ILLUSTRATIONS OF THE IPA

Armenian (Yerevan Eastern Armenian and Beirut Western Armenian)

Scott Seyfarth
University of California, San Diego
scottseyfarth@ucsd.edu

Hossep Dolatian
Stony Brook University
hossep.dolatian@alumni.stonybrook.edu

Peter Guekguezian
University of Rochester
p.a.guekguezian@gmail.com

Niamh Kelly
Newcastle University
niamh.kelly@newcastle.ac.uk

Tabita Toparlak
Yeditepe University
tabita.toparlak@std.yeditepe.edu.tr

Introduction

Armenian (հայերէն or հայերեն, /hɑjeˈren/, ISO 639-1 hy) comprises an independent branch of the Indo-European language family.[1] Its earliest attested ancestor is Classical Armenian in the fifth century CE (see Godel 1975; Thomson 1989; DeLisi 2015; Macak 2016). Modern Armenian is classified into two dialect families: Eastern Armenian (ISO 639-3 hye) and Western Armenian (ISO 639-3 hyw). Eastern Armenian is spoken in modern-day Armenia, and large speaker communities also exist in Georgia, Russia and Iran (shown in Figure 1). Western Armenian was historically spoken in the Ottoman Empire, but now includes varieties spoken throughout the Armenian diaspora in the Middle East, Europe, and the Americas (Donabédian 2018). There are substantial Western Armenian speaker communities in Turkey (Istanbul), Lebanon (Beirut), Syria (Aleppo, Damascus), California (Fresno, Los Angeles County), France (Marseilles), Australia (Sydney) and Argentina (Buenos Aires). There are also recent diaspora communities of Eastern Armenian speakers in California (Karapetian 2014), as well as communities of Western Armenian speakers in Armenia who

[1] Some scholars contend that Armenian should be grouped together within Indo-European with Hellenic, Indo-Aryan, or both (see Clackson 1994 for a critical review of arguments; Martirosyan 2014).

Journal of the International Phonetic Association (2024) 54/1

doi:10.1017/S0025100323000130
First published online 9 October 2023

Figure 1 (Colour online) Map of the distribution of Armenian in the Southern Caucasus (CC-BY-SA 4.0 figure created by Wikimedia Commons user GalaxMaps, retrieved June 20, 2021).

escaped the Armenian genocide during World War I, who repatriated after World War II, or who fled the ongoing Syrian civil war. UNESCO lists Western Armenian as an endangered language in Turkey, and there are significant language promotion efforts in many diaspora communities that are intended to combat declining use by speaker generations born in the Americas and Europe (Al-Bataineh 2015; Chahinian & Bakalian 2016).

Each of the two dialect families has dozens of documented varieties (Adjarian 1909; Vaux 1998:ch1.1; Sayeed & Vaux 2017).[2,3] Instrumental phonetic research on the Armenian languages began with Adjarian 1899, which first proposed the concept of voice onset time to differentiate plosive voicing contrasts prior to its independent development in Lisker & Abramson 1964 (Khachatryan & Airapetyan 1987; Braun 2013). Xačatryan 1988 provides a detailed phonetic description of Eastern Armenian including acoustic measurements, palatography, tracings of mid-sagittal X-ray images of the vocal tract, and discussion of perceptual experiments. Khachatryan & Ayrapetyan 1971 report instrumental articulatory and acoustic descriptions of Eastern Armenian consonants. Both works focus on a high-register literary variety spoken by students and broadcast announcers. Fairbanks 1948, Johnson 1954, and Dum-Tragut 2009 are general linguistic grammars of standardized Eastern and Western dialects with substantial phonetic material, and Allen 1950 is a phonetic description of an Eastern Armenian speaker who had grown up in Iran.

[2] Adjarian 1909 and Aṭ̣aṙean 1926 comprise major dialectological and etymological references. For phonological and phonetic descriptions of other dialects written in English, see Khachaturian 1983, 1992; Greppin & Khachaturian 1986; Weitenberg 2002, 2017; Chirikba 2008; Schirru 2011, 2012; Martirosyan 2019; Baronian 2017; and work by Vaux (1998, i.a.).

[3] Author names are transliterated for works that were not published in the Latin script. Armenian names are transliterated using the ISO-9985 standard unless another transliterated Latin form was printed in the original publication. If a new ISO-9985 transliteration is used, the original spelling is included in the references section in square brackets.

https://doi.org/10.1017/S0025100323000130 Published online by Cambridge University Press

This illustration describes and compares the phonetics of two Armenian varieties: the Western variety spoken in Beirut, and the Eastern variety spoken in modern Yerevan and surrounding regions. The Beirut Western Armenian recordings were made by Hossep Dolatian (HD), a twenty-eight-year-old male speaker who was born in Beirut, Lebanon. He grew up in an Armenian-speaking community in Beirut and moved to the USA at the age of twenty-one. In addition to Western Armenian, he is fluent in English and has advanced proficiency in Arabic. His recordings were made with a stand-mounted MXL 770 microphone in a quiet environment. The Yerevan Eastern Armenian recordings were made by Susanna Khechoyan (SK), a fifty-six-year-old female speaker who was born in Artsvashen. She lived in Yerevan, Armenia from the age of six up to thirty-eight, and has lived in Los Angeles since then. She grew up speaking Eastern Armenian and continues to use it daily, and also speaks English fluently and has advanced proficiency in Russian. She taught Armenian as an elementary school teacher in Armenia for twelve years. Her recordings were made with a head-mounted Shure SM10A microphone in a sound isolation booth.

One coauthor, Tabita Toparlak (TT), grew up speaking Western Armenian and Turkish in Istanbul and also speaks French and English. Another coauthor, Peter Guekguezian (PG), identifies as a heritage speaker of Western Armenian with intermediate proficiency and grew up in the western USA speaking English as a first language. When we had metalinguistic questions about pronunciation, we also discussed them with several other Eastern and Western Armenian speakers that we knew in the USA, Canada, Istanbul, Yerevan and Beirut. The speakers who contributed recordings, judgments and commentary to this illustration are Armenian language instructors, linguistics researchers and educated professionals in other fields. As such, the Armenian varieties that we describe are high-register varieties. In particular, HD describes the variety in his contributed recordings as a standardized variety of Western Armenian as it is spoken in Beirut,[4] though his illustrated plosive pronunciations differ from more Arabic-dominant Western Armenian speakers still living in Beirut (discussed in **Beirut Armenian plosives**; see also Godson 2004; Kelly & Keshishian 2021; Tahtadjian 2021).

Consonants

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Palatal	Velar	Uvular	Glottal
Plosive	(p) p^h b		(t) t^h d				(k) k^h g		
Affricate			t͡s (t͡s^h) d͡z		t͡ʃ (t͡ʃ^h) d͡ʒ				
Nasal	m			n					
Trill				(r)					
Tap				ɾ					
Fricative		f v		s z	ʃ ʒ			χ ʁ	h
Approximant						j			
Lateral approximant				l					

[4] One exception is the progressive form /goɾ/ կոր in HD's recording of the North Wind and Sun (**Transcription of recorded passage**). This form is used in colloquial speech but proscribed in writing due to perceived influence from Turkish.

https://doi.org/10.1017/S0025100323000130 Published online by Cambridge University Press

The consonant inventory of the two Armenian varieties is given in the '**Consonants**' table above (see also Xačatryan 1988: 85; Vaux 1998: 16; Dum-Tragut, 2009: 13). Consonants in parentheses are found only in Yerevan Armenian. Yerevan Armenian and most Eastern varieties have a three-way laryngeal contrast for plosives and affricates (voiced, voiceless unaspirated and voiceless aspirated), while Beirut Armenian and most Western varieties make only a two-way distinction for these sounds (Vaux 1998: 7ff). Yerevan Armenian also has a phonemic trill, which is merged to the tap in Beirut Armenian.[5]

The Yerevan voiceless unaspirated plosives correspond with Beirut voiced ones, and the Yerevan voiced plosives correspond with Beirut aspirated ones (Baronian 2017). These correspondences are shown below for labial plosives in word-initial position. The orthography is given with the Soviet-era reformed system that is currently used in Armenia. In cases where this differs from the Classical orthography used by the Western Armenian diaspora, the Classical orthography is listed second.

Plosive correspondences in Yerevan and Beirut Armenian

Yerevan	**Beirut**		
ˈpɑɾ	ˈbɑɾ	պար	'dance'
ˈpʰɑk	ˈpʰɑg	փակ	'closed'
ˈbɑr	ˈpʰɑɾ	բառ	'word'

Like the plosives, the Yerevan voiceless unaspirated affricates correspond with Beirut voiced ones, but Yerevan voiceless aspirated and voiced affricates are both voiceless unaspirated in HD's Beirut Armenian variety. These correspondences are shown below for dental affricates in word-initial position.

Affricate correspondences in Yerevan and Beirut Armenian

Yerevan	**Beirut**		
ˈt͡sɑr	ˈd͡zɑr	ծառ	'tree'
ˈt͡sʰɑv	ˈt͡sɑv	ցավ, ցաւ	'pain'
ˈd͡zɑkʰ	ˈt͡sɑkʰ	ձագ	'young of an animal'

Plosives and affricates in recent loanwords do not respect these correspondences. In recent loanwords, these sounds are typically borrowed using the same pronunciation (voicing or aspiration) in both dialects, and are spelled differently in each dialect. For example, the borrowed city name /bejˈrutʰ/ 'Beirut' has a word-initial voiced plosive in both Yerevan and Beirut Armenian, but is spelled Բեյրութ in the Eastern orthography and Պէյրութ in the Western orthography. The accompanying recording of the Yerevan form was contributed

[5] The Armenian tap has a fricative variant in syllable codas, discussed in **Sonorants**. We chose the tap as the basic symbol because (i) the tap has a wider distribution, (ii) a tap spirantization process seems more phonetically natural than a fricative tapping process, (iii) coauthor PG reports that some Armenian varieties do not have a fricative variant, and (iv) the tap follows the convention in Armenian linguistics literature.

https://doi.org/10.1017/S0025100323000130 Published online by Cambridge University Press

by Vahagn Petrosyan (VP), a thirty-five-year-old male speaker who has lived in Yerevan since birth.

The consonant inventory is illustrated in the table below. While almost all of the words in the table exist in both dialects, the dialectal forms that do not illustrate the target sound in each row are omitted.

	Yerevan	**Beirut**		
p	ˈpɑɾ		պար	‘dance’
pʰ	ˈpʰɑk	ˈpʰɑg	փակ	‘closed’
b	ˈbɑr		բառ	‘word’
		ˈbɑɾ	պար	‘dance’
t	ˈtɑr		տառ	‘alphabet letter, character’
tʰ	ˈtʰɑg	ˈtʰɑkʰ	թագ	‘crown’
d	ˈdɑɾ		դար	‘century’
		ˈdɑɾ	տառ	‘alphabet letter, character’
k	ˈkɑɾ		կար	‘seam’
kʰ	ˈkʰɑɾ	ˈkʰɑɾ	քար	‘rock’
g	ˈgɑh		գահ	‘throne’
		ˈgɑɾ	կար	‘seam’
t͡s	ˈt͡sɑr		ծառ	‘tree’
		ˈt͡sɑv	ցաւ	‘pain’
t͡sʰ	ˈt͡sʰɑv		ցավ	‘pain’
d͡z	ˈd͡zɑkʰ		ձագ	‘young of an animal’
		ˈd͡zɑɾ	ծառ	‘tree’
t͡ʃ	ˈt͡ʃɑʃ		ճաշ	‘food’
		ˈt͡ʃɑɾ	չար	‘bad’
t͡ʃʰ	ˈt͡ʃʰɑɾ		չար	‘bad’
d͡ʒ	ˈd͡ʒɑŋkʰ		ջանք	‘effort’
		ˈd͡ʒɑʃ	ճաշ	‘food’
m	ˈmɑh	ˈmɑh	մահ	‘death’
n	ˈnɑv	ˈnɑv	նավ, նաւ	‘boat’
r	rɑmkɑˈkɑn		ռամկական	‘democratic’

https://doi.org/10.1017/S0025100323000130 Published online by Cambridge University Press

ɾ	ɾɑˈfi	ɾɑˈfi	Ռաֆֆի	‘Raffi (name)’
f	fɑtʰiˈmɑ	fɑtʰiˈmɑ	Ֆաթիմա	‘Fatima (name)’
v	ˈvɑɾ	ˈvɑɾ	վար	‘down’
s	ˈsɑr	ˈsɑɾ	սառ	‘ice’
z	ˈzɑt	ˈzɑd	զատ	‘separate’
ʃ	ˈʃɑh	ˈʃɑh	շահ	‘gain’
ʒ	ˈʒɑm	ˈʒɑm	ժամ	‘hour’
χ	ˈχɑt͡ʃʰ	ˈχɑt͡ʃ	խաչ	‘cross’
ʁ	ʁɑzɑˈɾos	ʁɑzɑˈɾos	Ղազարոս	‘Lazarus (name)’
h	ˈhɑm	ˈhɑm	համ	‘taste’
j	jɑvˈɾik	jɑvˈɾig	յավրիկ, եաւրիկ	‘dear person’
	ˈjet	ˈjed	ետ	‘backward’
l	ˈlɑv	ˈlɑv	լավ, լաւ	‘good’

Yerevan Armenian plosives

Yerevan Armenian has three labial, three dental, and three velar plosives that contrast in both onset and coda position:

ˈbok բոկ ‘barefoot (archaic)’	ˈpok պոկ ‘reed for music’	ˈpʰok փոկ ‘band, strap’
ˈdɑsə դասը ‘lesson (DEF)’	ˈtɑsə տասը ‘ten’	ˈtʰɑsə թասը ‘cup (DEF)’
gɑˈɾi գարի ‘barley’	kɑˈɾi կարի ‘seam (DAT.GEN)’	kʰɑˈɾi քարի ‘rock (DAT.GEN)’
ˈʃtɑb շտաբ ‘headquarters’	ˈʃtɑp շտապ ‘urgent’	ˈtɑpʰ տափ ‘plain’
ˈkod կոդ ‘code’	ˈkot կոտ ‘wooden vessel’	ˈkotʰ կոթ ‘handle’
ˈtʰɑg թագ ‘crown’	ˈtʰɑk թակ ‘mallet’	ˈtʰɑkʰ թաք ‘odd’

With respect to their distribution, final /b/ is very rare and attested mostly in loanwords, such as /ˈʃtɑb/ ‘headquarters’ borrowed from Russian штаб (originally German *Stab*).[6] The Armenian orthography does not reliably index final voicing due to diachronic change and perhaps cross-dialectal borrowings.[7] For example, the form ձագ ‘young of an animal’ (in table

[6] See also **Syllable structure** on the pronunciation of sibilant-initial consonant clusters in Yerevan Eastern compared to Beirut Western Armenian. Prothetic schwa is variable in Yerevan Armenian and may be uncommon especially in Russian loanwords such as շտաբ ‘headquarters’. This word is not used in Beirut Armenian but HD suggests that it might be pronounced /əʃˈtʰɑpʰ/ with an invariable initial schwa.

