

## Word stress in Georgian: going unnoticed but working hard

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Based on novel acoustic data, this paper shows that Georgian (Kartvelian) has **(A)** word stress, which is fixed on the initial syllable and primarily cued by syllable duration, and **(B)** phrasal intonational pitch targets that are located at the right edge of the prosodic word (penult and ultima) and serve as markers of particular discourse contexts. This paper argues that the combination of these two separate phenomena is what has led previous investigations to postulate two word stress loci in Georgian – initial and (ante)penultimate. The current findings also have broader theoretical implications, notably for the role of nuclear stress in signaling focus. Specifically, they align with the finding that, in addition to phrasal intonational targets serving as markers of focus in Georgian [1]–[3], the duration of the initial syllable increases in certain focal contexts [4]. We propose that word stress, therefore, plays an additional role in signaling focus in Georgian, in the form of nuclear stress (NS). Finding robust acoustic evidence for NS is unexpected, given that word stress is not phonologically ‘active’ [5] in Georgian, in that it does not play a role in any morphophonological processes, and speakers have difficulty identifying it. **Background.** Native speakers of Georgian have no consistent intuitions about word stress placement, nor are there minimal pairs based on stress. Authors who advocate for its existence acknowledge its acoustic weakness and uncertainty of their observations [6], [7]. According to them, stress targets the initial syllable in di- and trisyllabic words, while in longer words there is another stress-like target on the (ante)penultimate syllable [6], [8]–[10]. In longer words, either the initial syllable or the (ante)penult have been variably analyzed as carrying (primary) stress, with the other locus possibly carrying secondary stress. In contrast, other authors suggest that Georgian relies solely on phrasal pitch targets [11]–[14], like French [15] or Korean [16]. Existing instrumental studies, while limited in scope, reveal that the final two syllables of a word are the locus for phrasal intonational pitch targets [17]–[19]. Specifically, the ultima carries a boundary tone associated with the right edge of an Accentual Phrase (AP; each prosodic word typically forms an AP in Georgian [19]), which can be high (Ha) or low (La) [19]. The penult, in turn, has been found to carry a low pitch target on predicates in certain discourse contexts, such as polar and wh-questions and narrow focus contexts [3], [19], [2], which has been analyzed as a phrase accent L [2], [19]. **Data.** The data for the current study was obtained from four native speakers of Georgian (3 females: F1-F3; one male: M1; age range: 24-40), natives of Tbilisi residing in the US. The recordings were made using an Audio Technica 8022 microphone and a Scarlett 2i4 audio recorder in a soundproof booth at a 44100Hz sampling rate. The stimuli consisted of 1-6 syllable words,  $n=179$ , of CV structure (C = [+cons, +voice], V = any vowel), embedded in a carrier phrase (*Me sitq'va X davts'ere/vimghere/vixmare* ‘I wrote/used/sang word X’). Since there is no evidence that morphological structure plays a role in stress placement in Georgian [20], [21], both mono- and polymorphemic words were included. Each word was iterated 3 times (179 types x 3=537 tokens) by each speaker. Duration and mean F0 of each syllable were measured in Praat. After elimination of disfluent tokens, the resulting dataset consisted of 1966 word tokens (F1: 174 types, 515 tokens; F2: 179 types, 536 tokens; F3: 179 types, 536 tokens; M1: 127 types, 379 tokens). **Statistical analysis and results.** Statistical analysis of the duration and F0 data was based on generalized linear mixed-effects modeling using the `glmer` function in the `lme4` package for R. **(A)** For the duration data, Syllable Number (1<sup>st</sup>, 2<sup>nd</sup>, etc.) was taken as a fixed effect and Speaker and Token as random intercepts. The model was run separately for words of each syllable count in order to have a group-specific intercept for each group, to account for the effect of polysyllabic shortening [22]. There was a significant effect of Syllable Number ( $p<0.01$ ) in words of all syllable counts other than six-syllable ones, with the initial syllable having greater duration than all subsequent ones. Lack of significance in six-syllable words is likely due to a small amount of data (42 out of 1966 tokens). **(B)** A visual inspection

