# A new type of focus projection?
# Word stress and F0 patterns in Georgian

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**Abstract**

Based on experimental evidence, this paper shows that the prosodic realization of focus in Georgian exhibits a behavior consistent with focus projection/percolation – the phenomenon by way of which prosodic prominence on a sub-constituent is used to signal focus on a larger constituent. The novelty of these findings lies in the prosodic property of Georgian that differentiates it from most languages that have been studied from the point of view of focus projection: Georgian does not consistently utilize pitch accents in the expression of focus (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 VP- or broad focus utterances, and so are the direct objects in these contexts, since in all three cases sentential stress is realized on the direct object. In contrast, in utterances with narrow focus on the subject, the subject carries sentential stress, which is incompatible with a broad-focus interpretation of the utterance; accordingly, narrowly focused subjects and those in broad focus contexts receive different prosodic realizations. This paper shows that the prosodic realization of the respective elements in Georgian fits with the same generalization, even if expressed with different prosodic means. The realization of focused objects does not differ from those of objects in broad focus contexts, with respect to their boundary tone or the duration of the stressed syllable. In contrast, focused subjects differ from subjects in broad focus in the same parameters.

**Keywords:** focus projection/percolation, word stress, syllable duration, pitch accent, boundary tone, F0, prosodic phrasing, Georgian.

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## 1 Introduction

This paper provides empirical evidence that prosodic facts consistent with the phenomenon of focus projection are found in a language that is prosodically (and syntactically) considerably different from a language like English, for which the phenomenon of focus projection was originally described and accounts of it were developed. The language discussed here is Georgian (Kartvelian). 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). Additionally, syntactically, Georgian has a preverbal focus position, which means that all types of focus are realized in the same (linear) position: immediately preverbal (Skopeteas, Féry & Asatiani 2009; Asatiani & Skopeteas 2012) – again, unlike in English, where focused constituents are not restricted to a particular position in a sentence.

The basic focus projection facts in English are as follows. In a broad-focus SVO utterance, sentential stress, realized as the nuclear pitch accent, targets the direct object, while the subject carries a pre-nuclear accent. Utterances with VP- and object focus have the same prosodic realization. This means that the prosodic realization of the direct object is the same in all three contexts: it carries sentential stress/nuclear pitch accent (Contreras 1976; Culicover & Rochemont 1983; Selkirk 1984; von Stechow & Uhmann 1986; Reinhart 1995; Cinque 1993; Zubizarreta 1998). In contrast, in utterances with narrow focus on the subject, the subject carries the nuclear pitch accent, which automatically makes its realization different from that of a subject in a broad-focus context, where it carries a pre-nuclear accent.

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This is illustrated in (1), where boldfacing indicates the focused constituent, small caps mark constituents that are most prosodically prominent (i.e., carry the nuclear pitch accent), double underscoring marks constituents that are realized in the same way when narrowly focused and in broad focus, and wavy underscoring marks those that are pronounced differently from each other when narrowly focused and in broad focus.

(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 (Pochkhua 1962; Aronson 1982; cf. Skopeteas & Fanselow 2010 for an overview), as illustrated in (2a) and (3a). 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, as shown in (2) and (3). 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).[1]

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.

(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]$_F$)

      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, SO$_F$V)

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[1] The realizations of the subject in SOV and SVO do not differ from each other; the comparison here is set up between SO$_F$V and [SOV]$_F$, and S$_F$VO 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.

(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, $[SVO]_F$)

      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, $S_F VO$)

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 here: one between the realizations of objects in the two contexts, and one between the realizations of subjects. This is schematized in Table 1.

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

*Table 1. Prosodic realization of different types of foci*

In terms of its prosodic organization, in contrast with English, Georgian has been described as a somewhat unusual type of 'phrase language' (Skopeteas & Féry 2010; 2016). In contrast with 'pitch-accent languages', 'phrase languages' primarily rely on boundary tones and phrasing in signalling information structural notions such as focus, as opposed to stress-aligned pitch-accents. The peculiarity of Georgian is in that its tonal inventory includes both boundary tones and pitch accents, but only the former are consistently used to mark focus (Vicenik & Jun 2014; Skopeteas & Féry 2010; 2016). The phenomenon of focus projection, in contrast, is commonly understood in terms of pitch accent alignment (which, under different approaches, serves as the input to other phonological or syntax-based rules; see Section 2.1.1). This paper, therefore, shows that a 'phrase language', too, exhibits behavior in a way that is consistent with focus projection, though it relies on different acoustic cues when doing so. Two independent acoustic cues – 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. The results reported here corroborate the results available for Hindi, a 'phrase language' of a similar prosodic profile. [2]

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[2] 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 even in English (Rump & Collier 1996; Xu & Xu 2005). For a 'phrase language' like Georgian, which does not mark narrow foci with particular pitch accents, no direct predictions can be made in this respect. The fact that narrowly focused subjects and objects in Georgian receive different realizations, as this paper demonstrates, awaits explanation. It should be pointed out, though, that the same asymmetry is found in Hindi, where narrowly focused subjects are marked by a higher final rise, while objects are not (Patil et al. 2008; Féry 2010; Féry, Pandey & Kentner 2016).

This paper is structured in the following way. Section 2 provides the necessary background: the phenomenon of focus projection (2.1), the prosodic make-up of Georgian (2.2), the idea of focus projection in a 'phrase language' (2.3), the known properties of the prosody of focus in Georgian (2.4), and, for context, the relevant syntactic facts (2.5). Section 3 introduces the experimental method: the stimuli (3.1), procedure and participants (3.2), data processing (3.3), and analysis (3.4). Section 4 reports on the results of a production study that investigated the prosody of different focus types in Georgian: duration of the stressed syllable (4.1) and F0 contours on focused constituents (4.2), followed by a summary (Section 4.3). Finally, Section 5 provides a discussion, conclusions, and implications.

**2 Theoretical background and previous work**

*2.1 The phenomenon of focus projection*

*2.1.1 Theoretical approaches*

A sentence such as (4) 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 all questions in (5), each of which successively selects for a focused constituent of smaller size. This prosodic ambiguity between focus on a constituent and a sub-constituent is known as the phenomenon of focus projection.[3]

The idea behind focus projection relies on the fact that, in terms of sentential prominence/stress, the replies to (a)-(d) in (5) are identical: focus in them is manifested by sentential prominence/stress on the word SOCKS, regardless of the size of the focused constituent that contains it. This means that the prosodic pattern with sentential 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 (nuclear) pitch accent (Ladd 2008: 214).

(4)    (Nini (knitted (a pair of (**SOCKS**)))).

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

In contrast with objects, narrow focus on the subject does not lead to focus ambiguity of the same sort. In these utterances, the subject carries sentential stress/prominence, which, intuitively, is incompatible with broad focus.[4] This is illustrated in (6) and (7): of the three questions in (7), only (e) can be felicitously answered with the utterance in (6).

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

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[3] The term 'focus projection' (*Focusprojektion*) was first introduced by Höhle (1982) to refer to the phenomenon of focus size ambiguity in nested foci. It was later widely adopted by Selkirk (1984; 1995), who, in addition to 'focus projection' as the name of the phenomenon, used 'Focus Projection' as a technical term for a particular analysis of the phenomenon, couched in terms of syntax-prosody interaction. The term has since been used in its general sense (e.g. Arregi 2016; Bishop 2017) as well as a technical term. Here, 'focus projection' is used as a general label for the prosodic ambiguity between nested foci, and 'Focus Projection' (capitalized), is used in Selkirk's technical sense.

[4] This holds for transitive and unergative predicates, where the subject is the external argument of the verb, but not unaccusative predicates, where the subject is the internal argument and typically carries sentential stress in broad focus. Throughout the paper, 'subject' in this context, with respect to the English examples, refers to the external argument.

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

Numerous analytical approaches that account for the rules of focus projection have been put forward. In the rest of this section, the existing analyses are discussed according to the classification provided in Arregi (2016). For the reasons of space, no detailed discussion of individual proposals is provided; an interested reader is direct to Arregi (2016) and references therein.

The existing accounts of focus projection fall into two camps: Default Prosody ones and F-projection ones. All analyses of focus projection, as Arregi (2016: 187) observes, subscribe to (some variant of) a rule of FOCUS PROMINENCE:

(8)  FOCUS PROMINENCE
     The focused constituent in a certain domain (typically, the sentence) must contain some type of a prosodic peak.

The two families of approaches diverge with respect to other rules that supplement FOCUS PROMINENCE. According to the Default Prosody analyses, focus projection is ensured by default principles of prominence distribution within a sentence, which also govern prominence distribution within a focused constituent. This means that under Default Prosody analyses, focus projection is epiphenomenal. In contrast, F-projection approaches calculate the relative prominence of adjacent constituents, based on their position in the syntactic structure, and account for focus projection based on dedicated F-Projection rules. Let us consider both families of proposals in more detail.

According to the earliest Default Prosody accounts, the ambiguity in (4) results from an ambiguity between 'contrastive stress' on the direct object, SOCKS, and 'normal stress', which is the default pattern of prominence, specified by rule for every sentence (Newman 1946). This intuition became the basis for the Nuclear Stress Rule (NSR; Chomsky & Halle 1968), according to which the strongest/sentential stress in a broad-focus utterance (in VO languages) is located on the rightmost constituent. Jackendoff (1972) formalized the NSR as the rule of DEFAULT PROMINENCE, some version of which supplements the rule of FOCUS PROMINENCE in the Default Prosody accounts:

(9)  DEFAULT PROMINENCE
     a.  Within a focused constituent, prosodic prominence is determined by default principles of prosody that are independent of focus.

     b.  Default prominence in English is determined by the cyclic Nuclear Stress Rule.

The notion of DEFAULT PROMINENCE is subject to cross-linguistic variation: in Basque, for instance, it is the preverbal constituent that receives sentential stress (Hualde, G. Elordieta & A. Elordieta 1994; A. Elordieta 2001; Arregi 2002; G. Elordieta 2003), not the rightmost one.

Therefore, according to the Default Prosody approaches, focus projection in (4)-(5) takes place because in each of broad and VP focus, and narrow focus on the object or its subpart, DEFAULT PROMINENCE assigns the strongest/sentential stress to the rightmost constituent, **SOCKS,** which leads to prosodic ambiguity

between nested foci of different sizes. Focus projection simply results from the fact that, if sentential stress targets the rightmost constituent, expanding the size of the focused constituent (linearly) to the left does not change the position of sentential stress. The opposite is the case in (6)-(7): here, the focused constituent is the subject, **NINI**, which receives sentential stress. Given that sentential stress cannot be realized any further to the right than **NINI** in this case, no ambiguity arises between e.g., (6) and its string-identical broad focus equivalent. There is also no ambiguity between (6) and a string-identical VP- or object-focus equivalent, given that the foci in the respective strings would not even overlap.