[7] The Armenian alphabet was first developed around the fifth century CE. Although it has been modified since then, the spelling of Armenian words does not perfectly correspond with modern pronunciation, particularly with regard to obstruent voicing and aspiration (Johnson 1954: 5; Vaux 1998: 17–18, 237; Dum-Tragut 2009: 24–27).

https://doi.org/10.1017/S0025100323000130 Published online by Cambridge University Press

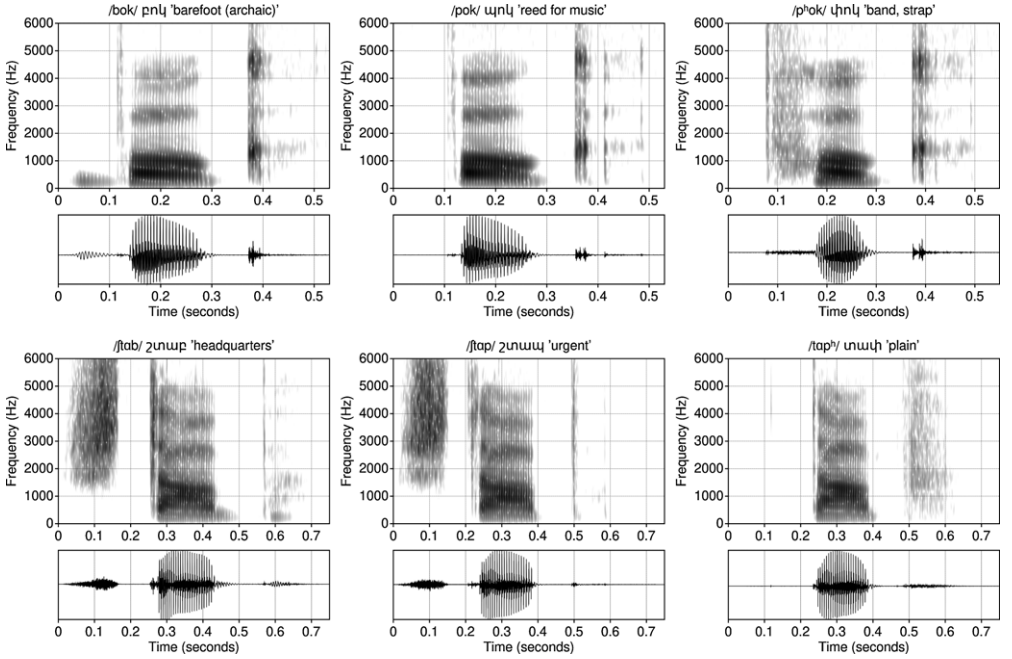


Figure 2 Yerevan Armenian labial plosives in words produced in isolation. Upper row shows voiced, voiceless unaspirated, and voiceless aspirated plosives in word-initial position; lower row shows the same plosives in word-final position. All spectrograms are calculated with a 5-millisecond Gaussian window and a 2-millisecond window advance.

Affricate correspondences in Yerevan and Beirut Armenian) is written with final <q>. This letter typically corresponds to /g/ in Yerevan Armenian and /kʰ/ in Beirut Armenian, but this word is pronounced /ˈd͡zɑkʰ/ in Yerevan and /ˈt͡sɑkʰ/ in Beirut with the same final voiceless aspirated plosive in both varieties.

Some Yerevan Armenian speakers report a (lamino-)alveolar pronunciation of the dental /d, t, tʰ/ plosives, such as for the accompanying recording of /tʰəˈtʰu/ թթու ‘sour’ contributed by speaker VP. The velar /k/ plosive can be placed farther back toward [k̠, q]. This is illustrated in the accompanying recording of /ˈkoʁ/ կող ‘rib’ pronounced [k̠oʁ], which was contributed by a twenty-year-old female speaker of Eastern Armenian who grew up in Yerevan. This pronunciation is optional, and the X-ray tracings in Xačatryan 1988 show a clearly velar [k] between two /ɑ/ vowels.

Figure 2 shows spectrograms and waveforms of SK’s recordings of the labial plosives in word-initial (upper row) and word-final (lower row) positions. Figure 3 shows the mean and standard deviation of closure duration, closure voicing duration, and aspiration duration for all nine plosives in each position. These measurements are from eight speakers who grew up in Yerevan, each reading aloud 155 unique words in a carrier phrase with nuclear accent (collected in Seyfarth & Garellek 2018).

The voiced series /b, d, g/ typically has breathy voicing during the closure and could be closely transcribed as [b̤, d̤, g̤] (Macak 2017; Seyfarth & Garellek 2018). Seyfarth & Garellek (2018) report that 15% of word-initial /b, d, g/ tokens lack voicing during the closure; the accompanying recording of /gɑˈri/ գարի ‘barley’ contributed by SK is an example of such a token. In syllable onset position, the breathy voice quality can be measured in the initial portion of the following vowel as a louder first harmonic (2–3 dB) and lower cepstral peak prominence (1 dB) relative to the voiceless unaspirated plosives (Schirru 2012; Seyfarth & Garellek 2018). These measures index a more open glottis (Klatt & Klatt 1990;

https://doi.org/10.1017/S0025100323000130 Published online by Cambridge University Press

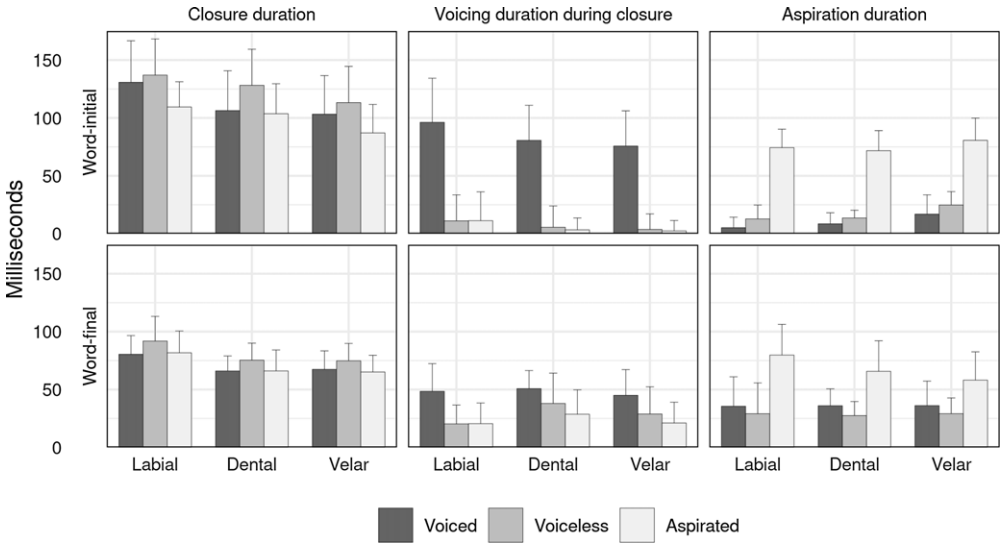


Figure 3 Mean (filled bars) and standard deviation (whiskers) for closure duration, closure voicing duration, and aspiration duration for the nine Yerevan Armenian plosives in word-initial and word-final position, based on measurements from eight speakers in Seyfarth & Garellek 2018. Each bar includes between 32–176 tokens.

Chai & Garellek 2022) with more noise during the vowel transition (Hillenbrand, Cleveland & Erikson 1994), respectively.

Unlike the voiced aspirated consonants found in many South Asian and other languages (Berkson 2013; Namboodiripad & Garellek 2017; Esposito & Khan 2020; Faytak, Steffman & Tankou 2020), Yerevan Armenian breathy-voiced plosives typically lack noisy post-aspiration, at least in onset position (Khachatryan & Airapetyan 1987; Xačatryan 1988; Seyfarth & Garellek 2018; see Figure 2 and cf. Figures 2, 14 in Seyfarth & Garellek 2018). However, Khachaturian (1983, 1992) indicates that speakers of some other regional Eastern Armenian varieties produce more extended and audible aspiration after voiced plosive onsets than in the Yerevan variety. In syllable coda position, voiced plosives more often have short post-aspiration (< 50 ms in citation forms) in addition to reliable closure voicing and a longer nucleus vowel (Adjarian 1899; Lisker & Abramson 1964; Xačatryan 1988; Hacopian 2003; Seyfarth & Garellek 2018).

The series /p, t, k/ is voiceless without aspiration in both onset and coda position. Relative to the other two series, these plosives are characterized by a longer voiceless closure (Xačatryan 1988; Seyfarth & Garellek 2018). This series is sometimes reported to be associated with glottal constriction or a glottalic airstream (e.g., Allen 1950; Fleming 2000; Ladefoged & Maddieson 1996; Schirru 2012). The acoustic and articulatory evidence for this in contemporary Armenian varieties is mixed (see Amirian 2017; Toparlak 2017; Seyfarth & Garellek 2018). The word-final plosives in the accompanying recordings of /ˈʃtɑp/ շտապ ‘urgent’, /ˈkot/ կոն ‘wooden vessel’, and /ˈtʰɑk/ թակ ‘mallet’ are ejectives. It seems likely that some Eastern Armenian speakers may constrict or tense the vocal folds in order to inhibit airflow and maintain a longer voiceless closure, but that this articulation is not universal or obligatory for these sounds in this Eastern variety (Allen 1950: 188; Hacopian 2003: 54–55; Khachatrian 1996; Dum-Tragut 2009: 17–18; Toparlak 2017; Seyfarth & Garellek 2018 §4.1.2). As these words were recorded in minimal triplets alongside aspirated and voiced final plosives, they probably have contrastive focus. In other languages, audible word-final glottalization can be a side-effect of overlapping constrictions or can be used to enhance a voicing contrast (e.g., Germanic: Kohler 1994; Gordeeva & Scobbie 2013; McCarthy & Stuart-Smith 2013; Seyfarth & Garellek 2020; Brandt & Simpson 2021), which may also be the case here.

https://doi.org/10.1017/S0025100323000130 Published online by Cambridge University Press

The other voiceless series /pʰ, tʰ, kʰ/ is defined by post-aspiration in both syllable onset and coda positions, along with a correspondingly higher f0 during the initial portion of a following vowel in onset position (Allen 1950; Lisker & Abramson 1964; Khachatryan & Airapetyan 1987; Xačatryan 1988; Hacopian 2003; Schirru 2012; Toparlak 2017; Seyfarth & Garellek 2018). Yerevan Armenian is thus typologically rare in that it maintains a three-way voicing and aspiration contrast in both initial and final position using virtually the same acoustic cues in both positions (Hacopian 2003).

Beirut Armenian plosives

Western Armenian is described as having a two-way contrast between voiceless aspirated and voiced plosives (Fairbanks 1948; Vaux 1998; Baronian 2017).

ˈbaɾ պար 'dance'	ˈpʰag բակ 'yard'
daˈpʰad տաբատ 'pants'	tʰaˈnag դանակ 'knife'
ˈgaɾ կար 'seam'	ˈkʰaɾ քար 'rock'

Among Western Armenian speakers in Anglophone Canada and the USA, the voiceless plosives are aspirated, and the other plosive series varies phonetically between voiceless unaspirated and voiced (Kelly & Keshishian 2021; Tahtadjian & Kochetev 2021; Tahtadjian 2021; also compare to Balabanian 2020 with Armenian-English-French speakers in Quebec). This pattern is similar to North American English, though closure voicing may be somewhat more common in North American Western Armenian than English (compare to e.g., Lisker & Abramson 1964: 395; Schertz 2013: 254; Davidson 2016).

Among speakers of Western Armenian in Lebanon, the plosive voicing contrast is between voiceless unaspirated and voiced plosives (Kelly & Keshishian 2019; Tahtadjian 2021). This pattern corresponds to what has been described for Lebanese Arabic stops (Bellem 2014; Al-Tamimi & Khattab 2018). As Lebanese Arabic was the most dominant non-Armenian language for the speakers in Kelly & Keshishian 2019 and Tahtadjian 2021, it is possible that the phonetic contrast used by these speakers is influenced by their multilingualism.

HD grew up in Beirut, Lebanon but has lived in the USA for the past eight years at the time of recording. His Armenian plosives currently follow the Western Armenian pattern reported for speakers in Anglophone Canada and the USA: one series is voiceless aspirated in most environments while the other can be either voiced or plain voiceless. Figure 4 shows the mean and standard deviation of closure duration, closure voicing duration, and aspiration duration for all six plosives in prevocalic word-initial (upper row) and postvocalic word-final (lower row) position. In this intervocalic context, HD consistently produces the voiced series with closure voicing, but in other environments he often produces these plosives as voiceless unaspirated, especially in utterance-initial position. For example, the initial sound of the accompanying recording of /bɑɾdkʰ/ [pɑ̰ɾ̥tkʰ] պարտք 'debt' is voiceless (see also Figure 9 in **Syllable structure**).

