenon, and does not transparently correspond to syntactic phrasing. Instead, the connection between prosodic phrasing and syntactic phrasing in Georgian is likely to be more indirect. A possible approach to this indirect mapping is sketched below.

Georgian has been analyzed as a ‘phrase language’ (Skopeteas & Féry 2016) – i.e., one that does not rely on pitch accents in order to distinguish different information-structural contexts, but utilizes patterns of prosodic phrasing to do so instead. The unmarked prosodic pattern of all-new, broad-focus declaratives is such that each word is parsed into an AP. The same prosodic pattern is found in object-focus contexts. This is not surprising: the same parallelism is obtained in languages that rely on pitch accents – there, both broad-focus and object-focus contexts carry sentential stress on the direct object. In contrast, Georgian, due to not utilizing pitch accents as markers of information structure, signals the same parallelism with the unmarked pattern of prosodic phrasing.

In subject focus contexts, in languages that rely on pitch accents, subjects carry a nuclear pitch accent. In turn, languages like Georgian, which do not rely on pitch accents, use the acoustic means available to them – namely, prosodic phrasing. In order to make the subject in a subject-focus context more prominent, such languages alter the unmarked pattern of prosodic phrasing, by either introducing or deleting prosodic boundaries (cf. Büring 2006). In Georgian, the unmarked pattern of prosodic phrasing is such that each word forms an AP; in order to make a constituent prominent, this pattern has to be altered – the most straightforward way to do that is getting rid of the boundary tone that follows the narrowly focused constituent.

Abbreviations/glosses

3 – third person, AOR – aorist, DAT – dative, ERG – ergative, GEN – genitive, IPFV – imperfective, MOD – modal, NEG – negation, NOM – nominative, OBL – oblique, OPT – optative, PL – plural, PRS – present, PRV – preverb, PTCP – participle, SF – stem formant, SG – singular, SM – stem/screeve marker, TS – thematic suffix, VER – version marker.

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