Many aspects of Jackendoff's (1972) approach were later refined, but the essential intuition that some version of DEFAULT PROMINENCE plays a role in focus projection was prominent in subsequent literature. The rule of DEFAULT PROMINENCE has been derived from the properties of word order (Ladd 1980; Culicover & Rochemont 1983, a.o.), argument structure (Schmerling 1976; Gussenhoven 1983a; Zubizarreta 1998; Büring 2006, a.o.), syntactic depth of embedding (Cinque 1993) or height in a certain syntactic domain (Szendrői 2001), or cyclic phase-by-phase computation (Legate 2003; Kahnemuyipour 2004; Adger 2007; Kratzer & Selkirk 2007; based on insight in Bresnan 1971).

F-projection approaches account for the focus projection facts based on rules that license focus given the distribution of prosodic peaks/pitch accents in a sentence, which is rooted in information structure as opposed to derived from rules of default prominence (Selkirk 1984; 1995; von Stechow & Uhmann 1986; Rochemont 1986). The most prominent F-projection account is Selkirk (1984; 1995), which is based on the following components:

(10)   BASIC F-RULE
       An accented word is F-marked.

(11)   F-PROJECTION RULES

   a.  HEAD PROJECTION
       F-marking of the head of a phrase licenses the F-marking of the phrase.

   b.  ARGUMENT PROJECTION
       F-marking of an internal argument of a head licenses the F-marking of the head.

According to the F-PROJECTION RULES, F-marking can spread 'horizontally' from a complement of XP to the head $X^0$ (ARGUMENT PROJECTION), then 'vertically' to the whole XP (HEAD PROJECTION), and, similarly, to the phrase YP that embeds XP, thereby creating a succession of nested foci. This mechanism accounts for the ambiguity in (4)-(5): when the direct object is accented, F-PROJECTION RULES allow for various sizes of the actual focused constituent, given that an accented direct object can 'spread' F-marking up the syntactic tree. The lack of focus projection in (6)-(7) is also accounted for: an accented subject does not license F-marking of the verb because the subject is not a syntactic sister of the verb. Accordingly, F-marking cannot be projected any further than the subject itself (Selkirk 1995; cf. also von Stechow & Uhmann 1986). An additional set of rules governs the interaction of F-marking with semantics, especially in more information-structurally complex contexts:

(12)   a. The focus of a sentence is an unembedded F-marked constituent (i.e., not dominated by any other
          F-marked constituent)
       b. An embedded F-marked constituent is new (i.e. not given)
       c. A non-F-marked constituent is given

An advantage of F-projection analyses over Default Prosody ones is that they make more detailed (and correct) predictions about the correlation between the distribution of pitch accents and the information-structural status of the constituents. On the other hand, later work showed that F-PROJECTION RULES wrongly limit F-projection to heads and internal arguments, because F-projection from modifiers is possible (Büring 2006). More generally, later work showed that the notion of DEFAULT PROMINENCE is, after all, indispensable for the correct analysis of focus projection (Jacobs 1988; Schwarzschild 1999; Büring 2006).

Most importantly for our purposes, anticipating the discussion in Sections 2.2-2.4, the following postulates can be derived from the existing approaches to focus projection of both types:

  i.  Focus projection is accounted for with the help of a notion that marks phrasal/sentential prominence, such as (a) nuclear stress, manifested by a nuclear pitch accent, or (b) a pitch accent licensed by the information structural context.
  ii. The canonical explanandum of both Default Prosody and F-projection approaches is the asymmetry with respect to ambiguity between narrowly focused objects and subjects and broad focus contexts. An utterance with narrow focus on the object receives the same pattern of sentential prominence as the VP- or broad focus one, while an utterance with narrow focus on the subject is not compatible with VP- or broad focus interpretation.

### 2.1.2 Instrumental studies

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. Variable results have been obtained for other languages, too. In German, Baumann et al. (2006; 2007) found that speakers produce narrow focus on the object differently from broad focus, with variable patterns of upstep, downstep and duration. In Neapolitan Italian declaratives, narrowly focused objects carry a different kind of pitch accent (L+H*) as compared to objects in broad focus utterances (H+L*) (D'Imperio 1997; 2000). In European Portuguese, sentence-final objects bear a falling accent with an early peak (H+L*) under broad focus, but a falling accent with a late peak (H*+L) under narrow focus (Frota 2000; 2012). In contrast, in Greek, narrow focus on the object and broad focus, in terms of their F0 contours, are not reliably different from each other (Gryllia 2009). The evidence, therefore, is not conclusive. In some languages, broad focus and object focus utterances are identical with respect to the alignment and type of a pitch accent on the object, though there may be differences in other acoustic cues, such as prenuclear accents, intensity and relative F0 values on various constituents, etc. In other languages, the two contexts are differentiated with the help of different pitch accents. 'Phrase languages' have not been extensively studied from the point of view of focus projection (with the exception of Hindi, for which some, albeit indirect, evidence is available; cf. Section 2.3).

### 2.2 Prosodic make-up of Georgian

Georgian is an unusual language from the point of view of prosodic typology. With respect to phrasal/sentential prosody, languages typically fall into one of two camps: those that mark sentential prominence *culminatively*, via alignment and identity of pitch accents, anchored to metrically strong

syllables, and those that mark sentential prominence *demarcatively*, via alignment of prominent syntactic constituents with prosodic boundaries (e.g., Jun 2005a). In a different classification, which makes direct reference to the way a given language expresses phrasal/sentential prominence, the former are called 'pitch-accent languages', while the latter are 'phrase languages' (e.g., Féry 2001; 2010).

Georgian combines properties of both language types, while also presenting an overall unusual pattern of sentential/phrasal prosody. On the one hand, Georgian has lexical stress, fixed on the initial syllable and cued by duration, with intonational pitch accents anchored to the stressed syllables, like in canonical 'pitch-accent languages'. On the other hand, existing work on Georgian prosody has shown that each Accentual Phrase in Georgian obligatorily contains a pitch accent, and the identity of a pitch accent is not uniquely associated with an information structural notion like focus. Instead, there is a growing consensus that Georgian expresses prominence via alignment of prominent constituents with prosodic boundaries, like a 'phrase language'. This section presents the relevant facts of the prosodic profile of Georgian and shows that it falls outside the scope of focus projection theories.

To start with word-level prosody, the existence and placement of word stress in Georgian have long been debated issues. There is consensus, however, that (i) in di- and trisyllabic words stress is initial, and (ii) in longer words, secondary stress may occur on the antepenult or penult (if the initial syllable is taken to carry primary stress) (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). Experimental evidence demonstrates that Georgian has fixed initial stress, cued by greater duration as compared to other syllables (Vicenik & Jun 2014; Borise & Zientarski 2018; Borise 2019). In accordance with these results, word stress is taken to be initial in the current study.

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 analysis of Georgian prosody, determining the available levels of prosodic phrasing and inventory of F0 targets. Unless noted otherwise, the rest of this section summarizes their analysis of Georgian prosody.

Autosegmental-Metrical (AM) theory is one of the main approaches to analyzing prosodic systems, originally developed in Lieberman (1975), Bruce (1977), and Pierrehumbert (1980).[5] The main tenet of AM theory is that intonation can be modelled as a sequence of pitch targets, aligned with specific hosts in the abstract prosodic structure, and transitions between them (interpolation). The values of pitch targets in AM theory can be high (H) or low (L). These labels are not absolute and take into account the speaker's pitch range and the surrounding pitch targets. There are several types of pitch targets. Pitch accents are anchored to stressed syllables (e.g., H*, L*), and boundary tones are aligned with edges of prosodic domains (e.g., H%, L%). Complex pitch targets consist of a combination of tones (typically two); in a complex pitch accent, the main pitch target, aligned with the stressed syllable, is asterisked, with leading or trailing tones preceding or following it (e.g., L+H*, L*+H). Another pitch target, phrase accent, has been variably

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[5] A prominent alternative framework for the analysis of intonation is Prosodic Phonology (Selkirk 1980; 1984; Nespor & Vogel 1986; 2007; Hayes 1989). AM is used for the analysis here because this is the framework that the existing analyses of Georgian intonation have been couched in (Vicenik & Jun 2014; Skopeteas, Féry & Asatiani 2009; Skopeteas & Fanselow 2010; Skopeteas & Féry 2010; Skopeteas & Féry 2016), but the same facts can be modelled within Prosodic Phonology as well.

analyzed either as a boundary tone for medium-level prosodic phrases, or as a dedicated pitch target found between the last pitch accent and the final boundary tone (Bruce 1977; Pierrehumbert 1980; Ladd 1983; Grice, Ladd & Arvaniti 2000). Smaller prosodic units, such as prosodic words, in the AM theory are grouped into larger prosodic units, such as prosodic phrases and intonational phrases. In a given language, two or three levels of prosodic phrasing are distinguished (Shattuck-Hufnagel & Turk 1996). Pitch accents are assigned within smaller prosodic phrases, while all types of prosodic phrases can carry initial and/or final boundary tones.