In HD's Beirut Armenian variety, the voiceless plosives are not aspirated adjacent to voiceless sibilants (see Fairbanks 1948: 4–5), with word-medial examples shown below:

[apˈse]	ափսէ	'tray'
[əʃˈtapʰ]	շտաբ	'headquarters' (see footnote 6)
[jeɾekʃapˈtʰi]	երեքշաբթի	'Tuesday'
[pʰa͡tspeˈɾan]	բացբերան	'babbler'

https://doi.org/10.1017/S0025100323000130 Published online by Cambridge University Press

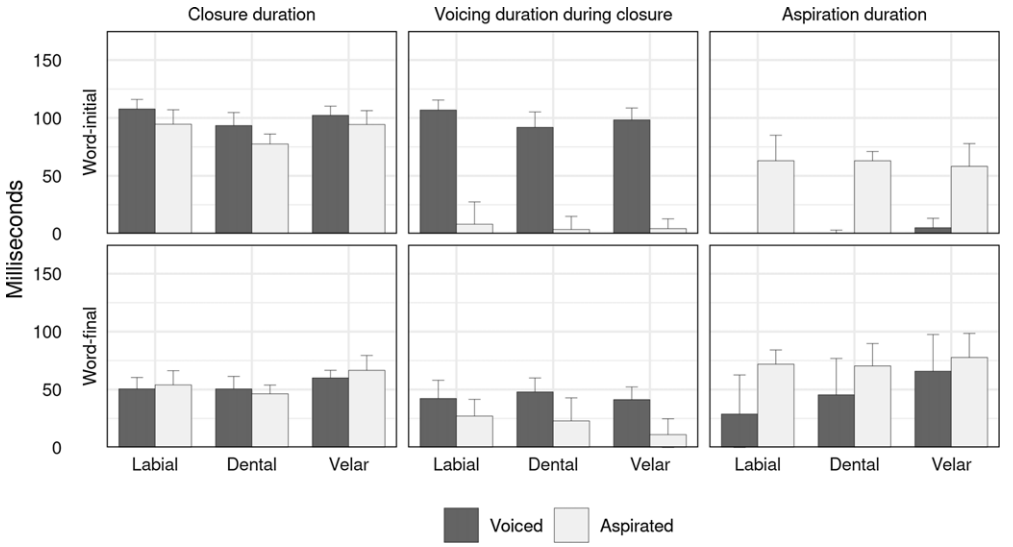


Figure 4 Mean (filled bars) and standard deviation (whiskers) for closure duration, closure voicing duration, and aspiration duration for the six Beirut Armenian plosives in word-initial and word-final position. Measurements are from recordings of HD reading aloud ten unique words containing each plosive twice in one or two carrier phrases, collected and annotated using the procedure in Seyfarth & Garellek 2018. Each bar includes twenty tokens.

Word-final voiceless plosives are also unaspirated after voiceless sibilants, though *utterance*-final plosives are typically still aspirated. This is illustrated in utterance-final [ˈɑskʰ] ɯqq ‘nation’ compared to utterance-medial [mɑrˈjɑmə ˈɑsk əˈsɑv] Մարիամը «ɯqq» ըսաւ ‘Mariam said “nation”.’

Aspiration is variable in sequences of two plosives, where the first plosive is often unaspirated even when it has a definite release, such as in /jɛɾekʰʃɑpʰˈtʰi/ [jɛɾekʃɑpˈtʰi] երեքշաբթի ‘Tuesday’ in the table above (see Fairbanks 1948: 4–5). However, when a sequence of two voiceless plosives has the same place of articulation, it is consistently pronounced as a long aspirated plosive and not rearticulated. This is illustrated in the form /pʰɑtʰtʰəˈvɑd͡z/ [pʰɑtʰːəˈvɑd͡z] փաթթուած ‘wrapped’ as compared with the borrowing /pʰɑtʰɑˈtʰes/ [pʰɑtʰɑˈtʰes] փաթաթէս ‘potato’.

With respect to place of articulation, we perceived the Western Armenian speakers in Lebanon recorded by Kelly & Keshishian (2021) as using a dental articulation for the coronal plosives. Impressionistically, some of the speakers in the USA pronounced dental plosives while others pronounced alveolar ones.

Affricates and fricatives

Yerevan Armenian has a three-way voicing contrast for both dental and postalveolar affricates, including voiced, voiceless unaspirated and voiceless aspirated affricates. Word-initial examples are given in the **Consonants** table above; word-final examples appear below:

	Yerevan	**Beirut**		
Dental	ˈχɑn͡ts	ˈχɑn͡dz	խանձ	‘bait’
	ˈt͡sʰɑn͡tsʰ	ˈt͡sɑn͡ts	ցանց	‘net’
	ˈtɑn͡dz	ˈdɑn͡ts	տանձ	‘pear’

https://doi.org/10.1017/S0025100323000130 Published online by Cambridge University Press

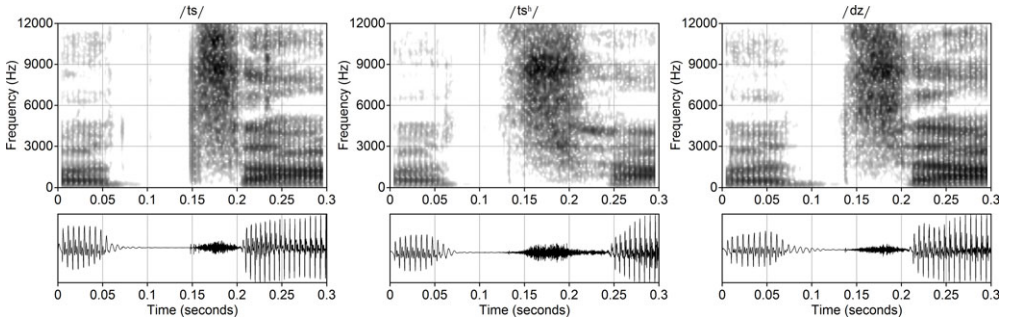


Figure 5 Yerevan Armenian dental affricates in a carrier phrase. Spectrograms and waveforms show a 300-millisecond excerpt beginning with a preceding /o/ vowel, then the target dental affricate indicated above the panel, and then the following /ɑ/ vowel.

Postalveolar	ˈhat͡ʃ	ˈhad͡ʒ	հաճ	'satisfied'
	ˈχat͡ʃʰ	ˈχat͡ʃ	խաչ	'cross'
	ˈkʰad͡ʒ	ˈkʰat͡ʃ	քաջ	'brave'

The word-final voiceless unaspirated affricates in Yerevan /ˈχant͡s/ խանձ 'bait' and /ˈhat͡ʃ/ հաճ 'satisfied' are audibly ejectives (see discussion in **Yerevan Armenian plosives**).

Figure 5 illustrates the closure, sibilant frication and aspiration intervals of the three dental affricates in a carrier phrase for Yerevan Armenian:

kʰo ˈt͡sɑr ɑselə	քո «ծառ» ասելը	'your (way of) saying "tree"'
kʰo ˈt͡sʰɑv ɑselə	քո «ցավ» ասելը	'your (way of) saying "pain"'
kʰo ˈd͡zɑkʰ ɑselə	քո «ձագ» ասելը	'your (way of) saying "young of an animal"'

Although all three affricates show some carry-over voicing from the preceding vowel, it is more robust for the voiced affricate in the right panel of Figure 5. The closure is longer in the unaspirated affricate than in the aspirated one (Khachatryan & Ayrapetyan 1971; Xačatryan 1988). For the aspirated affricate (center panel), the aspiration interval begins at the 0.2-second mark. There is not always such a clear boundary between the sibilant frication and the aspiration in the aspirated affricates. However, the interval of combined frication and aspiration in the aspirated affricates is reliably longer than the frication in the unaspirated affricates (Khachatryan & Ayrapetyan 1971; see Xačatryan 1988: 139 for perceptual evidence). Khachatryan & Airapetyan (1987) report substantially more overlap in the distributions of voicing lag time for the voiceless aspirated and unaspirated affricates than we observed, but they also show that the voiceless aspirated and unaspirated affricates can nevertheless be distinguished by a linear combination of voicing lag time and the intensity of noise above 2 kHz after the closure.

Beirut Armenian has a two-way voicing contrast for both affricate places. The broader Western affricate contrast is commonly reported as voiceless aspirated and voiced, matching the Western plosive contrast (Vaux 1998, in contrast with Fairbanks 1948). Because HD's voiceless affricate pronunciations are unaspirated (shown in Figure 6), which is different than his plosive pronunciations, we categorize the voiceless affricates in his Western variety as /t͡s,

https://doi.org/10.1017/S0025100323000130 Published online by Cambridge University Press

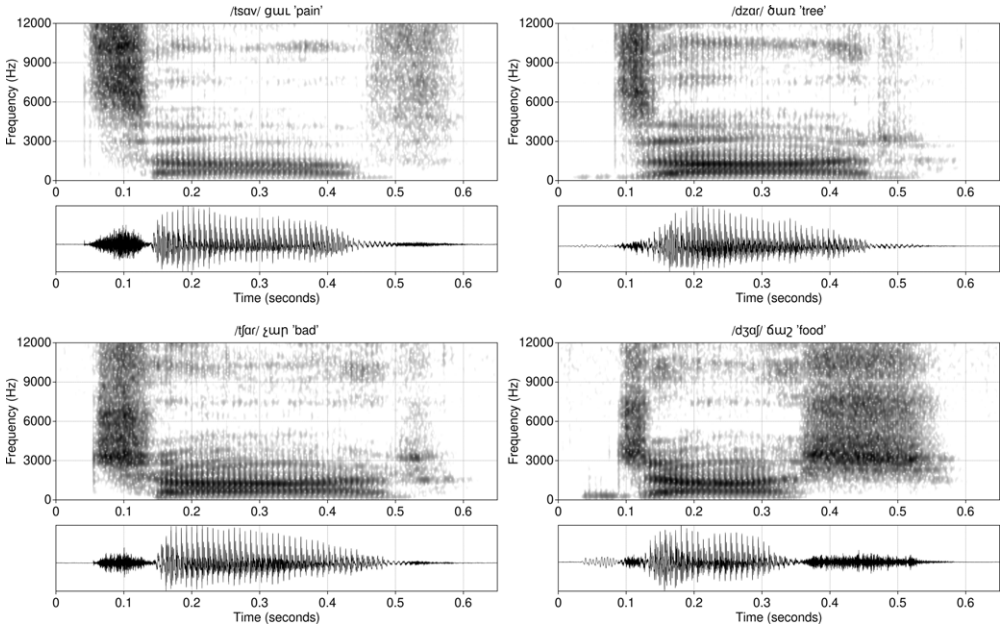


Figure 6 Beirut Armenian affricates in words produced in isolation.

t͡ʃ/. Kelly & Keshishian (2019) also found that the voiceless affricate series is unaspirated for Lebanese Western speakers more broadly.

The dental series /d͡z, t͡s, t͡sʰ/ (/d͡z, t͡s/ for Beirut Armenian) may be lamino-alveolar apico-dental, with the tongue tip incidentally contacting the upper teeth. Based on palatography and X-ray images, Xačatryan (1988: 170) and Khachatryan & Ayrapetyan (1971: 296) describe these affricates as apical and post-dental, having gingival contact which differs from the greater dental contact in the plosives. Other descriptions have labeled these affricates as alveolar (Fairbanks 1948; Dum-Tragut 2009) and dental (Allen 1950; Johnson 1954). Our speakers express disagreement and uncertainty as to whether the tongue usually makes contact with the back of the upper teeth. The X-ray tracings in Xačatryan 1988 do show dental contact during the affricate closure (Figures 29–30). In recordings of connected speech, we perceive these sounds as having a dental closure after vowels when the frication release is removed from the audio.

The sibilants /s, z/ are described as 'dental' (Allen 1950; Khachatryan & Ayrapetyan 1971), 'post-dental' (Johnson 1954: 26; Xačatryan 1988: 85, 110), or 'alveolar' (Fairbanks 1948; Dum-Tragut 2009). SK, TT, and a Yerevan speaker report that the tongue tip is held behind the upper teeth, while HD and three Yerevan speakers report that the tongue tip touches the back of the *lower* teeth during these sounds. The sagittal X-ray tracings for /s, z/ in Xačatryan 1988 show a lamino-alveolar place of articulation with an inconsistent tongue tip position (Figures 23–24, as described on p. 178).

Figure 7 shows the log power spectral density for the voiceless fricatives and affricates for SK and HD. For /s/ and /t͡s/, SK has a high spectral peak at roughly 9 kHz (as in Khachatryan & Ayrapetyan 1971: 302; Xačatryan 1988: 178) which may index an apico-dental articulation (cf. lower peak for alveolar /s/ in Jongman, Wayland, & Wong 2000; Maniwa, Jongman, & Wade 2009). HD has a lower spectral peak for /s/ around 7 kHz, consistent with a lamino-alveolar but not apico-dental articulation. For /ʃ/ and /t͡ʃ/, both speakers have a relatively low peak around 3 kHz (as in Khachatryan & Ayrapetyan 1971: 304), and SK has a second mode at 9 kHz.

https://doi.org/10.1017/S0025100323000130 Published online by Cambridge University Press

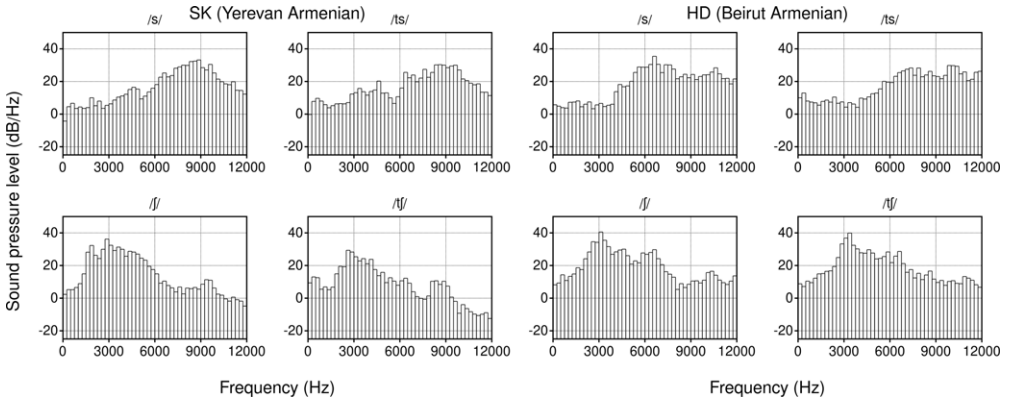


Figure 7 Log power spectral density for /s/, /ʃ/, /t͡s/, and /t͡ʃ/ for speakers SK (Yerevan Armenian) and HD (Beirut Armenian). Each panel shows a long-term average spectrum which is calculated over the center 30 milliseconds of sibilant energy (for fricatives), or over the 30 milliseconds immediately following the closure release (for affricates), omitting the release transient if one is present. Measurements are taken from the illustrative recordings accompanying the consonant table above.