of the aggregated mean F0 data showed a consistent pitch pattern at the right edge of words of all syllable counts, with a gradual fall from the left edge to the penult and a sharp rise on the ultima. To test for its significance, 3-6 syllable words were coded for syllable number counting from the right (Right-Edge): Ultima, Penult, and Antepenult. Right-Edge position was taken as a fixed effect and Speaker and Token as random intercepts. There was a significant effect of Right-Edge ( $p < 0.01$ ) in words of all syllable counts (3-6). There was no consistent pitch pattern at the left edge of words in the dataset, so it was not tested statistically. **Discussion. (A)** Georgian has fixed initial stress that is cued by duration, based on the consistently greater duration of the initial syllable as compared to all subsequent ones. This effect cannot be easily explained as any phenomenon other than word stress (e.g., initial strengthening would only affect the realization consonant [23]; no known phrase-initial phenomena have such an effect [24]). **(B)** The ultima carries a high AP-boundary tone, as expected according to the literature. The penult carries a low pitch target, which is similar to the phrase accent L that has been described as appearing on the penult of predicates in questions and focal contexts. The current study also highlights the atypical distribution and problematic theoretical status of L. Specifically, phrase accents in English, Greek, Hungarian, etc. are known to occupy stretches of pitch [25], [26], whereas the Georgian L has a very precise distribution (invariably found the penultimate syllable). At the same time, it cannot be analyzed as part of a complex boundary tone, since Georgian allows complex (HL%) tones to be realized within the ultima. **Conclusions & implications.** The data reported here provides strong evidence for fixed initial stress in Georgian, cued by syllable duration. This is unexpected, given that Georgian speakers do not have strong intuitions about stress placement, and that Georgian stress is phonologically ‘inactive’. Furthermore, the current findings, taken together with other work on Georgian prosody [4], suggest that even phonologically ‘inactive’ stress may be used by speakers as an additional marker of focus. Like in many other OV languages, focus in Georgian is regularly placed into the immediately preverbal position [1]. The fact that this is also the position of NS has been used as motivation for preverbal placement of focus in other OV languages, such as Basque [27]. For Georgian, however, it has been suggested that lack of strong word stress causes the language to rely on other means, such as phrasal pitch targets, to signal focus [1]. The current study provides further support for the finding that both phrasal pitch targets and word stress are used in signaling focus in Georgian. **References** [1] Skopeteas, Féry. 2016 *Focus and intonation in Georgian: Constituent structure and prosodic realization*. Ms. [2] Borise. 2017. Prosody of Focus in a Language with a Fixed Focus Position: Evidence from Georgian. *Proc. WCCFL* 34, 89-96. [3] Bush. 1999. Georgian Yes-No Question Intonation. *Phonol. St. Cruz* 6, 1-11. [4] Borise. 2019. *The Syntax and Prosody of Focus in Georgian*. Harvard University PhD Thesis. [5] Hyman. 2012. Do all languages have word accent? *UC Berkeley Phonol. Lab Annu. Rep.*, 32-54. [6] Robins & Waterson. 1952. Notes on the Phonetics of the Georgian Word, *Bull. Sch. Orient. Afr. Stud.*, 55-72. [7] Zhghenti, 1959. Eksperimental'no-fonetičeskoje izučenje akcentuacii gruzinskogo jazyka [An experimental phonetic study of Georgian accentuation]. *Fon. Sb.* 1, 69-108. [8] Akhvlediani. 1949. *Zogadi ponet'ik'is sapudzvlebi* [Introduction to general phonetics]. Tbilisi: TSU. [9] Tschenkeli. 1958. *Einführung in die georgische Sprache* [An introduction to Georgian language]. Zürich: Amirani Verlag. [10] Gudava. 1969. Maxvilis adgilisatvis megrulši [Stress placement in Megrelian]. G. Akhvlediani Festschrift, 106-111. [11] Gorgadze. 1912. *Kartuli ts'q'obilsit'q'vaoba* [Georgian poetic writing]. Tbilisi. [12] Marr. 1925. *Grammatika drevneliteraturnogo gruzinskogo jazyka* [A grammar of the Old Georgian literary language]. Leningrad: Russian Academy of Sciences Publishing. [13] Zhghenti. 1963. *Kartuli enis rit'mik'ul-melodik'uri st'rukt'ura* [The rhythmic-melodic structure of Georgian language]. Tbilisi: Tsodna. [14] Alkhazishvili. 1959. Porjadok slov i intonacija v prostom povestvovatel'nom predloženie gruzinskogo jazyka [Word order and intonation in simple declarative sentences in Georgian], *Fon. Sb.* 1, 367-414. [15] Féry. 2001. Focus and phrasing in French. In *Festschrift for A. von Stechow*, 153-181. [16] Jun, 1993. The Phonetics & Phonology of Korean Prosody. PhD Thesis, OSU. [17] Zhghenti, Kartuli salit'erat'uro enis akcent'uacis dziritadi sak'itxebi [Main questions of accentuation in Georgian literary language], *IKE* 5, 125-163. [18] Selmer. 1935. Georgische Experimentalstudien [Experimental studies in Georgian], in *Avhandlingar utgitt av det Norske Videnskaps-Akademi*. [19] Vicenik & Jun. 2014. An autosegmental-metrical analysis of Georgian intonation. In *Prosodic Typology II*. Oxford: OUP. [20] Dirr. 1904. *Grammatik der modernen georgischen (grusinischen) Sprache*. Vienna: Hartleben. [21] Butskhrikidze. 2002. *The consonant phonotactics of Georgian*. Utrecht: LOT. [22] Lehiste. 1972. The timing of utterances and linguistic boundaries. *JASA* 51, 6B, 2018-2024. [23] Fougeron & Keating. 1997. Articulatory strengthening at edges of prosodic domains, *JASA* 101, 6, 3728-3740. [24] Byrd et al. 2006. How far, how long: On the temporal scope of prosodic boundary effects. *JASA* 120, 3, 1589-1599. [25] Grice et al. 2000. On the place of phrase accents in intonational phonology, *Phonology* 17, 2, 143-185. [26] Barnes et al. 2010. Turning points, tonal targets, and the English L- phrase accent. *Lang. Cogn. Process.* 25, 7-9, 982-1023. [27] Arregi. 2002. Focus on Basque movements. PhD Thesis, MIT, 2002.