According the AM analysis of Georgian prosody by Vicenik & Jun (2014), the smallest prosodic phrase in Georgian is an Accentual Phrase (AP). [6] By default, an AP in Georgian spans a single lexical word or one followed by clitics (postpositions or discourse particles). APs have a regular tonal pattern: 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. 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 the question *What happened?* The contour is shown in Figure 1, with the gloss and translation of the example provided in (13); cf. also Skopeteas and Féry (2010) and Skopeteas, Féry & Asatiani (2009: 112).[7]

(13)  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.'
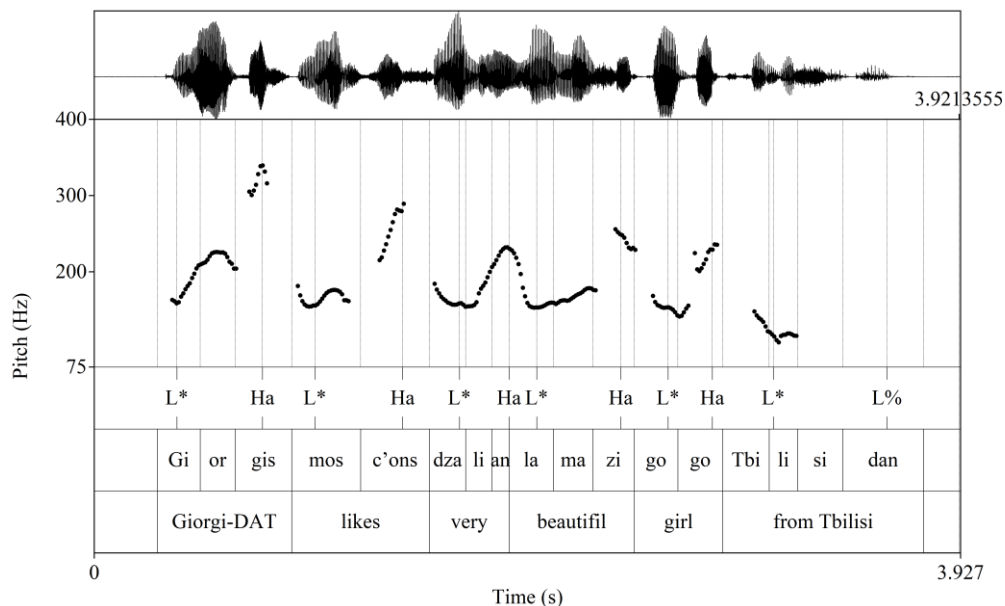


*Figure 1. Typical broad-focus intonation in Georgian; each word is an AP with overall rising intonation; downstep applies to each successive high final boundary tone Ha (Borise 2017: 92).*

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[6] Similar analyses, featuring APs, have been proposed for Japanese (Beckman & Pierrehumbert 1986), Korean (Jun 1993; 1998), French (Jun & Fougeron 1995; 2000; 2002), Farsi (Jun 2005b; Arbisi-Kelm 2007; Esposito & Barjam 2007; Scarborough 2007; Sadat-Tehrani 2007; 2008), and Bengali (Khan 2008).

[7] The acoustic data used for illustrating the prosodic patterns of Georgian come from the author's fieldwork in Georgia.

The key property of an AP is the presence of one pitch accent, aligned with the initial (stressed) syllable, and a final boundary tone. Occasionally, two or three lexical words may optionally form one AP, which is diagnosed by the absence of pitch accent(s) on the non-AP-initial word(s). This typically applies, e.g., to the verb and the immediately preverbal wh-word in wh-questions: only the wh-word carries a pitch accent. This may be due to the clitic-like nature of wh-word in Georgian (Vicenik & Jun 2014). Note that direct objects and verbs are therefore not integrated into a prosodic constituent to the exclusion of other material, which is unexpected from the point of view of syntax-prosody mapping (e.g., Selkirk 2011).

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. Similarly, according to Vicenik & Jun (2014), the H* La tonal pattern indicates that the AP is semantically or syntactically related to the next one, but does not encode a distinct information-structural notion. There are also complex pitch accents LH* (an F0 rise within the initial syllable) and L*+H (a rise with a delayed peak), and a complex AP-boundary tone L+Ha.

A prosodic constituent larger than an AP is an Intermediate Phrase (ip). Optional ip-formation in Georgian applies to two or three syntactically/semantically related APs, such as a noun and its modifying adjective(s). Obligatory ip-formation is found in certain focus contexts; more information about this is provided in Section 2.4. Each of the APs within an ip carries their own pitch accent. The H* La tonal pattern is used on the non-ip-final APs, in order to signal the relationship between the ip-internal APs. The ip-final AP carries an L* pitch accent and a H- or L- final boundary tone. This is illustrated in Figure 2, with the gloss and translation of the example provided in (14); note that the ip-boundary tone overrides that of the final AP, instead of both being realized.

(14)  Lamaz-ma        kalbat'on-ma    k'aba            mo-i-zom-a.
      beautiful-ERG    lady-ERG        dress.NOM        PRV-VER-try-AOR.3SG
      'A beautiful lady tried on a dress.'
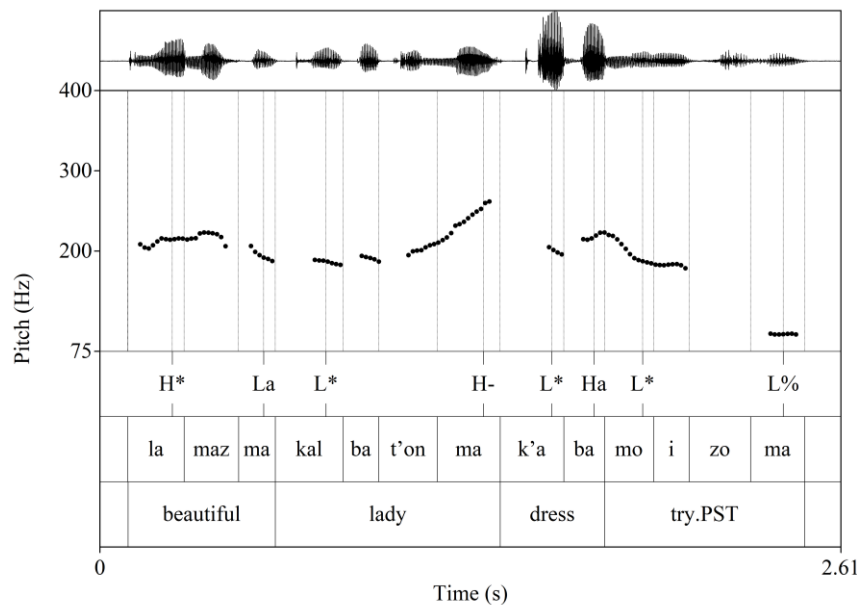


*Figure 2*. *Typical intonational contour of an utterance containing an ip* lamazma kalbat'onma *'a beautiful lady'*.

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 and Figure 2. Other possible IP-boundary tones include H% and HL%, which appear in questions (Vicenik & Jun 2014).

To recap, as the existing descriptions demonstrate, Georgian phrasal prosody does not easily fit into the existing prosodic typology. The distribution and functions of pitch accents in Georgian differ from those in typical pitch-accent languages in a number of ways. First, each AP (i.e., in declaratives, each lexical word) obligatorily carries a pitch accent, independently of the information-structural status of the word in a sentence. Second, the type of a pitch accent (e.g., H* or L*) is not associated with an information structural context either: instead, the variation may be vacuous, or may be used for tracking semantic/syntactic units.

These characteristics of Georgian gave rise to the view that it is a 'phrase language' – i.e., one that primarily relies on boundary tones and phrasing as opposed to stress-aligned pitch-accents to signal information-structural notions (Skopeteas & Féry 2010; 2016; Butskhrikidze 2016). Skopeteas & Féry (2016) define 'phrase languages' as those that "…add or delete phrase boundaries at the edges of constituents in order to signal information structure. The resulting phrases can but do not have to be associated with tonal prominence, like pitch accents." In other words, being a 'phrase language' means that the intonational grammar of Georgian may contain the category of a pitch accent, but the distribution of pitch accents is not governed by informational-structural contexts (e.g., focused vs. given); instead, alignment with prosodic boundaries serves to mark information structural notions. Similar analyses have been proposed for French (Vaissière 1983; Jun & Fougeron 1995) and Hindi (Féry 2010; Féry, Pandey & Kentner 2016); more information on the role of phrasing in focus-marking in Georgian is given in Section 2.4.

It should also be mentioned that no evidence for higher-level phrasal prominence, such as a nuclear pitch accent, is presented in the existing descriptions of Georgian prosody: instead, all APs in a sentence are of equal prominence. Some older descriptions authored by Georgian linguists, in fact, explicitly reject the notion of a nuclear stress in Georgian (Dzidziguri 1954; Alkhazishvili 1959; Zhghenti 1963; 1965).[8] Georgian speakers have no consistent intuitions about the default placement of sentential stress. With this in mind, the notion of DEFAULT PROMINENCE in Georgian is only meaningful insofar as it applies to the succession of rising contours on adjacent APs within a sentence. There is no evidence for there being obligatory higher groupings of APs (in broad-focus declaratives) or sentential/nuclear stress.

### 2.3 Focus projection in a 'phrase' language

The prosodic profile of Georgian does not easily fit with the analyses of focus projection, as discussed in Section 2.1. The property shared by all analyses of focus projection is that they utilize some notion of phrasal prominence/prosodic peak in their definition of focus projection. For the Default Prosody approaches this was nuclear stress, and for the F-marking approaches, the notion of a pitch accent. Yet Georgian does not use either of these notions in the same way as canonical pitch-accent languages do: there is no evidence for nuclear stress, and pitch accents are not distributed based on information-structural notions such as newness or givenness – instead, they automatically mark each AP. The identity of a pitch accent in a given AP (e.g., H* or L*) is not governed by information-structural notions either. This means that a language with a prosodic profile like that of Georgian falls outside the workings of the existing focus projection analyses; no direct predictions about whether it would exhibit focus projection-like behavior may be made.

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[8] The view commonly held in the older Georgian literature is that the distinct 'melodic contour' on the verb makes it the most intonationally prominent constituent in a Georgian sentence.

Yet, there is no reason to believe that focus projection would *a priori* be absent from a language like Georgian. In fact, there is some indirect evidence that focus projection may be obtained in a 'phrase' language of a similar type.[9] In Hindi, existence and placement of word stress and the distribution of pitch accents are a matter of debate, whereas phrase-final boundary tones are prominently marked. The existing literature shows that focus is marked by being right-adjacent to a prosodic boundary, which itself is not expressed in the F0 but in other phonetic cues, such as glottal stop insertion and the direction of cliticization. (Patil et al. 2008; Féry 2010; Féry, Pandey & Kentner 2016). Interestingly, the F0 contours that in Hindi span the constituents that are canonically investigated from the point of view of focus projection – narrowly focused subjects and objects, and those in broad focus contexts – exhibit a pattern that is consistent with focus projection, and one that would not be easy to account for otherwise. Objects in $[SOV]_F$ and $SO_FV$ contexts have identical rising contours, while the rising contours on subjects in $S_FOV$ contexts have significantly higher final F0 values than those on subjects in $[SOV]_F$ contexts. Additionally, $S_FOV$ but not $[SOV]_F$ contexts have strong post-focal pitch target suppression.