The postalveolar sibilants /ʃ, ʒ/ are also called 'pre-palatal' (Fairbanks 1948; Xačatryan 1988: 85), 'palato-alveolar' (Allen 1950; Khachatryan & Ayrapetyan 1971), or 'mid-palatal' (Johnson 1954). The X-rays in Xačatryan (1988: Figures 25–26, 32–34) show a laminal postalveolar constriction for /ʃ, ʒ/ and during the frication release of /d͡ʒ, t͡ʃ, t͡ʃʰ/. A laminal postalveolar constriction is consistent with the low spectral peak in the lower panels of Figure 7. Allen (1950: 188) and Khachatryan & Ayrapetyan (1971: 303) report that these are accompanied by lip-rounding. SK employs lip-rounding for /ʃ, ʒ/ while HD does not.

Voiceless labiodental /f/ (grapheme ֆ) is rare and occurs primarily in borrowed words, though many borrowings date to the twelfth century or earlier. Dum-Tragut (2009: 20) transcribes the voiced labiodental /v/ as the approximant [ʋ] when it occurs in word-initial position before /o/, as well as in medial and final position after /e/. Our speakers have the voiced fricative [v] in all positions. Xačatryan (1988: 176) measures a wider labiodental constriction for /ɑvɑ/ compared to /ɑfɑ/ from X-ray tracings (ibid., Figures 21–22). This may be a categorical manner difference ([f] vs. [ʋ]), or the wider /v/ constriction may simply facilitate voicing, which is unnecessary for voiceless /f/.

The back continuants (/χ, ʁ/ in the table above) vary between the uvular and velar places. Previous work describes these as 'velar' (Fairbanks 1948; Johnson 1954), 'post-velar' (Johnson 1954; Khachatryan & Ayrapetyan 1971), and 'uvular' (Vaux 1998; Dum-Tragut 2009), while Allen (1950) along with HD and PG report that the voiceless fricative is roughly velar while its voiced counterpart is roughly uvular. Xačatryan (1988: 85, 181) uses the term փափկաքմային 'of the soft palate' and provides X-ray tracings (Figures 27–28) that show a uvular constriction for both /χ, ʁ/ between two /ɑ/ vowels.

The examples listed below illustrate the two sounds adjacent to the near-back vowel /ɑ/ and the front vowel /e/ in syllable onsets and codas:

	Yerevan	**Beirut**		
Onset, /ɑ/	ˈχɑt͡ʃʰ	ˈχɑt͡ʃ	խաչ	'cross'
	ʁɑzɑˈros	ʁɑzɑˈros	Ղազարոս	'Lazarus (name)'

https://doi.org/10.1017/S0025100323000130 Published online by Cambridge University Press

Coda, /ɑ/	ˈvɑχ	ˈvɑχ	վախ	‘fear’
	ˈvɑʁ	ˈvɑʁ	վաղ	‘early’
Onset, /e/	χenˈtʰuk	χenˈtʰug	խենթուկ	‘foolish’
	ʁenˈd͡ʒɑk	ʁenˈt͡ʃɑg	ղենջակ	‘apron’
Coda, /e/	ˈt͡sʰeχ	ˈt͡seχ	ցեխ	‘mud’
	ˈt͡sʰeʁ	ˈt͡seʁ	ցեղ	‘race, tribe’

The voiced back continuant varies between the fricative [ʁ] and the approximant [ʁ̞]. The preceding Beirut Armenian recording of /ʁɑzɑˈɾos/ Ղազարոս ‘Lazarus (name)’, as well as the accompanying recording of Yerevan Armenian /səˈʁel/ սղել ‘to increase a price’ contain approximant realizations.

Obstruent cluster devoicing

All obstruents participate in a regressive devoicing pattern when a cluster of two obstruents is formed by compounding, suffixation, or other morphological alternations. In both dialects, the first obstruent is devoiced if the second obstruent is voiceless (see Xačatryan 1988: 104; Vaux 1998: 17–18). For example, the suffix /-t͡sʰi/ (Yerevan), /-t͡si/ (Beirut) -ցի is used to form demonyms (rows 1–2 of the table below). When this voiceless-initial suffix follows a word such as /pʰɑˈɾiz/ Փարիզ ‘Paris’ that has a final voiced obstruent, the stem-final obstruent is voiceless (rows 3–4). The Yerevan Armenian recordings in this subsection were contributed by VP.

Yerevan	**Beirut**		
[ɑmeriˈkɑ]	[ɑmeriˈgɑ]	Ամերիկա	‘America’
[ɑmeɾikɑˈt͡sʰi]	[ɑmeɾigɑˈt͡si]	ամերիկացի	‘American’
[pʰɑˈɾiz]	[pʰɑˈɾiz]	Փարիզ	‘Paris’
[pʰɑɾisˈt͡sʰi]	[pʰɑɾisˈt͡si]	փարիզցի	‘Parisian’

In addition to this regressive devoicing pattern, Beirut Armenian also has a progressive devoicing pattern: if the first obstruent is voiceless, then the second obstruent is devoiced. For example, the Beirut Armenian suffix /-god/ -կոտ is used to form adjectives (following a stem-final sonorant in row 1, and a voiced obstruent in rows 2–3 of the table below). When it combines with a word that has a final voiceless obstruent, such as /ˈvɑχ/ վախ ‘fear’, the suffix-initial obstruent is voiceless (rows 4–5).

Beirut		
[ɑd͡ʒɑbɑɾˈgod]	աճապարկոտ	‘rushing’
[tʰɑnˈtʰɑʁ]	դանդաղ	‘slow’
[tʰɑntʰɑʁˈgod]	դանդաղկոտ	‘sluggish’
[ˈvɑχ]	վախ	‘fear’
[vɑχˈkod]	վախկոտ	‘cowardly’

https://doi.org/10.1017/S0025100323000130 Published online by Cambridge University Press

In Yerevan Armenian, we observed optional progressive devoicing of /v/ following a voiceless obstruent. For example, when the diminutive suffix /-ik/ -իկ combines with a word ending in /u/, the final syllable is pronounced /-vik/ (rows 1–2 of the table below; see **Syllable structure** on vowel hiatus). However, the syllable onset varies between [v] and [f] when it follows a voiceless obstruent in the stem word (rows 3–4 below).

Yerevan

[leˈzu]	լեզու	'tongue'
[lezˈvik]	լեզվիկ	'tongue (DIM)'
[tʰəˈtʰu]	թթու	'sour'
[tʰətʰˈvik] ~ [tʰətʰˈfik]	թթվիկ	'sourish, sour (DIM)'

VP indicates that both the voiced [v] and devoiced [f] pronunciations are natural in թթվիկ, as well as in the /v/-initial passive suffix when it follows a voiceless obstruent (not illustrated here). However, other than obstruent sequences involving /v/, the morphophonological context where progressive devoicing could potentially occur is very rare in Yerevan Armenian, and it is thus not clear whether progressive devoicing is generally optional, obligatory, or idiosyncratic in this dialect.

Sonorants

The nasal /n/ has been categorized as 'dental' (Allen 1950; Xačatryan 1988), 'post-dental' (Khachatryan & Ayrapetyan 1971), 'alveodental' (Dum-Tragut 2009), 'alveolar' (Fairbanks 1948), and 'nondistinctly . . . postdental to alveolar' (Johnson 1954). Our speaker consultants disagree on whether /n/ involves dental contact. The nasal /n/ assimilates to the place of a following obstruent, as in Yerevan [ˈsuŋk], Beirut [ˈsuŋg] սունկ 'mushroom' (Fairbanks 1948: 8; Allen 1950: 196–197; Johnson 1954: 26–27; Dum-Tragut 2009: 27; Xačatryan 1988: 106).

The lateral /l/ is described as alveolar by Fairbanks (1948: 9), Johnson (1954: 27), and Dum-Tragut (2009: 21); and as dental by Allen (1950), and Xačatryan (1988: 85). As with /n/, our speaker consultants disagree on whether /l/ involves dental contact in their individual pronunciation.

The rhotics /r, ɾ/ are contrastive in Yerevan Armenian, with minimal pairs such as the following:

Yerevan	**Beirut**		
ɑˈru	ɑˈɾu	ար.նու	'ditch, creek'
ɑˈɾu	ɑˈɾu	արու	'male'
ˈser	ˈseɾ	սեռ	'gender, sex'
ˈseɾ	ˈseɾ	սեր, սէր	'love'

The tap is often spirantized in syllable codas (Fairbanks 1948: 8; Allen 1950: 195; Xačatryan 1988: 186; Toparlak 2017: Appendix 2). We observed this especially in citation

https://doi.org/10.1017/S0025100323000130 Published online by Cambridge University Press

forms and in emphatic speech.[8] For example, SK's recordings contrast /ˈseɾ/ and /ˈser/ primarily via louder frication noise for the tap /ɾ/ with a low spectral peak around 4 kHz (perhaps non-sibilant postalveolar fricative [ɻ̟]).[9] However, word-final /ɾ/ is often unambiguously tapped or approximated in connected speech, such as in the accompanying recordings of the North Wind and Sun by HD and SK (see **Transcription of recorded passage**). Tap and approximant variants are both common in intervocalic position. The recordings of /kʰɑˈɾi/ քարի 'rock (DAT.GEN)' and /χɑˈɾisχ/ խարիսխ 'anchor' contributed by SK illustrate approximant variants of /ɾ/.

The recording of /ˈser/ is not trilled, but has a falling third formant that is excited by aspiration without voicing, and only weak or absent oral frication noise. Most of the coda trills in the accompanying recordings contributed by SK are voiceless and/or spirantized. For example, the recording of /ˈt͡sɑr/ ծառ 'tree' in the section **Vowels** (below) includes a voiceless trill, while the recording of the same word in the **Consonants** table is more similar to the variant in /ˈser/. A voiced trill coda is illustrated in the recording of /ˈkor/ կոռ 'coerced labor (archaic)', from the speaker who contributed /ˈkoʁ/ կող 'rib' in the subsection **Yerevan Armenian plosives**.

Although the two rhotics are contrastive in Yerevan Armenian, the tap is sometimes trilled before coronals (Xačatryan 1988: 108; Vaux 1998: 19; also noted by speaker VP), and word-initial trills are often reduced to the tap.[10]

In Western Armenian, both sounds are merged to the tap /ɾ/ in all environments (Vaux 1998), though they are prescriptively taught as contrastive in Canadian Armenian language schools (Talia Tahtadjian, p.c.) and some Western Armenian dictionaries (Sak'apetoyean 2011; also in Fairbanks 1948). For the Western Armenian community in Canada, Tahtadjian (2020) reports that the Western Armenian tap and trill are acoustically distinguishable: the Western trill sometimes has multiple articulator contacts (occurring in about 30% of onset trills produced by older speakers, and <15% of other trills), and the trill is about 2 ms longer in onset position and 4 ms longer in coda position. These differences are probably too small or too variable to reliably index a category difference. In the accompanying recording of Beirut Armenian [ɾɑzmɑˈgɑn] ռազմական 'military' contributed by HD, the onset consonant has multiple contacts, but HD indicates that the tap and trill were perceptually indistinguishable for his peer group in a Lebanese Armenian school.

In both dialects, the two rhotics are rare word-initially. While there are some native rhotic-initial words such as Yerevan /ɾɑmkɑˈkɑn/ ռամկական 'democratic', most such words are names like Yerevan /ɾɑfɑˈjel/ Ռաֆայել 'Raphael (name)' and borrowings such as Yerevan /ɾɑˈbi/ ռաբբի 'rabbi'. For these words, the Beirut forms use a tap instead of the trill: /ɾɑmgɑˈgɑn/, /ɾɑfɑˈjel/ (Ռաֆայէլ), /ɾɑˈpʰi/. Both rhotics are more frequent medially and finally, and occur in Yerevan minimal pairs such as the above.

Most sources treat /j/ as phonemic (in contrast with Vaux 1998), though it has a limited distribution. In word-initial position, the palatal approximant /j/ primarily occurs before /e/, such as in /ˈjerpʰ/ երբ 'when' (see Vaux 1998: 13 for a phonological analysis and Dum-Tragut 2009: 14–17 for a lexical catalog; see also **Vowels**). All attested word-initial /jɑ/ are borrowings, such as /ˈjɑvrəm/ յավրում, եաւրում 'my dear' from Turkish. It is also found word-initially before the back vowels /u/ and /o/ in a handful of native words, such as /ˈjuʁ/

[8] Allen (1950: 195) also claims that /ɾ/ spirantization is a correlate of stress.

[9] The tap in Yerevan Eastern Armenian corresponds to an apico-postalveolar approximant /ɻ/ in the Tehran Eastern Armenian dialect. In the Istanbul Western Armenian dialect, TT reports that the tap is often pronounced as a postalveolar [ʃ] word-finally.

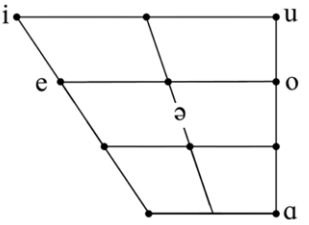
[10] For heritage speakers of Eastern Armenian in California, Karapetian (2014: 73ff) reports that the trill and tap have merged into a tap. For Western Armenian speakers in Syria, T'oxmaxyan (2015: 20) reports that the tap is trilled before nasals.

https://doi.org/10.1017/S0025100323000130 Published online by Cambridge University Press

յուղ, իւղ 'oil' and /ˈjotʰə/ յոթը, եօթը 'seven'. In some words, the Yerevan Armenian sequence /ju/ is pronounced [ʏ] in Beirut Armenian, though there is substantial variation (Khanjian 2011). For example, Yerevan /ˈgjuʁ/ գյուղ 'village' corresponds to Beirut [ˈkʰʏʁ] ~ [ˈkʰjʏʁ] ~ [ˈkʰjuʁ] գիւղ.

In native words, coda /j/ does not appear after /ə/, or word-finally after /i/ or /u/. It occurs in native complex codas only after /ɑ/ and /u/, such as in /ˈhɑjr/ հայր 'father'. Word-medially, /Cj/ sequences may have ambiguous onset syllabification (Margaryan 1997: 55), such as in Yerevan /sen.jɑk, se.njɑk/ սենյակ and Beirut /sen.jag, se.njag/ սենեակ 'room' (see also **Syllable structure**).

Vowels



Word-initial vowels

	Yerevan	**Beirut**		
i	itɑluˈhi	idɑluˈhi	իտալուհի	'Italian woman'
u	uˈtʰi	uˈtʰi	ութի	'eight (DAT.GEN)'
e	etʰiˈket	etʰiˈkʰetʰ	էթիկետ, էթիքէթ	'etiquette'
o	oˈtʰi	oˈtʰi	օդի	'air (DAT.GEN)'
ɑ	ɑˈtʰor	ɑˈtʰoɾ	աթոռ	'chair'
ə		əˈsel	ըսել	'say'
	ˈətʰ	ˈətʰ	ըթ	'name of letter ը'

Word-medial vowels

	Yerevan	**Beirut**		
i	ˈt͡sisɾ	ˈd͡zisɾ	ծիր	'orbit'
u	ˈt͡sur	ˈd͡zuɾ	ծուռ	'crooked'
e	ˈt͡seɾ	ˈd͡zeɾ	ծեր	'old'
o	ˈt͡soɾ	ˈd͡zoɾ	ծոր	'barberry, kind of shrub'
ɑ	ˈt͡sɑr	ˈd͡zɑɾ	ծառ	'tree'
ə	t͡səˈrel	d͡zəˈɾel	ծռել	'to lean'

https://doi.org/10.1017/S0025100323000130 Published online by Cambridge University Press

Word-final vowels

	Yerevan	**Beirut**		
i	dɑˈsi	tʰɑˈsi	դասի	‘lesson (DAT.GEN)’
u	hɑˈsu	hɑˈsu	հասու	‘competent’
e	ɑʁjuˈse	ɑʁjuˈse	աղյուսե, աղիւսէ	‘made of brick’
o	zəˈɾo	zeˈɾo	զրո, զէրօ	‘zero’
ɑ	pʰeˈsɑ	pʰeˈsɑ	փեսա, փեսայ	‘groom’
ə	ˈtɑsə	ˈdɑsə	տասը	‘ten’

For this illustration, we summarize the acoustic vowel measurements originally collected by Toparlak (2019). Other vowel measurements are provided by Xačatryan (1988: 152–164), Godson (2003, 2004), Gordon et al. (2012) and Seyfarth & Garellek (2018).

Toparlak (2019) measured vowels that were elicited from six speakers each of Yerevan Armenian and Beirut Armenian, including three female and three male speakers per variety. All speakers were aged 21–40 and living in Paris, and Armenian was their dominant language. The speakers each read aloud thirty-two dialect-appropriate sentences containing target words with initial, medial, and final vowels, and then repeated the target words in isolation. The sentences and isolated words were repeated multiple times by each speaker for a total of approximately 5,800 measured vowel tokens. Figure 8 shows a graphical summary of formant measurements for the six Armenian vowels, with values given in Table 1 (female speakers) and Table 2 (male speakers).

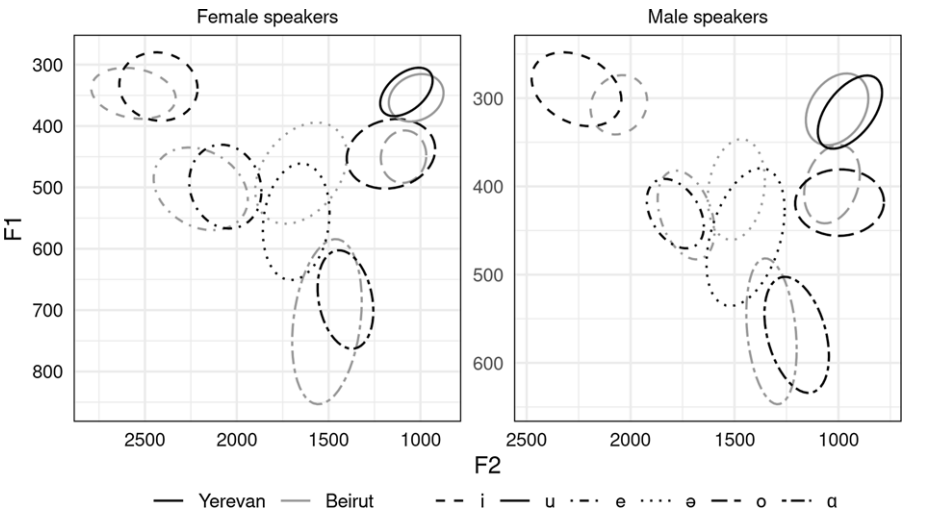


Figure 8 Average first and second formant frequencies for the six vowels in Yerevan and Beirut Armenian, based on measurements from three female and three male speakers per language variety in Toparlak 2019. Ellipses cover the central 50% of the observations for a vowel type.

https://doi.org/10.1017/S0025100323000130 Published online by Cambridge University Press

Table 1 Formant frequency mean and standard deviation for the six vowels in Yerevan and Beirut Armenian, based on measurements from Toparlak 2019 with three female speakers per language variety. Mean values are rounded to the nearest 10 Hz.

	F1		F2		F3		n	
	Yerevan	Beirut	Yerevan	Beirut	Yerevan	Beirut	Y	B
i	340 ± 54	350 ± 40	2380 ± 241	2550 ± 227	3170 ± 221	3330 ± 228	170	250
e	500 ± 64	500 ± 65	2040 ± 219	2200 ± 246	2880 ± 196	3120 ± 238	244	249
ə	550 ± 89	480 ± 81	1660 ± 175	1650 ± 248	2790 ± 260	3020 ± 301	247	335
ɑ	680 ± 78	720 ± 130	1410 ± 141	1510 ± 179	2690 ± 287	2990 ± 303	403	496
o	450 ± 57	450 ± 42	1190 ± 223	1100 ± 119	2680 ± 189	2870 ± 282	102	141
u	350 ± 43	360 ± 41	1070 ± 139	1020 ± 145	2690 ± 154	2990 ± 264	136	246

Table 2 Formant frequency mean and standard deviation for the six vowels in Yerevan and Beirut Armenian, based on measurements from Toparlak 2019 with three male speakers per language variety. Mean values are rounded to the nearest 10 Hz.

	F1		F2		F3		n	
	Yerevan	Beirut	Yerevan	Beirut	Yerevan	Beirut	Y	B
i	290 ± 42	310 ± 34	2240 ± 221	2050 ± 134	2840 ± 249	2690 ± 195	167	197
e	430 ± 38	430 ± 49	1790 ± 134	1730 ± 142	2560 ± 190	2510 ± 170	236	184
ə	460 ± 72	400 ± 56	1440 ± 177	1490 ± 133	2390 ± 334	2490 ± 206	280	270
ɑ	570 ± 63	560 ± 77	1210 ± 147	1320 ± 116	2290 ± 319	2520 ± 185	412	361
o	420 ± 36	400 ± 41	1020 ± 200	1050 ± 144	2230 ± 287	2370 ± 179	101	112
u	320 ± 39	310 ± 43	950 ± 150	1000 ± 146	2340 ± 246	2430 ± 152	165	207

The mid-front vowel /e/ varies acoustically between /e/ and /ɛ/ and could be narrowly transcribed as [ẹ]. As an example, the recording of /ɑʁjuˈse/ աղյուսե ‘made of brick’ contributed by SK has a final vowel closer to open-mid [ɛ] while the corresponding vowel in the recording contributed by HD is closer to [e]. On the other hand, the vowel in the recording of /ˈjet, ˈjed/ ետ ‘backward’ in **Consonants** contributed by HD is lower than in the corresponding recording by SK. Godson (2004) shows that this vowel is lower for Western Armenian speakers in southern California with increasing English dominance, closer to the California English open-mid front vowel.

The mid-back vowel is categorized as /ɔ/ by some grammars (e.g., Dum-Tragut 2009: 13), but it has a low F1 distribution that partially overlaps with the /u/ category (Toparlak 2019), which makes the broad symbol /o/ more appropriate.

We transcribe the low vowel with /ɑ/, as in Vaux (1998), Godson (2004), and Dum-Tragut (2009: 13). It could be narrowly transcribed as central or near-back [ä] (Allen 1950). Some descriptions transcribe this vowel as central or near-front /a/ (Fairbanks 1948: 2; Johnson 1954: 18), and Xačatryan (1988: 55) reports that this vowel can vary widely from front to back. In Yerevan Armenian, the back vowels /ɑ, o, u/ are further fronted by about 200 Hz after aspirated and (breathy-)voiced plosives (Seyfarth & Garellek 2018).

Although all six vowels occur in all three environments, word-initial mid vowels are uncommon (see below on **Schwa**). Word-initial /e/ occurs in forms of the copula է as found throughout the **Transcription of recorded passage** as well in as a few other native words such as /ˈeʃ/ էշ ‘donkey’, but is mostly used in loanwords. In word-final position, most roots with final /o/ are loanwords such as Yerevan /kʰ⁽ʰ⁾iˈlo/ կիլո or Beirut /kʰiˈlo/ քիլո, քիլոյ ‘kilogram’. However, the native Armenian hypocoristic suffix /-o/ is used widely, as in /ˈmɑɾo/ or /mɑˈɾo/ Մարո, Մարօ from /mɑɾˈjɑm/ Մարիամ ‘Mariam (name)’.

https://doi.org/10.1017/S0025100323000130 Published online by Cambridge University Press

Schwa

Khachaturian (1985) and Dum-Tragut (2009) treat the Armenian schwa as a phoneme, but Vaux (1998) and Allen (1950) analyze the schwa as purely epenthetic, and Hovhannisyan (2014: 89) argues that it is excrescent in some environments such as before final rhotics. Acoustically, schwa is mid-central for Yerevan Armenian, but might be transcribed as [ə̟] for Beirut Armenian (cf. lower F1 in Figure 2 and Tables 1–2; Toparlak 2019; see also Gordon et al. 2012 and Seyfarth & Garellek 2018). The two different acoustic distributions suggest that it has an acoustic or articulatory target in at least one of the dialects, in at least some environments.

Schwa is used in careful speech of both Eastern and Western Armenian (Ġaragyowlyan 1979: 37; Margaryan 1997: 51), but schwa elision is common in colloquial and connected speech (Allen 1950). Further, the schwa is optionally elided even in citation form for some lexemes, especially adjacent to rhotics, fricatives, and post-aspiration (Ġaragyowlyan 1974: 127, 145–147; Xačatryan 1988: 73; Hovakimyan 2016: 18ff). For example, the words /kʰ(ə)ˈsɑn/ քսան ‘twenty’ and /kʰ(ə)ˈʃel/ քշել ‘to drive’ are acceptable without schwa in citation form (for similar patterns in English and French, see Davidson 2006; Racine & Grosjean 2005; Bürki, Ernestus, & Frauenfelder 2010).

In monosyllabic non-onomatopoeic free-standing words, schwas are unattested except for the name of the alphabet letter /ˈətʰ/ ը. Schwas are also used in initialisms, in which consonant letters are pronounced as the corresponding consonant sound plus schwa, as in /i.iˈhə/ ԻԻՀ ‘I.I.H., the Islamic Republic of Iran’. Polysyllabic words generally have at least one other non-schwa vowel with word-level stress (see **Word-level prosody** below). A few polysyllabic words have only schwa vowels, but many of these are onomatopoeic or nativized loanwords, such as /fəsˈtəχ/ ֆստըխ ‘pistachio’ (cf. Turkish /fıstɯk/ fıstık).

Schwa often appears in morphophonological alternations involving stress changes or consonant clusters (Vaux 1998, 2003). For example, Yerevan /t͡səˈrel/, Beirut /d͡zəˈrel/ ծռել ‘to lean’ is a verb form of the adjective /ˈt͡sur/, /ˈd͡zuɾ/ ծուռ ‘crooked’ in which the stressed high vowel alternates with an unstressed schwa. The first- and second-person possessor suffixes /-s/, /-t/ (Yerevan), /-tʰ/ (Beirut) appear directly after vowel-final stems, but are preceded by a schwa when they are used with consonant-final stems. The presence of schwa in these alternations is not predictable from the phonology alone (Dolatian 2021): high vowels do not generally alternate with schwa when they are unstressed (see the **Vowels** table for examples), and /-s/ can occur in other word-final coda clusters such as in /ˈt͡sɑχs/, /ˈd͡zɑχs/ ծախս ‘cost’ without schwa (see **Syllable structure**). Moreover, some free-standing forms like Yerevan /vəˈkɑ/ վկա and Beirut /vəˈgɑ/ վկայ ‘witness’ have no related forms without schwa (Vaux 1998), and our speakers indicate that it is impossible or unnatural to elide the schwa (*vkɑ, *vgɑ) in isolation or in citation form.

Prosody

Syllable structure

Armenian generally allows up to CjVCCkʰ syllables, with all elements optional except for V. There are some exceptional complex onsets other than /Cj/ which are never pronounced with an intervening schwa, primarily in non-nativized loanwords (Ġaragyowlyan 1974: 65).

	Eastern	**Western**		
V	u	u	nɪ	‘and’
VC	ˈɑn	ˈɑn	ɯն	‘he’
VCC	ˈɑnd͡z	ˈɑnt͡s	ɯնձ	‘person’

https://doi.org/10.1017/S0025100323000130 Published online by Cambridge University Press

CV	ˈkɑ	ˈgɑ	կա, կայ	‘exists (3SG PRS)’
CVC	ˈkɑn	ˈgɑn	կան	‘exist (3PL PRS)’
CVCC	ˈkɑŋkʰ	ˈgɑŋkʰ	կանք	‘exist (1PL PRS)’
CjVCC	ˈkjɑŋkʰ	ˈgjɑŋkʰ	կյանք, կեանք	‘life’
CVCCkʰ	ˈpɑɾtkʰ	ˈbɑɾdkʰ	պարտք	‘debt’

When vowel hiatus would occur between a stem-final vowel and a suffix-initial vowel, various repair strategies are attested (Vaux 1998: 27ff; Dolatian 2020: 35ff). Vowel repair strategies include [j]-insertion between vowels and /u/ devocalizing to [v]. Different words and different vowel sequences show different types of vowel hiatus repairs. In some cases, multiple vowel hiatus repair strategies are possible for the same word. For example, the instrumental case form of the vowel-final stem /leˈzu/ լեզու ‘tongue’ with the vowel-initial suffix /-ov/ -ով is variably [lezuˈjov] լեզուով ([j]-insertion) or [lezˈvov] լեզվով (/u/ → [v]). The form with [j]-insertion is more typical in Western Armenian and preferred by HD, while the form with /u/ changing to [v] is more typical in Eastern Armenian and preferred by SK.