Unfortunately, not all Hindi facts can be directly replicated in Georgian since Georgian does not have consistent post-focal deaccenting (Vicenik & Jun 2014; Skopeteas & Féry 2010). Still, it may be hypothesized, based on the Hindi facts, that similar F0 contour properties – specifically, different height or type of the final boundary tone – may be found in narrowly focused subjects and objects and those in broad focus contexts in Georgian. The realization of a final boundary tone is also a more promising object of study given that pitch accent distribution is not governed by information-structural notions like focus, as discussed in more detail in Section 2.4. From a theoretical point of view, it is known that alignment with a prosodic boundary of a particular type may be used to mark focus, as an alternative to prominence-marking rather than a way to ensure prominence (Féry 2013).

In the absence of pitch accent-distribution based on information structure, other phonetic cues, such as duration of the AP-initial stressed syllable that carries a pitch accent may be investigated (regardless of the identity of the pitch accent). It is well-known that the acoustic effect of stress, such as duration, may become more prominent if a word carries narrow focus. To name just a few studies, 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).[10] The analysis of F0 contours in broad and narrow focus contexts is therefore supplemented by the analysis of duration of the stressed syllables in the same context.

The main contribution of this paper is, therefore, empirical: it investigates the realization of broad and narrow focus in Georgian, a member of a language type that is poorly understood from the point of view of focus projection.

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[9] I thank an anonymous reviewer for bringing these facts to my attention.

[10] 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.

## 2.4 Prosodic realization of focus in Georgian

The prosodic realization of narrow focus in Georgian has received some attention in the literature, and the F0 contours that characterize focus contexts have been investigated instrumentally. One of the first experimental studies that targeted 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 (15)-(16).

(15)  [*"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)

(16)  [*"Predicate"* **Omarašvil-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.

Skopeteas, Féry, and Asatiani (2009) show that Georgian has considerable freedom of word order, but narrowly focused expressions appear in the immediately preverbal position; the same paper also contains the first detailed discussion of postverbal focus in Georgian. 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.[11] 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 F0 contours, Skopeteas and Féry (2010) found narrowly focused preverbal objects in $SO_FV$ contexts to have the same rising F0 contour as objects in broad focus conditions, with no significant differences in the realization of the object in the two conditions; this was also replicated in the current study.[12] Subjects in both SOV and $S_FVO$ conditions were found to have both rising and falling contours, with falling contours less frequent than rising ones in both conditions, and 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. With respect to prosodic phrasing, Skopeteas & Féry (2010) conclude that preverbal narrowly focused subjects are phrased separately from the rest of the clause, $(S_F)_P(VO)_P$, based on the frequent absence of a high boundary tone between V and O but not the realization of $S_F$ itself.[13] Preverbal narrowly focused objects are taken to be prosodically grouped together with the verb, $(S)_P(O_FV)_P$, based on the height of the boundary between S and O but not the

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[11] Number of syllables per constituent or syllable structure of the stimuli were not reported.

[12] 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 $SO_FV$).

[13] The subscript P marks p(rosodic)-phrases (not defined independently).

realization of $O_F$. In contrast, Asatiani & Skopeteas (2012) conclude that 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, $X(Y_FV)$, based on the presence of a prosodic boundary to the left of the focused constituent.

Vicenik and Jun (2014) have a different take on the realization of focus in Georgian. In their analysis, focused constituents typically (but not always) carry a H* or LH* pitch accent, followed by an La boundary tone. Vicenik and Jun (2014) also observe that the focused constituent may be realized with the usual declarative intonation, L* Ha, and exemplify it with a narrowly focused object in an SOV context – which is in accord with the current findings for narrowly focused objects. With respect to prosodic phrasing, Vicenik and Jun (2014) note that the focused constituent, regardless of its thematic role, is frequently preceded by a prosodic boundary and grouped into a single ip with the following verb.

Finally, Skopeteas and Féry (2016) provide an overview and the main conclusions of their work on Georgian prosody and reanalyze some of the findings. They conclude that utterance-initial constituents in broad-focus contexts may carry variable F0 contours, and that narrowly focused constituents are characterized by greater duration of stressed syllables as compared to broad-focus contexts. With respect to prosodic phrasing, they propose that all foci are separated from the rest of the clause when clause-initial and in the presence of postverbal material, $((S_F)_\varphi(VO)_\varphi)_\iota$ and $((O_F)_\varphi(VS)_\varphi)_\iota$, and integrated with the preceding material if clause-medial and in the absence of postverbal material, $((SO_F)_\varphi(V)_\varphi)_\iota$ and $((OS_F)_\varphi(V)_\varphi)_\iota$.

As the above shows, many key properties of the prosodic realization of focus in Georgian have been addressed in the literature, but the existing work is comprised of conflicting analyses.

Additional concerns stem from the fact that the existing generalizations are based on experimental techniques that did not involve (semi-)spontaneous speech production. Skopeteas, Féry, and Asatiani (2009: 110) 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 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 difference in production mode is likely to be a contributing factor to the differences between the current results and those reported in previous studies. These two issues – the availability of incompatible analyses and the fact that the existing conclusions are based on non-spontaneous speech – provided the motivation for the current study.

### 2.5 Basic syntactic properties of 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 (Vogt 1971; Skopeteas & Fanselow 2010). Following the majority of authors (Pochkhua 1962; Aronson 1982; Nash 1995; McGinnis 1997a; 1997b; Harris 2000; Boeder 2005), we are adopting the view that Georgian is underlyingly OV, while VO is derived by short, semantically vacuous head-movement of the verb over the object; 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).

Focused constituents appear in the immediately preverbal position, as shown in (17) and (18).[14] 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*.

(17)  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.

(18)  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.

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 Foc$^0$ (Bhatt 1999 for Kashmiri; Karimi 2008 for Persian; Jayaseelan 2001 for Malayalam). [15] Second, focus-verb adjacency may be achieved with both elements being in situ, and with 'altruistic' movement removing the intervening material to the periphery of the clause. In this case, the preverbal focus position is a linear notion and not a structural one.

The available syntactic evidence suggests that preverbal narrow foci in Georgian are found in situ.[16] 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. Second, preverbal narrow foci do not give rise to Weak Crossover effects, which also suggests that they are not subject to movement. Finally, language-specific evidence that comes from different behavior of subject and object foci with respect to negative indefinites

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[14] Georgian also allows for narrow foci to appear in the immediately postverbal position. Postverbal foci differ from preverbal ones in their prosodic realization (Skopeteas & Féry 2010; Skopeteas, Féry & Asatiani 2018) and syntactic status (Borise 2019), and certain types of foci (wh-phrases) cannot appear postverbally. This type of focus is not discussed here.

[15] For a detailed investigation of the prosody of focus in a language that marks focus syntactically by placing it preverbally via a Spec-Head configuration, Hungarian, cf. Genzel et al. (2015).

[16] This is not the case for wh-phrases, which rely on a Spec-Head configuration instead (Borise 2019).

also shows that subject and object foci are found at different heights in the syntactic tree; see Borise (2019) for details.

Finally, it is worth pointing out that with respect to syntax-prosody mapping, the Georgian data has been subject to conflicting analyses. This may be at least partially due to the fact that, as a rule, every lexical word in Georgian forms an AP, and there are no tonal events that would consistently mark syntactic constituents larger than a word but smaller than a clause, which obscures the correspondence between prosodic and syntactic structure (unlike in e.g., Bantu languages; cf. Selkirk 2011). Vicenik and Jun (2014) note that optional ip-formation targets syntactic constituents such as DPs that contain modifiers, but they refrain from making generalizations about the correspondence between syntactic and prosodic phrasing of clausal constituents. Skopeteas & Féry (2010) take broad focus SOV sentences to be phrased as (SOV) or (S) (OV), while SVO ones, based on the derived syntactic status of the object, to be phrased as (SV) (O). In contrast, Skopeteas & Féry (2016) analyze broad focus SOV sentences as (SO) (V), while keeping the (SV) (O) analysis of broad-focus SVO clauses. The fact that different syntax-prosody analyses are available means that the relationship between syntactic and prosodic phrasing in Georgian is likely complex and indirect. 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.

**3 Methods**

*3.1 Stimuli*

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; based on the verbs, thirty scenarios were created. Personal names (*Mariami*, *Giorgi*, etc.) and common nouns (*a fisherman, children,* etc.) were used as subjects and direct objects. 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 scenario is provided in (19):

(19) Mebadur-ma       da-i-č'ir-a               zvigen-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 scenario was then turned into five questions, aimed at eliciting broad focus over the whole reply, narrow focus on the direct object, subject, and the VP, and contrastive focus on one of the constituents (subject, object, or the verb)[17], as in (20). A sample picture prompt is provided in Figure 3; please see the Appendix for the full summary of stimuli.

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[17] 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.

**Figure 3**. *Sample picture prompt.*

(20)  a. **Ra**  **mo-xd-a**  šaršan  zapxul-ši?
      what  PRV-happen-AOR.3SG  last_year  summer-LOC
      'What happened last summer?'

    b. **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?'

    c. **Vin**  da-i-č'ir-a  zvigen-i  šaršan  zapxul-ši?
        what  PRV-VER-catch-AOR.3SG  shark-NOM  last_year  summer-LOC
        'Who caught a shark last summer?'

    d. **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?'

    e. **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?'

### 3.2 Procedure and participants

The participants were presented with picture prompts that appeared on a laptop screen. Each prompt was accompanied by a question, and a recording of a native speaker of Georgian asking the question was provided as an embedded soundtrack, in order to make answering the question on the screen more natural.

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.[18] 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.

Eight native speakers of Georgian participated in the study: two males (M1, M2) and six females (F1-F6); data from all recorded subjects were included in the analysis. All speakers were natives of Tbilisi, with

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[18] 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, 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.

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 resulting set of questions equaled 134 (14 transitive x 5 + 9 unergative x 4 + 7 unaccusative x 4), but only 110 questions were used: before the experiment, two native speakers of Georgian assessed the naturalness of the pre-recorded questions and rejected 24 as pronounced unnaturally; they were removed from the experiment. No filler sentences were used. The final set was pseudo-randomized to ensure that items from the same scenario or focus type are not adjacent; each speaker provided replies to 110 questions, each uttered once. On average, a recording session took about 30-35 minutes. After eliminating disfluent replies from the participants (due to pauses, errors, repetitions, throat clearing etc.), the final dataset contained 817 replies.

### 3.3 Data processing

The prosodic data obtained was manually annotated in Praat (Boersma & Weenink 2019) by trained research assistants, based on the segmentation criteria developed by Machač & Skarnitzl (2009),[19] and checked by the author. Before that, the correct syllabification was established with three native speakers of Georgian.[20]

Since the participants provided (semi-)spontaneous replies to the experimental questions, there was substantial 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 items used for the investigation of duration and F0 properties are provided in Sections 4.1 and 4.2, respectively.