Words with initial sibilant-stop clusters are variably pronounced with an initial schwa, such as in [(ə)stɑˈnɑl] ստանալ ‘receive’. In citation form, word-initial sibilant-stop clusters are obligatorily pronounced with an initial schwa in Western Armenian. Such schwas used to be obligatory in earlier stages of Eastern Armenian too (Ġaragyowlyan 1974: 139ff), but the absence of a schwa in initial sibilant-stop clusters has now become more common, arguably due to contact with Russian (Dum-Tragut 2009: 31ff; see also Avetisyan 2011: 14). For both dialects, the presence of the schwa in word-initial sibilant-stop clusters varies in connected speech. For example, Ġaragyowlyan (1974: 143ff) reports that the presence of Eastern word-initial schwa before sibilant-stop clusters depends on the preceding word’s coda. A word-initial invariant schwa is found before other consonant clusters in a handful of words, such as in Yerevan [əŋˈkeɾ] and Beirut [əŋˈgeɾ] ընկեր ‘friend’.

A variety of coda clusters are found in word-medial and word-final positions. Almost all two-consonant coda clusters with falling sonority are attested without schwa epenthesis. However, nasal + obstruent clusters are homorganic, and coda /l/ generally does not occur in native coda clusters except after /j/. A few exceptional two-consonant coda clusters with rising or level sonority are attested, with examples below:

	Yerevan	**Beirut**		
z + m	pɑteˈɾɑzm	bɑdeˈɾɑzm	պատերազմ	‘war’
ʁ + m	ˈkoʁm	ˈgoʁm	կողմ	‘side’
kʰ + s	meˈtɑkʰs	meˈdɑkʰs	մետաքս	‘silk’
χ + s	ˈt͡sɑχs	ˈd͡zɑχs	ծախս	‘cost’
s + χ	χɑˈɾisχ	χɑˈɾisχ	խարիսխ	‘anchor’

The accompanying recording of Yerevan /pɑteˈɾɑzm/ is pronounced [pɑteˈɾɑsm̥], and SK sometimes deletes the final /m/ in this word. The accompanying recording of Beirut /meˈdɑkʰs/ is pronounced [meˈdɑks] with an unaspirated [k] due to the following sibilant (see **Beirut Armenian plosives**) though still without schwa. The orthography indicates other coda clusters with rising or level sonority, but many of these are pronounced with an intervening schwa (Vaux 1998: 26–27).

https://doi.org/10.1017/S0025100323000130 Published online by Cambridge University Press

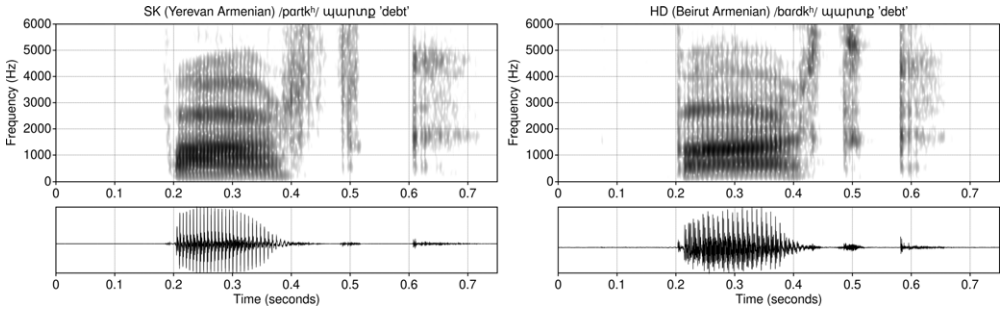


Figure 9 Spectrograms of /pɑrtkʰ/ and /bɑrdkʰ/ պարտք 'debt', illustrating a three-consonant coda.

Stem-final /-kʰ/ is an exception to these generalizations about coda clusters: it can occur after any singleton consonant or two-consonant cluster without any degree of schwa epenthesis, regardless of sonority, in both dialects (see Vaux 1998: 83; Dolatian 2021 for phonological analyses). Figure 9 shows spectrograms of /pɑrtkʰ, bɑrdkʰ/ [pɑ̊ɾ̥tkʰ, pɑ̊ɾ̥tkʰ] պարտք 'debt' from SK and HD, which each show three final consonant articulations — a spirantized /ɾ/, a /t, d/ constriction and release, and a final aspirated /kʰ/ release — with no acoustic evidence for schwa.[11]

Word-level prosody

Words in citation form are typically stressed on the final syllable, unless the final syllable nucleus is schwa. If the final syllable nucleus is schwa, then stress is on the last non-schwa vowel, which is typically in the penultimate syllable. The table below illustrates these stress generalizations for the word /t͡ʃaˈkɑt, d͡ʒaˈgɑd/ ճակատ 'forehead' and several of its derived forms. In the forms with a full vowel in the final syllable, stress is word-final, no matter whether the word ends in an open syllable (row 2) or a closed syllable (rows 1, 3 and 5), or whether the word is unsuffixed (row 1), suffixed (rows 2–3) or a compound (row 5). The form /t͡ʃaˈkɑtət, d͡ʒaˈgɑdətʰ/ ճակատդ (row 4) has a final schwa and penultimate stress.

Final non-schwa stress with suffixes and in compounds

Yerevan	**Beirut**		
t͡ʃaˈkɑt	d͡ʒaˈgɑd	ճակատ	'forehead'
t͡ʃakaˈti	d͡ʒagaˈdi	ճակատի	'forehead (DAT.GEN)'
t͡ʃakɑtaˈkan	d͡ʒagadaˈgan	ճակատական	'frontal'
t͡ʃaˈkɑtət	d͡ʒaˈgɑdətʰ	ճակատդ	'your forehead'
t͡ʃakɑtaˈmɑrt	d͡ʒagadaˈmɑrd	ճակատամարտ	'pitched battle'
ˈmɑrt	ˈmɑrd	մարտ	'battle'[12]

[11] For the Beirut Armenian token, the word-initial /b/ is voiceless [p], which is an example of HD's variability in plosive closure voicing (see **Beirut Armenian plosives**); and the coda /d/ is pronounced [t], which reflects the devoicing pattern described in **Obstruent cluster devoicing**.

[12] Note that the accompanying recordings were elicited in a list with list intonation, which will affect the acoustics of word-final syllables. For measurements of stress and focus in a controlled dialogue context, see the subsection **Acoustics of stress and focus**.

https://doi.org/10.1017/S0025100323000130 Published online by Cambridge University Press

Clitics are unstressed, as illustrated in the table below (contributed by VP), as well as in the Yerevan form /viˈt͡ʃum ejin/ in the first phrase of the North Wind and Sun (**Transcription of recorded passage**), which contains a bisyllabic clitic.

Clitics are unstressed

Yerevan	**Beirut**		
t͡ʃɑˈkɑt	d͡ʒɑˈgɑd	ճակատ	‘forehead’
t͡ʃɑˈkɑte	d͡ʒɑˈgɑde	ճակատ է	‘is a forehead’

For words with only schwa nuclei, our speakers produce final stress: /fəsˈtəx/ փստրխ ‘pistachio’. Aǧaŕyan (1971: 194) reports that these words have final stress, while Vaux (1998: 133) reports initial stress. This disagreement may reflect inter-speaker variation or differences in (loan)word origin. There are very few words with only schwa nuclei in Armenian and many of these words are onomatopoeic, which tend to be exceptional cross-linguistically.

Besides primary stress, most grammars report that Armenian has word-initial secondary stress (Vaux 1998: 134; Abeġyan 1933: 20; Ġaragyowlyan 1974: 133; Dum-Tragut 2009). Some sources report that secondary stress can fall on word-initial schwas (Fairbanks 1948: 2; Johnson 1954: 11).

Some notable classes of exceptions to the general stress patterns include ordinal numbers, vocatives, and hypocoristics, as well as some common adverbs and a few other idiosyncratic words, suffixes, and clitics, though exceptional non-final stress can be variable (Vaux 1998:ch4; Dum-Tragut 2009). For example, the Yerevan Armenian clitic /el/ էլ ‘also’ can carry stress, while the Beirut cognate /ɑl/ ալ cannot, as in Yerevan /t͡ʃɑkɑtˈel, t͡ʃɑˈkɑt el/ էլ contributed by VP versus Beirut /d͡ʒɑˈgɑd ɑl/ ճակատ ալ ‘also a forehead’.

Exceptional stress also occurs in some morphological alternations, which is also dialect-specific. For example, in subjunctive past imperfective forms in HD’s Beirut Western Armenian, stress exceptionally occurs on a theme vowel which precedes the tense-agreement suffix, regardless of where the theme vowel is in the word. This means that the Beirut Armenian subjunctive second-person singular form has stress on the penultimate syllable – which contains the theme vowel – even though the final syllable has a peripheral vowel that would normally be stressed (cf. rows 2–4 in the table below). In Yerevan Eastern Armenian, the final syllable (the tense-agreement suffix) receives expected stress in all inflected forms.

Idiosyncratic theme vowel stress in Beirut Armenian

Yerevan	**Beirut**		
kɑɾˈtʰɑl	gɑɾˈtʰɑl	կարդալ	‘to read (INF)’
kɑɾˈtʰɑ	gɑɾˈtʰɑ	կարդա, կարդայ	‘to read (SBJV 3SG PRS)’
kɑɾtʰɑˈjiɾ	gɑɾˈtʰɑjiɾ	կարդայիր	‘to read (SBJV 2SG PST IPFV)’
kɑɾtʰɑˈt͡sʰiɾ	gɑɾtʰɑˈt͡siɾ	կարդացիր	‘to read (2SG PST PRF)’

Additionally, in negative past perfective verb forms, the finite verb negation prefix չ is /t͡ʃ-, t͡ʃə-/ in Western Armenian, and /t͡ʃʰ-, t͡ʃʰə-/ in Eastern Armenian. The prefix has exceptional initial stress in Western Armenian, but is unstressed as expected in Eastern Armenian.

https://doi.org/10.1017/S0025100323000130 Published online by Cambridge University Press

The recorded sentences that accompany the subsection **Acoustics of stress and focus** illustrate the contrast of Yerevan Eastern /t͡ʃʰ(ə)-kɑrˈtʰɑt͡sʰ/ and Beirut Western /ˈt͡ʃə-gɑrtʰɑt͡s/ չկարդաց 'to read (3SG PST PRF NEG)'. The difference in stress correlates with the variable deletion of initial schwa in the Yerevan Eastern forms (final stress) but not the Beirut Western forms (initial stress).

Sentence-level intonation and focus

In Eastern Armenian, broad focus (neutral context) sentences can have either SVO or SOV word order (Samvelian, Faghiri & Khurshudyan 2023). In broad-focus SVO sentences in Eastern Armenian, each prenuclear prosodic constituent (i.e., S and V) has a rising -L H- contour aligned with its right edge. Each prenuclear constituent has a successively lower pitch, i.e., there is downstep or declination between successive H tone targets (Haghverdi 2016; Skopeteas 2021). Skopeteas (2021) also finds sentence-final lowering in Eastern Armenian, which he analyzes as an L-% boundary tone at the right edge of the intonational phrase. In Western Armenian, broad focus sentences have an unmarked SOV order, and Toparlak (2019) reports the same intonational patterns as Skopeteas (2021).[13] Western Armenian listeners perceive nuclear accent on the pre-verbal element – usually the object – and the verb undergoes post-focal compression or deaccenting (Toparlak 2019; Toparlak & Dolatian 2022; Dolatian 2022).

Skopeteas (2021) gives experimental evidence that narrow or contrastive focus is marked by a falling contour H*+L on the stressed syllable of the focused word.[14] The H* tone – indicated by maximal f0 – is aligned with the left edge of the stressed syllable, followed by the L tone, indicated by a steep fall starting either immediately after the H* or at the right edge of the prosodic word. For questions, Skopeteas (2021) finds a sharp rise L+H* on the stressed syllable of either the focused element in narrow focus questions or the verb in broad focus questions. After this rise, he finds post-focal deaccenting. Toparlak & Dolatian (2022) find similar results for unmarked, SOV sentences with narrow object focus in Western Armenian: a pitch rise on the focused word, followed by post-focal deaccenting.

Simple yes–no questions with the unmarked SOV order have a final pitch rise on the verb (H%) in both dialects, with no change in word order. Wh-questions have a pitch rise on the wh-word followed by post-focal deaccenting. In Eastern Armenian, wh-questions have a sentence-final fall (L%) while in Western Armenian these questions have a pitch rise (H%) instead (Fairbanks 1948: 29; Johnson 1954: 15, Ġowkasyan 1990; Dum-Tragut 2009: 54ff; Toparlak & Dolatian 2022).

Acoustics of stress and focus

Previous research on Eastern Armenian reports the acoustic correlates of stress as duration, intensity, and/or f0 including a final pitch rise (T'oxmaxyan 1983: 119; Xačatryan 1988: 76–79), but most of this earlier work did not clearly differentiate word-level stress and intonation. Skopeteas (2021) reports that a word-final pitch rise is a cue to the right edge of prenuclear constituents in Yerevan Armenian (see also **Sentence-level intonation and focus** and Haghverdi 2016). Both final and non-final stressed syllables can host a nuclear pitch accent that is aligned earlier within the syllable than this right edge tone.

For Western Armenian, Athanasopoulou et al. (2017) report that word-level stress is cued only by mean f0 and f0 excursion. They find that word-level stress has similar acoustic cues

[13] Although SVO order is possible under broad focus in Western Armenian, SOV is significantly more typical (Toparlak 2019: 47).