The nature of the data also allowed for variability with respect to placement of different types of foci. In the responses, narrowly (non-contrastively) focused objects appeared both preverbally and postverbally with almost equal frequency (55% vs. 45%, respectively), but contrastively focused objects were placed almost exclusively postverbally (in 82% of cases)[21]; postverbal foci were not considered here. In turn, both non-contrastively and contrastively focused subjects were found exclusively preverbally.[22] The clause types from which the subjects and objects were extracted are shown in Table 2.

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[19] 50ms of closure were added to utterance-initial stops and affricates.

[20] 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.

[21] 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.

[22] 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.

**Table 2.** *Clause types from which the subjects and objects were extracted for analysis.*

| Subjects | | Objects | |
|---|---|---|---|
| SV | 62 | SXOV | 42 |
| XSV | 49 | SOV | 28 |
| SVO | 48 | XSOV | 13 |
| SVX | 34 | OV | 7 |
| XSVO | 28 | **Total** | **90** |
| XSVX | 19 | | |
| XOSV | 13 | | |
| NoSVO | 13 | | |
| XOSV | 12 | | |
| SVOX | 11 | | |
| SVOX | 10 | | |
| NoSV | 7 | | |
| **Total** | **306** | | |

Preverbal narrowly focused subjects and objects were analyzed separately and compared to subjects and objects in broad focus contexts, respectively. In all contexts analyzed (broad and narrow focus), the constituents of interest, subjects and objects, were found immediately preverbally. Other contexts for which data was available, such as VP focus, were included into the analysis as well. The narrow focus condition, for subjects and objects, was divided into new information focus and contrastive focus. No significant interaction between verb type (transitive, unergative, or unaccusative) and prosodic realization of focus (duration of the stressed syllable, pitch accent or boundary tone type) or word order employed was detected. Therefore, different verb types are reported together in the remainder of the paper. The participants had some individual preferences with respect to word order: speakers F1 and F6 only produced VO-type orders, while other speakers utilized both VO-type and OV-type orders. Accordingly, the object dataset is based on data from six speakers instead of eight.

Duration of the stressed syllable and the F0 contour spanning the narrowly focused constituent were analyzed. Duration and average 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).

### 3.4. Analysis

### 3.4.1 Duration of the stressed (initial) syllable

With respect to duration, the comparison targeted the initial syllables in nouns that occupy the preverbal position in sequences of the shape "noun + verb", but with different focus properties: with the noun either in narrow focus or as part of broad focus. This was carried out separately for subjects and objects, as schematized in Table 3. The total counts of items in the dataset used for duration measurements are provided in Table 4.[23]

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[23] Several factors led to the numerical discrepancy between objects and subjects. First, only the subject condition includes intransitive sentences. Second, participants were free to place foci preverbally or postverbally in their

***Table 3.*** *The set-up of the syllable duration comparisons.*

|  | **O in OV** | **S in SV** |
|---|---|---|
| **Broad focus** | 1$^{st}$ σ, duration | 1$^{st}$ σ, duration |
|  | ↕ | ↕ |
| **Narrow focus on noun** | 1$^{st}$ σ, duration | 1$^{st}$ σ, duration |

***Table 4***. *The dataset used for the investigation of the duration of the stressed syllable under different focus conditions.*

| Test word | Syllable count | n | Total n |
|---|---|---|---|
| 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 | |

### 3.4.2 F0 contour

The analysis of F0 contours had two objectives. The first one was a quantitative investigation of the type and height of the boundary tone on a narrowly focused subject or object and its counterpart in broad focus. The boundary tone was selected as the object of study given that earlier literature found that narrow foci in Georgian are not marked by particular pitch accents, but may be marked by alignment with prosodic boundaries (even though no analytical consensus has been reached on the patterns of alignment); this was schematized in Table 5. In particular, subjects and objects in broad focus contexts are expected to adhere to the L* Ha tonal pattern, but no predictions can be made for narrowly focused constituents: based on the existing literature, they may receive either an (L)H* La or L* Ha tonal pattern. As in the investigation of stressed syllable duration, preverbal subjects and objects, in different focus contexts, were considered separately. The continuation of the F0 contour on the following verb was also considered, to allow for better visualization. Therefore, the strings analyzed were OV and SV; other segmental material that preceded or followed these strings was trimmed off. This is shown in Table 5.

***Table 5.*** *The set-up of the F0 contour comparisons.*

|  | **O in OV** | **S in SV** |
|---|---|---|
| **Broad focus** | boundary tone | boundary tone |
|  | ↕ | ↕ |
| **Narrow focus on noun** | boundary tone | boundary tone |

For the quantitative part of the study, F0 was measured in each test word/AP 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 of the test words/APs: Georgian carries intonational F0 targets on the penult and ultima of an AP (phrase accent and final boundary tone, respectively), as well as a pitch accent on the initial syllable. This

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response. While they used both options for narrowly focused objects with almost equal frequency, narrowly focused subjects occurred exclusively preverbally.

means that aligning words of unequal syllable count by either edge will obscure generalizations about the location of F0 targets, as illustrated in (21), where bold-faced syllables represent syllables with F0 targets.

(21)  a.  **σ**σσ**σ**          b.          **σ**σσ**σ**
           **σ**σσσ**σ**                     **σ**σσσ**σ**
           **σ**σσσσσ**σ**                   **σ**σσσσσ**σ**

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.[24] Consequently, each resulting test word in the subject and object datasets contained only the initial syllable (coded '1'), penult (coded '-2') and ultima (coded '-1') of the original word. The datasets introduced in Section 4.1 were used for the analysis of F0 properties too, though here each test word was also accompanied by 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: $S_1$, $S_{-2}$, $S_{-1}$, $V_1$, $V_{-2}$, $V_{-1}$; e.g. an utterance *Mariami sadilobda* 'Mariami had dinner' was reduced to $(Ma)_{S1}$ $(a)_{S-2}$ $(mi)_{S-1}$ $(sa)_{V1}$ $(lob)_{V-2}$ $(da)_{V-1}$. Similarly, OV strings were reduced to $O_1$, $O_{-2}$, $O_{-1}$, $V_1$, $V_{-2}$, $V_{-1}$: *samzareulos alagebda* '[s/he] cleaned the kitchen' was reduced to $(sam)_{O1}$ $(u)_{O-2}$ $(los)_{O-1}$ $(a)_{V1}$ $(geb)_{V-2}$ $(da)_{V-1}$.

Because the stimuli had to be at least three syllables long for this manipulation to be possible, 20 mono- and disyllabic test words were discounted from the object dataset; no subjects were discarded, since all subjects in the subject dataset were tri- or tetrasyllabic. The total stimuli counts are provided in Table 6.

**Table 6.** *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 second goal of the F0 part of the study was to provide a global, qualitative analysis of the F0 contours. This was performed for the most frequent word orders used in broad and narrow focus conditions.[25] In order

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[24] 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).

[25] 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. 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

to do so, the tonal events in the responses with most common word order patterns in broad focus utterances and those containing subject or object foci were manually annotated by the author. For utterances containing subject foci, the most common word orders were SV, SVO, and XSV, and for utterances with object foci, the most common were OV, SOV, XSOV and SXOV; cf. Table 2.

## 4 Results

### *4.1 Duration of the stressed (initial) syllable*

Statistical analysis of the syllable duration data was performed using the `lmer` function in the `lme4` package (Bates et al. 2015) for R (R Core Team 2020); the `lmerTest` package (Kuznetsova, Brockhoff & Christensen 2017), which calculates Satterthwaite's approximation to degrees of freedom, was used to calculate p-values.

A mixed-effects model of the same set-up was used for subject and object data (separately). DURATION of the initial syllable acted as the dependent variable, FOCUS TYPE as the fixed factor, and SPEAKER, ITEM, CLAUSE SUBTYPE (such as, e.g. SVO, SV, XSV for subjects) and SYLLABLE COUNT as random factors (with a random intercept for each of those predictors, but no random slopes). The random factor SYLLABLE COUNT was included in order to account for the fact that the nouns in each of the subject and object datasets were of different syllable counts, and the duration of individual syllables decreases as the number of syllables in a word increases (polysyllabic shortening; Lehiste 1972). In both models, the broad focus condition acted as the intercept and was taken to be the baseline that other types of focus are compared with. Below, the subject and object results are discussed.

Table 7 provides the average durations of the initial syllable in subjects in different focus contexts, and Figure 4 show the distribution of the duration data. In addition to the main object of comparison – the values for subjects in broad focus and narrowly focused subjects (contrastive and non-contrastive) – Table 7 and Figure 4 also include the values for subjects in other focus contexts for which the data was available (contrastive and non-contrastive focused object focus, and VP focus). As Table 7 and Figure 4 demonstrate, the stressed syllable receives an increase in duration in narrowly focused subjects, as compared to subjects in broad focus.

*Table 7*. *Average durations (ms) of the initial (stressed) syllable in subjects in utterances with different focus types.*

| Focus type | n | $1^{st}$ σ, ms | SE, ms |
|---|---|---|---|
| **broad** | 83 | 181 | 61 |
| $S_F$ | 95 | 192 | 62 |
| $S_{ContrastiveF}$ | 34 | 216 | 71 |
| $O_F$ | 14 | 161 | 45 |
| $O_{ContrastiveF}$ | 7 | 134 | 47 |
| $[VP]_F$ | 73 | 160 | 45 |

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was produced in the right or left periphery or dropped altogether). For this reason, a systematic comparison of the F0 contours on given material in narrow focus contexts, in this study design, was not feasible, and only the prosodic realization of the most commonly used word orders was analyzed qualitatively.
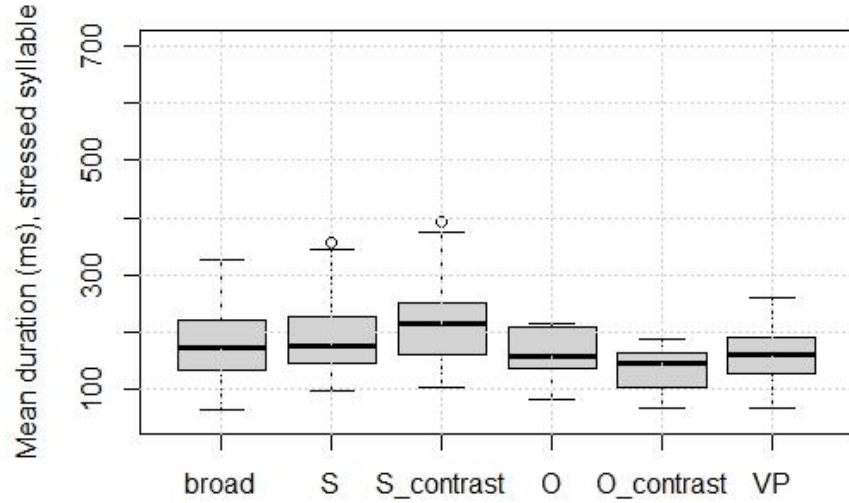
**Figure 4**. *Duration of the stressed (initial) syllable in subjects in utterances with different focus types.*