[14] For SVO sentences, Skopeteas found that narrow focus on the final object creates a crowded tonal contour of H*+L L-%. In narrow focus, the focused object has a higher pitch than in neutral SVO sentences where the object carries only the boundary tone L-%.

https://doi.org/10.1017/S0025100323000130 Published online by Cambridge University Press

regardless of whether stress is final or non-final (due to a final schwa nucleus). Using the same data, Vogel & Athanasopoulou (2018) also report that stress does not involve significant enhancement in duration. To measure a word-level stress and focus paradigm, we elicited four target word forms in the following two carrier contexts, adapted from Athanasopoulou et al. (2017) and Vogel, Athanasopoulou & Pincus (2016):

Non-focus condition

	Մարիամը	«__»	կարդա՞ց:	Ոչ,	Մարիամը	«__»	գրեց,	չկարդաց:
Yerevan	mɑrˈjɑmə	__	kɑrˈtʰɑt͡sʰ	vot͡ʃʰ	mɑrˈjɑmə	__	gəˈɾet͡sʰ	t͡ʃʰəkɑrˈtʰɑt͡sʰ
Beirut	mɑrˈjɑmə	__	gɑrˈtɑt͡s	vot͡ʃ	mɑrˈjɑmə	__	kʰə͡ˈɾets	t͡ʃəgɑrtʰɑt͡s
English gloss	Mariam.DEF	__	read	no	Mariam.DEF	__	wrote	read.NEG

‘Did Mariam read __? No, she wrote __; she didn't read it.’

Focus condition

	Մարիամը	ի՞նչ	գրեց:	Մարիամը	«__»	գրեց:
Yerevan	mɑrˈjɑmə	ˈint͡ʃʰ	gəˈɾet͡sʰ	mɑrˈjɑmə	__	gəˈɾet͡sʰ
Beirut	mɑrˈjɑmə	ˈint͡ʃ	kʰəˈɾets	mɑrˈjɑmə	__	kʰəˈɾet͡s
English gloss	Mariam.DEF	what	wrote?	Mariam.DEF	__	wrote

‘What did Mariam write? She wrote __.’

The four target word forms are listed below:

Yerevan	**Beirut**		
t͡ʃɑˈkɑt	d͡ʒɑˈgɑd	ճակատ	‘forehead’
t͡ʃɑˈkɑtə	d͡ʒɑˈgɑdə	ճակատը	‘forehead (DEF)’
bɑt͡sʰɑˈkɑ	pʰɑt͡sɑˈgɑ	բացակա, բացակայ	‘absent’
t͡ʃɑkɑˈti	d͡ʒɑgɑˈdi	ճակատի	‘forehead (DAT.GEN)’

As described in **Word-level prosody**, stress is final in these forms except /t͡ʃɑˈkɑtə/, /d͡ʒɑˈgɑdə/ ճակատը, which has a final schwa nucleus. The first and second row contrast final and non-final stress. The third row has a trisyllabic form with final stress, for comparison

https://doi.org/10.1017/S0025100323000130 Published online by Cambridge University Press

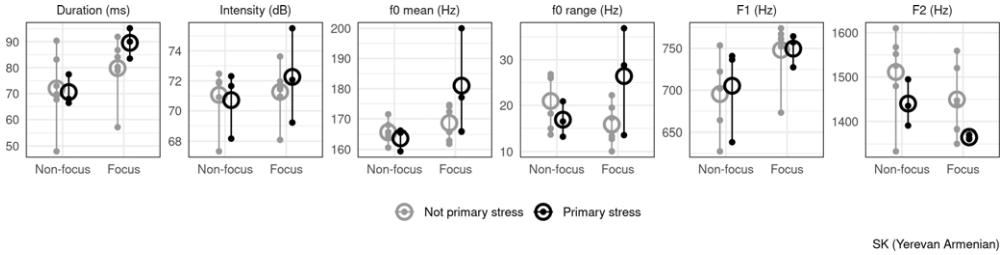


Figure 10 Measurements for /ɑ/ vowels for SK (Yerevan Armenian). Connected points show the actual token measurements and large open circles show group means for each measure. Gray circles (/ɑ/ vowels without primary stress) include six tokens per group, and black circles (/ɑ/ vowels with primary stress) include three tokens per group.

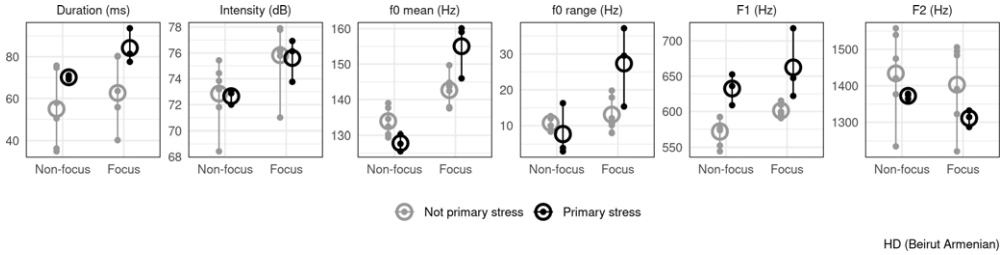


Figure 11 Measurements for /ɑ/ vowels for HD (Beirut Armenian). Connected points show the actual token measurements and large open circles show group means for each measure. Gray circles (/ɑ/ vowels without primary stress) include six tokens per group, and black circles (/ɑ/ vowels with primary stress) include three tokens per group.

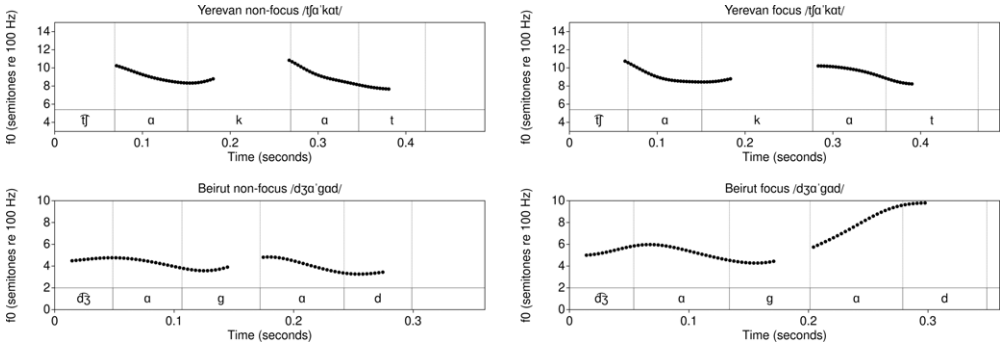


Figure 12 f0 contours for /t͡ʃɑˈkɑt/ and /d͡ʒɑˈgɑd/ 'forehead' (Yerevan Armenian non-focus top left, Yerevan Armenian focus top right, Beirut Armenian non-focus bottom left, Beirut Armenian focus bottom right).

with the non-final stress in the second row. The fourth row contrasts unstressed word-medial /ɑ/ with the stressed word-medial syllable in the second row.

Vowel measurements for these elicitations are shown in Figures 10–11. HD (Beirut Western Armenian) produced stressed /ɑ/ vowels with longer duration, higher F1 and lower F2 (i.e., more peripheral). In the focus condition, stressed /ɑ/ also had a higher f0 and a wider range. SK (Yerevan Eastern Armenian) produced stressed /ɑ/ vowels with a similar effect on F2, but duration and f0 were affected only in the focus condition (see Skopeteas 2021). This suggests that duration may be an acoustic correlate of stress for HD's Beirut Armenian, while vowel space expansion may be a stress correlate for both dialects. Both speakers showed post-focal compression or deaccenting. In two of four tokens, word-final schwa had an f0 rise even though it followed the stressed syllable (Figure 13).

https://doi.org/10.1017/S0025100323000130 Published online by Cambridge University Press

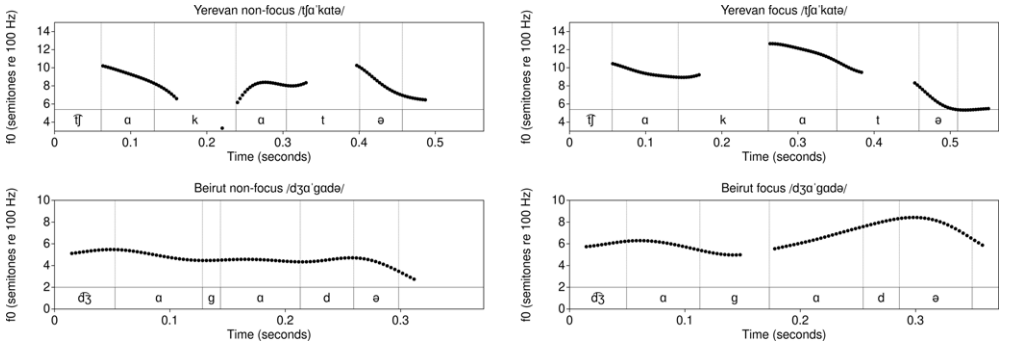


Figure 13 f0 contours for /t͡ʃaˈkatə/ and /d͡ʒaˈgadə/ 'forehead (DEF)' (Yerevan Armenian non-focus top left, Yerevan Armenian focus top right, Beirut Armenian non-focus bottom left, Beirut Armenian focus bottom right).

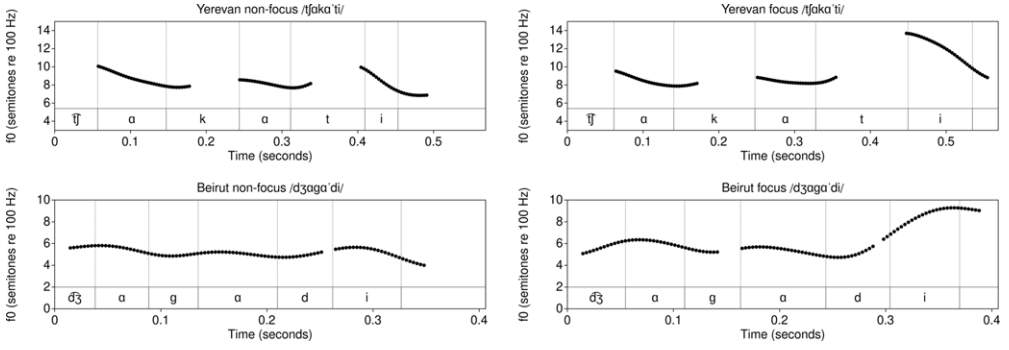


Figure 14 f0 contours for /t͡ʃakaˈti/ and /d͡ʒagaˈdi/ 'forehead (DAT.GEN)' (Yerevan Armenian non-focus top left, Yerevan Armenian focus top right, Beirut Armenian non-focus bottom left, Beirut Armenian focus bottom right).

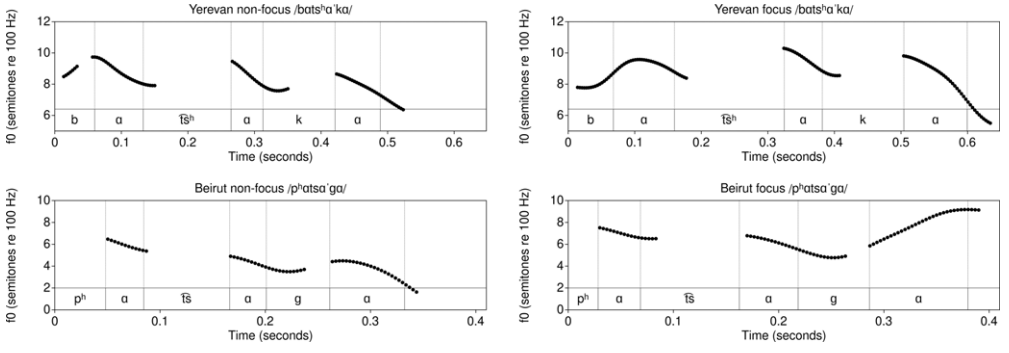


Figure 15 f0 contours for /bɑt͡sʰɑˈkɑ/ and /pʰɑt͡sɑˈgɑ/ 'absent' (Yerevan Armenian non-focus top left, Yerevan Armenian focus top right, Beirut Armenian non-focus bottom left, Beirut Armenian focus bottom right).

As Figures 10–11 and 12–15 illustrate, the f0 of stressed syllables is higher under the focused condition than either unstressed or stressed syllables in the non-focused condition, except in SK's recording of bisyllabic /t͡ʃaˈkat/. In our elicitations, all vowels were also longer in words under focus.

https://doi.org/10.1017/S0025100323000130 Published online by Cambridge University Press

Transcription of recorded passage

Broad phonetic transcription

Yerevan Eastern Armenian: hjusisaˈjin kʰaˈmin jev aˈɾevə viˈt͡ʃum ejin | tʰe iɾenˈt͡sʰit͡sʰ ˈov e avˈli uˈʒeʁə | jerpʰ mi t͡ʃanapaˈɾortʰ jereˈvat͡sʰ mi ˈtakʰ verarkuˈjov pʰatʰatʰˈvat͡s ‖ voroʃeˈt͡sʰin | um araˈt͡ʃʰinə kəhad͡ʒoʁˈvi t͡ʃanaparorˈtʰin stiˈpel verarˈkun haˈnel | na mjuˈsit͡sʰ avˈli uˈʒeʁ kəhamarˈvi ‖ hjusisaˈjin kʰaˈmin pʰəˈt͡ʃʰet͡sʰ ir amˈboχt͡ʃʰ uˈʒov | baj̆t͡sʰ vorˈkʰan avˈli uˈʒeʁ er pʰəˈt͡ʃʰum | t͡ʃanapaˈɾortʰn ajŋˈkʰan avˈli aˈmur er pʰatʰatʰˈvum verarkuˈjov || jev hjusisaˈjin kʰaˈmin vert͡ʃʰaˈpes han̆d͡znəˈvet͡sʰ ‖ heˈto aˈɾevə pʰajˈlet͡sʰ | jev t͡ʃanapaˈɾortʰə takʰaˈt͡sʰav ‖ na anmit͡ʃʰaˈpes haˈnet͡sʰ ir verarˈkun ‖ ajspiˈsov | hjusisaˈjin kʰaˈmin stipˈvat͡s er χostovaˈnel | vor aˈɾevn iɾeˈnit͡sʰ avˈli uˈʒeʁ er ‖