Statistical analysis showed that the duration of the stressed (initial) syllable was significantly greater in narrowly (non-contrastively and contrastively) focused subjects than in subjects in broad focus utterances. There was no significant difference between subjects in broad focus and subjects in other contexts tested (utterances with object focus, contrastive and non-contrastive, and VP focus). The statistical results are summarized in Table 8.[26]

**Table 8**. *Results of the statistical analysis of the duration of the stressed (initial) syllable in subjects in different focus contexts, as compared to the broad focus condition. Asterisks are used to mark levels of significance: p<0.05 (*), p<0.01 (**).*

| Focus type | *p*-value | *β* | SE | *t* |
|---|---|---|---|---|
| **Intercept (broad)** | 0.015* | 183.24 | 17.197 | 10.655 |
| **S$_F$** | 0.046* | 12.885 | 6.413 | 2.009 |
| **S$_{ContrastiveF}$** | 0.006** | 24.558 | 8.875 | 2.767 |
| **O$_F$** | 0.855 | 2.253 | 12.320 | 0.183 |
| **O$_{ConstrativeF}$** | 0.442 | -13.452 | 17.462 | -0.77 |
| **[VP]$_F$** | 0.463 | -4.959 | 6.743 | -0.735 |

Next, let us consider objects. Table 9 shows the average duration values of the initial syllable in objects in different focus contexts, and Figure 5 provides an overview of the duration data. The contexts here do not include subject focus, since all focused subjects in the dataset were preverbal – hence, no OV contexts with subjects focus (OVS$_F$) were available. Similarly, contrastively focused objects were attested exclusively postverbally, and not considered here. These two factors lead to there being only one additional context included, objects in VP-focus. As Table 9 and Figure 5 demonstrate, the initial syllable in narrowly

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[26] 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. For this reason, clause-initial vs. clause-medial position was not a factor in the models. This applies to both subjects and objects.

focused objects does not receive extra lengthening, as compared to objects in broad focus – in fact, the bulk of the stressed syllables in narrowly focused objects is shorter than those in objects in broad focus.

*Table 9*. *Average durations of the initial (stressed) syllable in objects in utterances with different focus types.*

| Focus type | n | $1^{st}$ σ, ms | SE, ms |
|---|---|---|---|
| broad | 25 | 236 | 68 |
| O$_F$ | 24 | 225 | 45 |
| [VP]$_F$ | 41 | 254 | 98 |
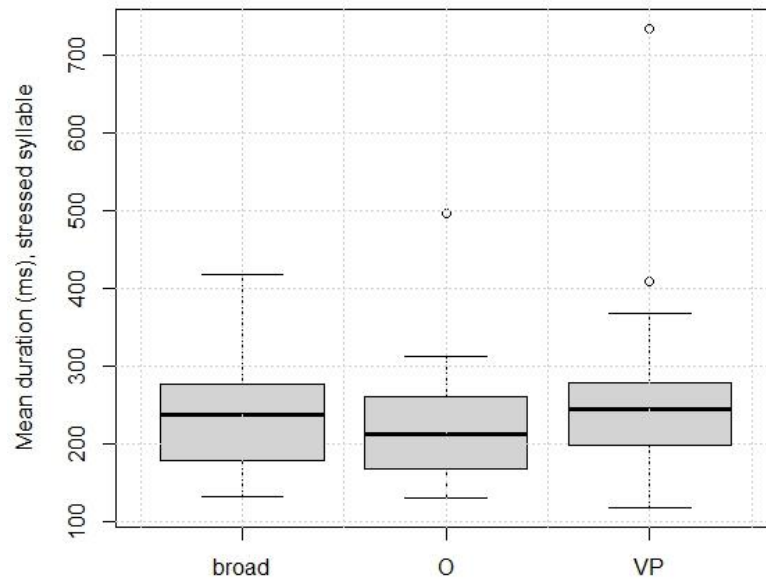


*Figure 5*. *Duration of the stressed (initial) syllable in subjects in utterances with different focus types.*

Statistical analysis showed that, in preverbal objects, there was no significant difference between the durations of stressed syllables in utterances with narrow focus on the object or broad focus. The statistical results are summarized in Table 10.

*Table 10*. *Results of the statistical analysis of the duration of the stressed (initial) syllable in objects in different focus contexts, as compared to the broad focus condition. Asterisks are used to mark levels of significance: p<0.05 (\*), p<0.01 (\*\*).*

| Focus type | *p*-value | β | SE | *t* |
|---|---|---|---|---|
| Intercept (broad) | 0.006** | 283.072 | 52.294 | 5.413 |
| O$_F$ | 0.435 | -11.725 | 14.955 | -0.784 |
| [VP]$_F$ | 0.502 | 8.673 | 12.855 | 0.675 |

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. In narrowly focused preverbal subjects, greater duration of the stressed syllable was found, as compared to broad focus contexts. This was not the case with narrowly focused preverbal objects: here, the duration of initial syllable not only did not exceed its counterpart in broad focus, but was, in fact, shorter.
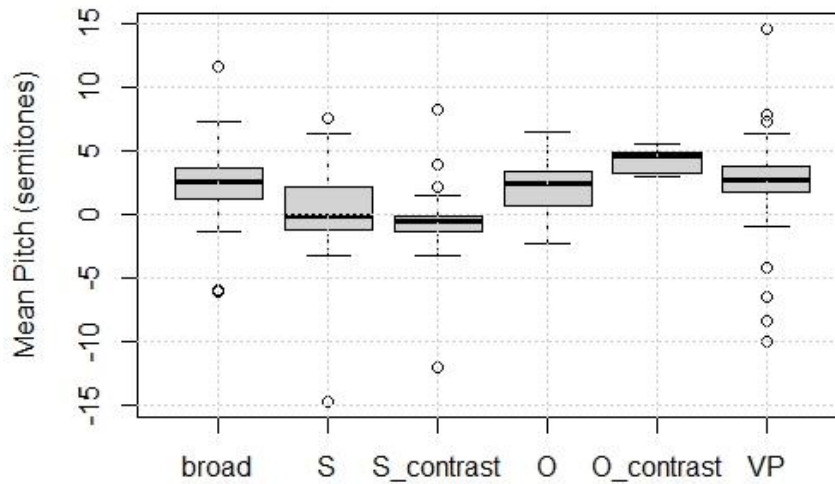
### 4.2 F0 contour

### 4.2.1 Final boundary tone

The analysis of the F0 values was also performed using a mixed effects model, with the `lmer` function in the `lme4` package (Bates et al. 2015) for R (R Core Team 2020); the `lmerTest` package (Kuznetsova, Brockhoff & Christensen 2017), which calculates Satterthwaite's approximation to degrees of freedom, was used to calculate p-values. 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.

First, let us consider the prosodic realization of the final syllables in subjects in SV strings with various focus types, as summarized in Table 11 and Figure 6. Here, the $S_{-1}$ values are considerably lower for contrastively and non-contrastively focused subjects, as compared to the broad focus conditions (as well as the other conditions).

***Table 11***. *Averaged F0 values at the mid-point of the syllable of interest ($S_{-1}$) in SV strings with various focus types.*

| Focus type | n | $S_{-1}$, st | SE, st |
|---|---|---|---|
| **broad** | 83 | 2.404 | 2.338 |
| $S_F$ | 95 | 0.449 | 2.735 |
| $S_{ContrastiveF}$ | 34 | -0.74 | 2.535 |
| $O_F$ | 14 | 2.089 | 2.508 |
| $O_{ContrastiveF}$ | 7 | 4.136 | 1.043 |
| $[VP]_F$ | 73 | 2.477 | 3.151 |



***Figure 6.*** *F0 values at the mid-point of the syllable of interest ($S_{-1}$) in SV strings with various focus types*

Figure 7 provides a visualization of the average F0 contours over SV strings in different focus contexts. Here, the difference between the behavior of subject focus contexts and all other contexts with respect to the boundary tone on the subject ($S_{-1}$) is apparent. 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 (rising-)falling F0 contour, while the latter have a (falling-)rising one.
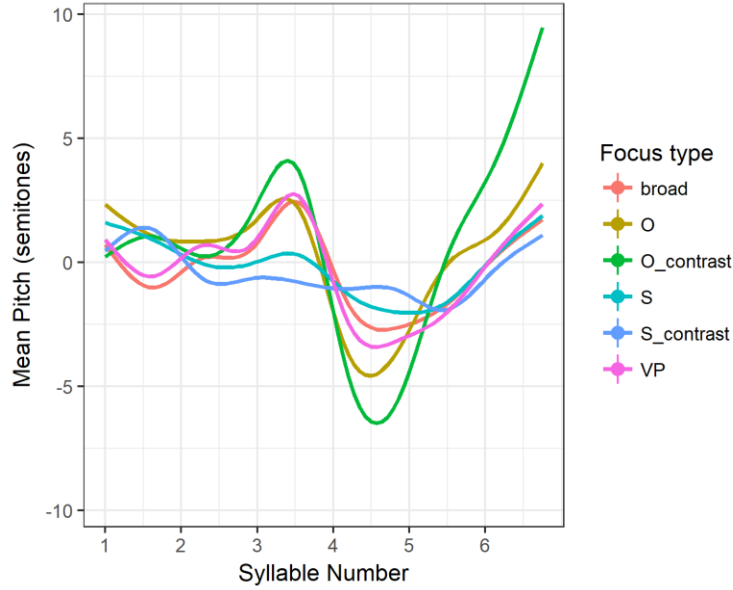
*Figure 7*. *Averaged F0 contours in SV strings with various focus types, with each word reduced to three syllables (1=S$_1$, 2=S$_{-2}$, 3=S$_{-1}$, 4=V$_1$, 5=V$_{-2}$, 6=V$_{-1}$), smoothed at 0.2. On the x-axis, each tick marks the onset of a syllable.*

According to the statistical analysis, 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. None of the other contexts significantly differ from the intercept (broad focus).

*Table 12*. *Results of the statistical analysis of the F0 (in semitones) on the mid-point of the final syllable in subjects in different focus contexts, as compared to the broad focus condition. Asterisks are used to mark levels of significance: p<0.05 (\*), p<0.01 (\*\*), and p<0.001(\*\*\*).*

| Focus type | *p*-value | $\beta$ | SE | *t* |
|---|---|---|---|---|
| **Intercept (broad)** | <0.001*** | 2.489 | 0.39 | 6.376 |
| **O$_F$** | 0.695 | -0.286 | 0.73 | -0.39 |
| **O$_{ContrastiveF}$** | 0.281 | 1.127 | 1.043 | 1.081 |
| **S$_F$** | <0.001*** | -2.052 | 0.368 | -5.576 |
| **S$_{ContrastiveF}$** | <0.001*** | -2.996 | 0.479 | -6.252 |
| **[VP]$_F$** | 0.76 | -0.121 | 0.396 | -0.306 |

Turning to the F0 properties of objects, Table 13 and Figure 8 summarize the facts pertaining to the realization of the final syllable in objects in OV strings with different focus properties.

*Table 13*. *Averaged F0 values at the mid-point of the syllable O-1 in OV strings with various focus types.*

| Focus type | n | O$_{-1}$, st | SE, st |
|---|---|---|---|
| **broad** | 20 | 1.985 | 2.029 |
| **O$_F$** | 20 | 0.77 | 2.501 |
| **[VP]$_F$** | 30 | 1.58 | 2.149 |
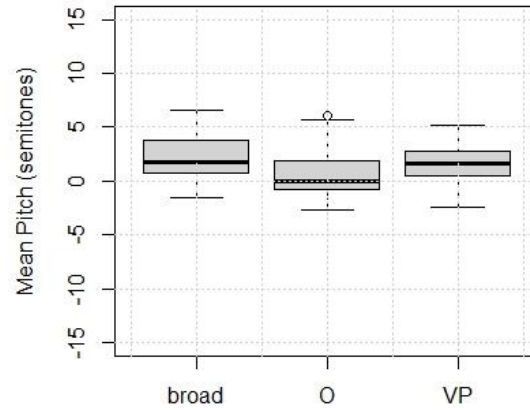
***Figure 8.*** *F0 values at the mid-point of the syllable of interest (O₋₁) in OV strings with various focus types*

Figure 9 shows the average F0 contours over OV strings in different focus contexts. Here, all three remaining focus conditions considered – broad focus, [VP]F and OF – closely align in their prosodic realization, including with respect to the final rise on the object.
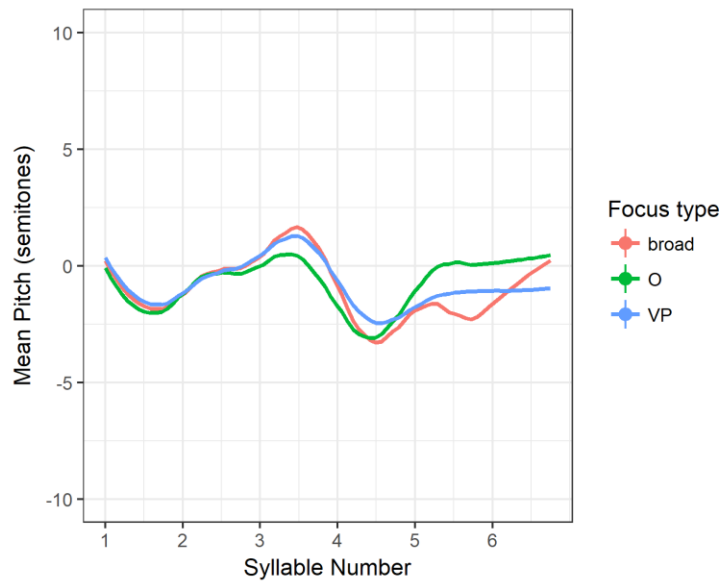


***Figure 9****. Averaged F0 contours in OV strings with various focus types, with each word reduced to three syllables (1=O₁, 2=O₋₂, 3=O₋₁, 4=V₁, 5=V₋₂, 6=V₋₁), smoothed at 0.2. On the x-axis, each tick mark marks the onset of a syllable.*

As per the statistical results, presented in Table 14, there was no significant difference between the F0 values on the final syllable of narrowly focused objects and those in broad focus conditions.

*Table 14*. *Results of the statistical analysis of the F0 (in semitones) on the mid-point of the final syllable in objects in different focus contexts, as compared to the broad focus condition. Asterisks are used to mark levels of significance: p<0.05 (\*), p<0.01 (\*\*), and p<0.001(\*\*\*).*

| Focus type | *p*-value | *β* | SE | *t* |
|---|---|---|---|---|
| **Intercept (broad)** | 0.049* | 1.5354 | 0.722 | 2.127 |
| **O$_F$** | 0.219 | -1.243 | 0.979 | -1.27 |
| **[VP]$_F$** | 0.076 | -1.747 | 0.933 | -1.873 |

To sum up, preverbal narrowly focused subjects, both contrastive and non-contrastive, receive a markedly different realization from subjects in broad focus contexts. The latter are characterized by a rising contour, which is the expected F0 contour on constituent in broad focus utterances, as established in Section 2.4. In contrast, narrowly focused subjects carry a (rising-)falling F0 contour. Narrowly focused preverbal objects, like preverbal objects in broad (and VP-) focus contexts, carry a rising contour; no difference between focused objects and those in broad focus was revealed.

### 4.2.2 Global F0 contour

Within the subject dataset, broad focus utterances (<u>SV</u>, <u>SVO</u>, and X<u>SV)</u> consistently received the overall F0 contour that is expected in broad-focus utterances. Each lexical word formed an AP: utterance-medial APs received a L* Ha realization, final ones the L* L% realization, and initial ones an L* Ha or LH* La realization. In line with the observations in the literature (Skopeteas & Féry 2016), this variation seems semantically vacuous. If two APs formed an ip (e.g., in a two-word adverbial), they carried an (H* La) (L* H-) contour.

Sting-identical utterances with subject focus differed from the broad-focus ones in their realization of the SV string: in most subject focus utterances (65 out of 73 analyzed), the subject received an H* La or LH* La realization. The H*-LH* variation was found in both contrastive and non-contrastive subject foci, and did not seem meaningful. The verb carried a shallow falling contour, analyzed as H* (H+)L L% (containing a phrase accent (H+)L, anchored to (antepenult+)penult), in accordance with Vicenik & Jun (2014). The tonal properties of the annotated utterances from the subject dataset are provided in Table 15. *Figure 10* and (22) exemplify the H* La realization of the focused subject, and Figure 11 and (23) the LH* La realization.

*Table 15*. *Tonal realizations of SV strings in broad focus utterances vs. utterances with subject focus (contrastive and non-contrastive).*

| Tonal events | (S)(V), broad | (S$_F$)(V) | (S$_{CF}$)(V) |
|---|---|---|---|
| (L* Ha) (L* L%) | 83 | 8 | 0 |
| (H* La) (H* (H+)L L%) | 0 | 58 | 2 |
| (LH* La) (H* (H+)L  L%) | 0 | 7 | 1 |

(22)　('Who had dinner last night?')
　　　Gasul　　ghame-s　　**MARIAMI**$_F$　　sadil-ob-d-a.
　　　last　　night-DAT　Mariami.NOM　dine-SF-SM-IPFV.3SG
　　　'MARIAMI$_F$ had dinner last night.'
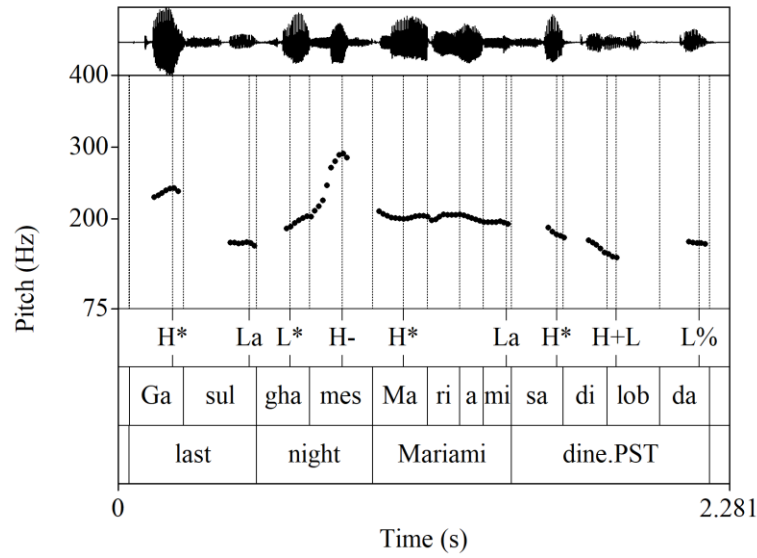
*Figure 10. Tonal realization of an utterance with subject focus and an (H\* La) (H\* H+L L%) tonal contour over the SV string. The initial two-word adverbial forms an ip and carries an H\* La L\* H- contour.*

(23)  ('Who laughed in the evening?')
      Saghamo-s       **DEMET'RE**F      i-cin-od-a.
      evening-DAT,    Demetre.NOM     VER-laugh-SM-AOR.3SG
      'DEMETREF laughed in the evening.'
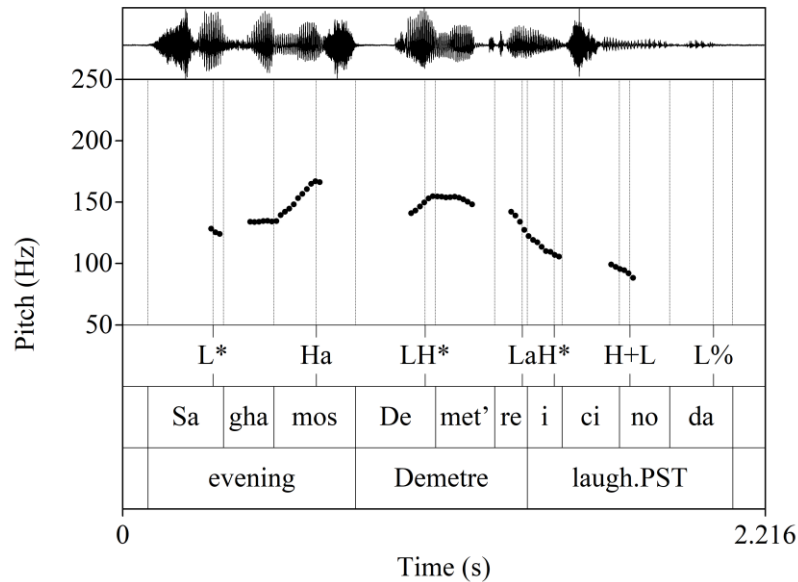


*Figure 11. Tonal realization of an utterance with subject focus and an (LH\* La) (H\* H+L L%) tonal contour over the SV string.*

In the object dataset, the realization of broad focus utterances (OV, SOV, XSOV and SXOV) adhered to the same generalizations as that described for broad focus sentences in the subject dataset.

In contrast with subject foci, however, the majority of object foci (18 out of 24 analyzed) received the same, broad focus-like realization, with the preverbal object focus carrying an L* Ha contour, followed by the verb with the L* L% contour; this is shown in **Figure 12** and (24). There was more variability in the object dataset, though, with 6 OV strings in narrow focus contexts and, surprisingly, 4 in broad focus contexts exhibiting the contour typical of narrow focus in the subject dataset. In these, the object carried the H* La contour, and the verb carried the H* (H)+L L% contour. It should be noted that 3/6 such contours in the narrow focus condition and 2/4 in the broad focus condition are due to the same speaker, F4. The summary of the data is provided in **Table 1**.

**Table 16.** *Tonal realizations of OV strings in broad focus utterances vs. utterances with object focus*

| Tonal events | (O)(V), broad | (O$_F$)(V) |
|---|---|---|
| (L* Ha) (L* L%) | 21 | 18 |
| (H* La) (H* (H)+L L%) | 4 | 6 |
| (LH* La) (H* (H)+L  L%) | 0 | 0 |

(24)  ('What did grandma clean yesterday morning?')

Bebia   gušin  dilas  **SAMZAREULO-S**$_F$ a-lag-eb-d-a .
grandma.NOM yesterday morning kitchen-DAT  VER-clean-SF-SM-IPFV.3SG
'Grandma cleaned the **KITCHEN**$_F$ yesterday.'
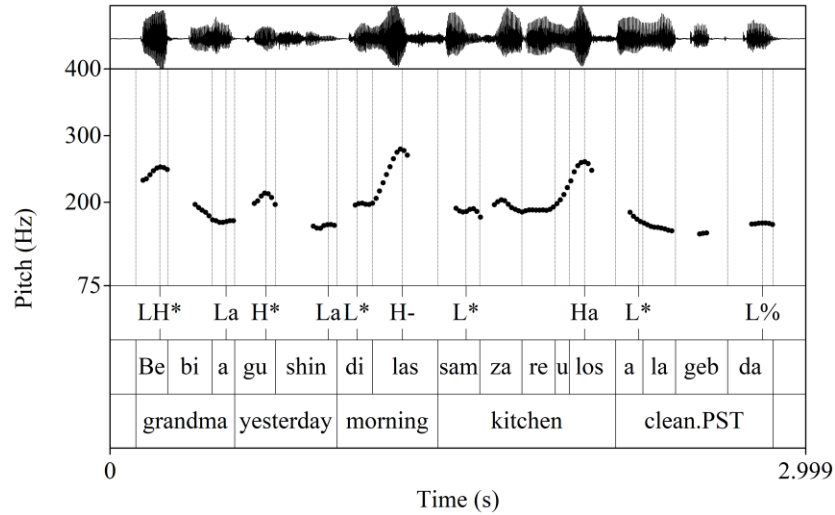


**Figure 12.** *Tonal realization of an utterance with object focus and an (L* Ha) (L* L%) tonal contour over the OV string (identical with broad focus).*

### 4.3 Summary

In this section, the acoustic parameters of narrowly focused subjects and objects were compared to those of subjects and objects in broad focus. For subjects, the duration of the stressed syllable was shown to be greater under narrow focus, as compared to the broad focus condition. This was not the case for objects, where the duration of the stressed syllable did not vary significantly across focus conditions. With respect to F0 contours, the majority of focused subjects received a (rising-)falling contour, identified as (L)H* La, while all subjects in broad focus carried a rising contour, L* Ha. In contrast, the majority of objects, both focused and found in broad contexts, received the rising F0 contour, L* Ha.

**5 Discussion, conclusions, and implications**

The current results allow for making some generalizations that have implications for our understanding of the nature of focus marking. According to the current study, two prosodic phenomena, duration of the stressed syllable and the F0 contour (most consistently, the final boundary tone), mark subject focus contexts as distinct from broad focus ones, but neither differentiates object focus contexts from broad focus ones.

In terms of the ToBI-style tonal inventory available for Georgian (Vicenik & Jun 2014), the F0 contours on narrowly focused subjects, H* La or LH* La, are qualitatively different from the one found on subjects in broad focus, L* Ha. The realization of verbs in the two contexts is also different: H* (H)+L L% vs. L* L%, respectively. As noted by Vicenik & Jun (2014), the falling contour, H* La, is indicative of a close semantic/syntactic connection between an AP and the following one. This is manifested in the APs forming an ip, in focus contexts as well as in larger syntactic constituents more generally. This means that subject focus contexts in Georgian are characterized by a closer connection with the following verb, with the $S_F V$ string integrated into a single ip.

Given the variability in pitch accents on focused subjects (H* or LH*), the main marker of focus is the La boundary tone. This is consistent with the 'phrase language' analysis of Georgian – i.e., a language that uses prosodic boundaries as opposed to pitch accents to signal information structure. It is unusual, though, that instead of marking focus by adding or deleting a prosodic boundary (cf. Büring 2009), Georgian does so by reversing the value of the boundary tone from Ha to La. Narrowly focused objects, in turn, are not differentiated from objects in broad focus, either by increased duration of the stressed syllable or by the F0 contour. The majority of focused objects in the study carried the L* Ha tonal contour, which is also the realization that objects receive in broad focus. This tonal realization signals a lack of close integration between the object and the verb, which is unexpected from the point of view of syntax-prosody mapping (e.g. Selkirk 2011), as discussed in more detail below.

Note that the object dataset was considerably smaller that the subject dataset, for two independent reasons: the fact that contrastive objects were realized postverbally and so excluded from the study, and the fact that the subject dataset also included intransitive verbs. Therefore, the fact that the statistical analysis did not reveal a significant difference between the realizations of narrowly focused objects and those in broad focus does not necessarily mean that the two are identical. In this sense, the qualitative analysis of the object data is very illustrative: it showed that, even in a limited sample, the majority of focused objects pattern tonally with the objects in broad focus. As the qualitative analysis also showed, the same was not the case for subjects.

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, both among the existing studies, as discussed in Section 2.4, and between the existing studies and the current one. 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.

The fact that the realization of narrow focus on the object, but not the subject, patterns together with that of broad focus is consistent with and reminiscent of the phenomenon of focus projection in pitch-accent languages: there, focused objects and those in broad focus have the same prosodic realization (carry the nuclear pitch accent), whereas the realization of subjects in the corresponding contexts differs (nuclear vs. prenuclear pitch accent). The current study demonstrates that even a language that does not rely on pitch accents in its expression of information structure, such as Georgian, marks focus on subjects and objects in such a way that is consistent with the phenomenon of focus projection, albeit by relying on different acoustic means: boundary tones and the duration of the stressed syllable. That is to say, Georgian uses these acoustic cues to represent the same prosodic contrasts that 'pitch accent' languages such as English rely on pitch accents for. The current study is alco consistent with the results for Hindi, another 'phrase language' of a similar profile, which, based on the available evidence, also exhibits a pattern of focus marking that is consistent with focus projection: there, subject foci carry a sharper rise in F0 than subjects in broad focus, but objects in the corresponding contexts receive the same tonal realization (Patil et al. 2008; Féry 2010; Féry, Pandey & Kentner 2016).

The results obtained for Georgian and Hindi would be hard to explain without reference to focus projection, even though their exact phonetic implementation is not predicted by focus projection theories. The fact that the Georgian and Hindi patterns exist, in turn, highlights the need to rethink the inventory of the phonetic and phonological phenomena that serve as the basis for the theoretical approaches to focus projection. In particular, since there is no evidence for sentential stress/nuclear pitch accent in Georgian, a focus-mapping principle cannot refer to it. Similarly, it cannot directly refer to phrasing rules, which are usually formulated in terms of alignment with a prosodic boundary (Féry 2013), because in the L* Ha-to-(L)H* La reversal that is used to mark focused subjects as compared to broad-focus subjects in Georgian, only the value of the boundary is affected.

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).

These results, however, do not necessarily show that the prosodic realization of broad focus and object focus are 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 associated with the expression of focus, but not the only ones. Other acoustic cues, such as the intensity and duration of words and the silences between them (Breen et al. 2010), the types and absolute value of other F0 targets (Skopeteas & Féry 2010), and the 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.

An important question that this paper did not consider is the interaction between prosodic and syntactic phrasing in narrow focus contexts. It seems counterintuitive that a narrowly focused subject has a closer connection with the following verb (the two form an ip), while a narrowly focused object does not, given that the object has a closer syntactic connection with the verb (structural sisterhood) than the subject: $[_{XP}OV]$ vs. $(O)_{AP}(V)_{AP}$, $[_{YP}S[_{XP}V]]$ vs. $((O)_{AP}(V)_{AP})_{ip}$. Such mismatches between prosodic and syntactic phrasing are not uncommon, and usually result from an independent prosodic constraint that outranks the syntax-prosody matching constraints (Selkirk 2011). In Georgian, this may be manifested as the requirement for the unmarked prosodic pattern of broad-focus declaratives to be a succession of APs. The same prosodic pattern is found in object-focus contexts. This parallelism is also found in 'pitch accent' languages – there, both broad-focus and object-focus contexts carry sentential stress on the direct object. Georgian, a 'phrase language', signals the same parallelism with the unmarked pattern of prosodic phrasing. Focused subjects in 'pitch accent' languages carry a nuclear pitch accent, but Georgian, instead, uses the acoustic means available to it: prosodic phrasing. To make a focused subject more prominent, it alters the unmarked pattern of prosodic phrasing – the easiest way to do that is to reverse the value of a prosodic boundary tone that follows the narrowly focused constituent. While establishing the general principles of syntax-prosody interface in Georgian is beyond the scope of the current paper, the hope is that, once they are established, they will accommodate the current results.

**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.

**Supplementary file:** Appendix. Test words used in the experiment.

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