Beirut Western Armenian: hʏsisaˈjin ˈhovə jev aˈɾevə | gəviˈd͡ʒejin gor | tʰe irent͡sˈme ˈov e avˈli zoraˈvorə | jerpʰ d͡ʒanabaˈrortʰ mə jerevˈt͡sav | ˈdakʰ verargуˈjov mə pʰatʰːəˈvad͡z ‖ voroʃeˈt͡sin | vor araˈt͡ʃinə vor gəhat͡ʃoˈʁi | d͡ʒanabarorˈtʰin əstiˈbel | vor verarˈgun haˈne | an mʏˈsen avˈli zoraˈvor gəhamarˈvi ‖ hʏsisaˈjin ˈhovə ir amˈpʰoχt͡ʃ uˈʒov pʰəˈt͡ʃet͡s | pʰajt͡s vorˈkʰan avˈli zoraˈvor gəpʰəˈt͡ʃer gor | d͡ʒanabaˈrortʰə | ajŋˈkʰan avˈli aˈmur gəpʰatʰːəˈver gor verargуˈjov ‖ jev hʏsisaˈjin ˈhovə ˈvert͡ʃabes geˈt͡sav pʰort͡seˈlen ‖ hedo | aˈɾevə pʰajleˈt͡sav | jev d͡ʒanabaˈrortʰə | daktsav ‖ an anˈmit͡ʃabes haˈnet͡s ir verarˈgun ‖ ajspiˈsov | hʏsisaˈjin ˈhovə əstibˈvad͡z er χostovaˈnil | vor aˈɾevə irˈme avˈli zoraˈvor er ‖

Orthographic version

Yerevan Eastern Armenian: Հյուսիսային Քամին և Արևը վիճում էին, թե իրենցից ով է ավելի ուժեղը, երբ մի ճանապարհորդ երևաց մի տաք վերարկուով փաթաթված: Որոշեցին, ում առաջինը կհաջողվի ճանապարհորդին ստիպել վերարկուն հանել, նա մյուսից ավելի ուժեղ կհամարվի: Հյուսիսային Քամին փչեց իր ամբողջ ուժով, բայց որքան ավելի ուժեղ էր փչում, ճանապարհորդն այնքան ավելի ամուր էր փաթաթվում վերարկուով: Եվ Հյուսիսային Քամին վերջապես հանձնվեց: Հետո Արևը փայլեց և ճանապարհորդը տաքացավ: Նա անմիջապես հանեց իր վերարկուն: Այսպիսով, Հյուսիսային Քամին ստիպված էր խոստովանել, որ Արևն իրենից ավելի ուժեղ էր:

Beirut Western Armenian: Հիւսիսային Հովը եւ Արեւը կը վիճէին կոր, թէ իրենցմէ ով է աւելի զօրաւորը, երբ ճանապարհորդ մը երեւցաւ տաք վերարկուով մը փաթթուած: Որոշեցին որ առաջինը որ կը յաջողի ճանապարհորդին ստիպել որ վերարկուն հանէ, ան միւսէն աւելի զօրաւոր կը համարուի: Հիւսիսային Հովը իր ամբողջ ուժով փչեց, բայց որքան աւելի զօրաւոր կը փչէր կոր, ճանապարհորդը այնքան աւելի ամուր կը փաթթուէր կոր վերարկուով: Եւ Հիւսիսային Հովը վերջապէս կեցաւ փորձելէն: Յետոյ Արեւը փայլեցաւ եւ ճանապարհորդը տաքցաւ: Ան անմիջապէս հանեց իր վերարկուն: Այսպիսով, Հիւսիսային Հովը ստիպուած էր խոստովանիլ որ Արեւը իրմէ աւելի զօրաւոր էր:

https://doi.org/10.1017/S0025100323000130 Published online by Cambridge University Press

English translation

The North Wind and the Sun were disputing who was stronger when a traveler came along wrapped in a warm coat. They decided that the first to succeed in making the traveler take his coat off — he should be considered stronger than the other. Then the North Wind blew as hard as he could, but the more he blew, the more closely the traveler folded his coat around him; and at last the North Wind gave up the attempt. Then the Sun shined out, and the traveler became warm. Immediately, the traveler took off his coat. And so the North Wind was obliged to confess that the Sun was the stronger of the two.

Acknowledgements

We are grateful to Susanna Khechoyan, Vahagn Petrosyan, and an anonymous contributor for recording their speech for this Illustration. We also thank Arevik Torosyan, Avedis Samuelian, George Balabanian, Hovhannes Zadikyan, Hrag Vosgerichian, Hrayr Khanjian, Lilit Petrosyan, Susanna Khechoyan, Vahagn Petrosyan, and Vartan Haghverdi for their advice and judgments on many aspects of the Armenian languages; Carolyn Seyfarth, Eric Seyfarth, John Seyfarth, Kristina Magpayo Nyden, Matthew Faytak, Megha Sundara, and the UCLA Phonetics Lab for their assistance with audio recording; and Bert Vaux and Stavros Skopeteas for comments on an earlier version of this manuscript.

Supplementary material

To view supplementary material for this article, please visit https://doi.org/10.1017/S0025100323000130.

References

Abeġyan, Manowk [Աբեղյան, Մանուկ]. 1933. *Metrics of the Armenian language* [Հայոց լեզվի տաղաչափություն մետրիկա]. Yerevan: Armenian SSR Academy of Sciences Press [Հայկական ՍՍՀ Գիտությունների Ակադեմիա Հրատարակչություն].

Aċaŕean, Hračeay [Ածառեան, Հրաչեայ]. 1926. *Armenian etymological dictionary* [Հայերէն արմատական բառարան]. Yerevan: Yerevan University Press [Երեւանի-Համալսարանի Հրատարակչութիւն].

Aċaŕyan, Hračya [Ածառյան, Հրաչյա]. 1971. *Complete grammar of the Armenian language* [Լիակատար քերականություն հայոց լեզվի] (Vol. 6). Yerevan: Armenian SSR Academy of Sciences Press [Հայկական ՍՍՀ Գիտությունների Ակադեմիա Հրատարակչություն].

Adjarian, Hratchia. 1899. Les explosives de l'ancien arménien: études dans les dialectes modernes. *La Parole. Revue internationale de rhinologie, otologie et laryngologie*, 119–127.

Adjarian, Hrachia. 1909. *Classification des dialectes arméniens*. Paris: Librairie Honoré Champion.

Al-Bataineh, Anke. 2015. *Cent ans après: Politiques scolaires et la vitalité des langues en danger le cas de l'arménien occidental*. Ph.D. Thesis, Institut National des Langues et Civilisations Orientales.

Allen, Sidney W. 1950. Notes on the phonetics of an Eastern Armenian speaker. *Transactions of the Philological Society* 49(1), 180–206. https://doi.org/10.1111/j.1467-968X.1950.tb00241.x

Al-Tamimi, Jalal & Ghada Khattab. 2018. Acoustic correlates of the voicing contrast in Lebanese Arabic singleton and geminate stops. *Journal of Phonetics* 71, 306–325. https://doi.org/10.1016/j.wocn.2018.09.010

Amirian, Beaina. 2017. *A study of acoustic features of stops and affricates in Eastern Armenian* [انسایشی در زبان ارمنی شرقی های صوت شناختی همخوان های انسدادی و ویژگی]. Master's Thesis, Allameh Tabataba'i University.

Athanasopoulou, Angeliki, Irene Vogel & Hossep Dolatian. 2017. Acoustic properties of canonical and non-canonical stress in French, Turkish, Armenian and Brazilian Portuguese. *Interspeech* 2017, 1398–1402. http://doi.org/10.21437/Interspeech.2017-1514

Avetisyan, Yowri [Ավետիսյան, Յուրի]. 2011. *Comparative grammar of Eastern and Western Armenian* [Արևելահայերենի և արևմտահայերենի զուգադրական քերականություն]. Yerevan: Republic of Armenia Ministry of the Diaspora [Հայաստանի սփյուռքի նախարարություն].

Balabanian, George. 2020. *Exploring voicing contrast in Western Armenian: A language contact case study*. Ms., University of Pennsylvania.

Baronian, Luc. 2017. Two problems in Armenian phonology. *Language and Linguistics Compass* 11(8), 1–18. https://doi.org/10.1111/lnc3.12247

Bellem, Alex. 2014. Triads, emphatics and interdentals in Arabic sound system typology. *Journal of Semitic Studies* 34, 9–41.

Berkson, Kelly. 2013. *Phonation types in Marathi: An acoustic investigation*. Ph.D. Thesis, University of Kansas.

Brandt, Erika & Adrian P. Simpson. 2021. The production of ejectives in German and Georgian. *Journal of Phonetics* 89, 101111. https://doi.org/10.1016/j.wocn.2021.101111

Braun, Angelika. 2013. An early case of 'VOT'. *Interspeech* 2013, 119–122.

Bürki, Audrey, Mirjam Ernestus & Ulrich H. Frauenfelder. 2010. Is there only one 'fenêtre' in the production lexicon? On-line evidence on the nature of phonological representations of pronunciation variants for French schwa words. *Journal of Memory and Language* 62(4), 421–437. https://doi.org/10.1016/j.jml.2010.01.002

Chahinian, Talar & Anny Bakalian. 2016. Language in Armenian American communities: Western Armenian and efforts for preservation. *International Journal of the Sociology of Language* 237, 37–57. https://doi.org/10.1515/ijsl-2015-0034

Chai, Yuan & Marc Garellek. 2022. On H1–H2 as an acoustic measure of linguistic phonation type. *Journal of the Acoustical Society of America* 152(3), 1856–1870. https://doi.org/10.1121/10.0014175

Chirikba, Viacheslav A. 2008. Armenians and their dialects in Abkhazia. *Studies in Slavic and General Linguistics* 33, 51–67. https://doi.org/10.1163/9789401206365_006

Clackson, James. 1994. *The linguistic relationship between Armenian and Greek*. Oxford: Blackwell.

Cowe, S. Peter. 1992. Amēn teł hay kay: Armenian as a pluricentric language. In Michael Clyne (ed.), *Pluricentric languages: Differing norms in different nations*, 325–346. Berlin: De Gruyter Mouton. https://doi.org/10.1515/9783110888140.325

Davidson, Lisa. 2006. Schwa elision in fast speech: Segmental deletion or gestural overlap? *Phonetica* 63(2–3), 79–112. https://doi.org/10.1159/000095304

Davidson, Lisa. 2016. Variability in the implementation of voicing in American English obstruents. *Journal of Phonetics* 54, 35–50. https://doi.org/10.1016/j.wocn.2015.09.003

DeLisi, Jessica L. 2015. *Epenthesis and prosodic structure in Armenian: A diachronic account*. Ph.D. Thesis, University of California, Los Angeles.

Dolatian, Hossep. 2020. *Computational locality of cyclic phonology in Armenian*. Ph.D. thesis, State University of New York at Stony Brook.

Dolatian, Hossep. 2021. Cyclicity and prosodic misalignment in Armenian stems: Interaction of morphological and prosodic cophonologies. *Natural Language and Linguistic Theory* 39, 843–886. https://doi.org/10.1007/s11049-020-09487-7

Dolatian, Hossep. 2022. Interface constraints for nuclear stress assignment under broad focus in Western Armenian vs. Turkish and Persian. In Öner Özçelik & Amber Kennedy (eds.), *Proceedings of the 4th Conference on Central Asian Languages and Linguistics (ConCALL-4)*, 59–80. Bloomington: Indiana University, CeLCAR.

Donabédian, Anaïd. 2018. Middle East and beyond – Western Armenian at the crossroads: A sociolinguistic and typological sketch. In Christiane Bulut (ed.), *Linguistic minorities in Turkey and Turkic-speaking minorities of the periphery*, 89–148. Wiesbaden: Harrassowitz Verlag.

Dum-Tragut, Jasmine. 2009. *Modern Eastern Armenian*. Amsterdam/Philadelphia: John Benjamins Publishing Company. https://doi.org/10.1075/loall.14

Esposito, Christina M. & Sameer ud Dowla Khan. 2020. The cross-linguistic patterns of phonation types. *Language and Linguistics Compass* 1–25. https://doi.org/10.1111/lnc3.12392

Fairbanks, Gordon H. 1948. *Phonology and morphology of modern spoken West Armenian*. Ph.D. thesis, University of Wisconsin-Madison.

Faytak, Matthew, Jeremy Steffman & Rolain Tankou. 2020. *True voiced aspirates in Yemba* Poster presented at LabPhon 17.

Feydit, Frédéric & Anaïd Donabédian. 2007. La langue: Origine et etapes du developpement de la langue (grabar, armenien moyen, armenien moderne). In Gérard Dedayan (ed.) *Histoire du peuple arménien*, 47–66. Toulouse: Privat.

Fleming, Harold C. 2000. Glottalization in Eastern Armenian. *Journal of Indo-European Studies* 28(1/2), 155–196.

Ġaragyowlyan, T'ereza [Ղարագյուլյան, Թերեզա]. 1974. *Modern Armenian orthoepy* [Ժամանակակից հայերենի ուղղախոսությունը]. Yerevan: Armenian SSR Academy of Sciences Press [Հայկական ՍՍՀ Գիտությունների Ակադեմիա Հրատարակչություն].

Ġaragyowlyan, T'ereza [Ղարագյուլյան, Թերեզա]. 1979. Primary characteristics of epenthetic schwas [Հայերենի գաղտնավանկային ը-ի հնչման հիմնական առանձնահատկությունները]. *Lraber hasarakakan gitutyunneri* [Լրաբեր Հասարակական Գիտությունների] 12, 35–45.

Godel, Robert. 1975. *An introduction to the study of Classical Armenian*. Wiesbaden: Reichert.

Godson, Linda. 2003. *Phonetics of language attrition: Vowel production and articulatory setting in the speech of Western Armenian heritage speakers*. Ph.D. Thesis, University of California, San Diego.

Godson, Linda. 2004. Vowel production in the speech of Western Armenian heritage speakers. *Heritage Language Journal* 2(1), 45–70. https://doi.org/10.46538/hlj.2.1.3

Gordeeva, Olga B. & James M. Scobbie. 2013. A phonetically versatile contrast: Pulmonic and glottalic voicelessness in Scottish English obstruents and voice quality. *Journal of the International Phonetic Association* 43(3), 249–271. https://doi.org/10.1017/S0025100313000200

Gordon, Matthew, Edita Ghushchyan, Bradley McDonnell, et al. 2012. Sonority and central vowels: A cross-linguistic study. In Steve Parker (ed.), *The sonority controversy*, 219–256. Berlin: De Gruyter Mouton. https://doi.org/10.1515/9783110261523.219

Ġowkasyan, Sewak [Ղուկասյան, Սևակ]. 1990. *The intonational features of literary Eastern Armenian and Western Armenian: Experimental-comparative research* [Գրական արևելահայերենի և արևմտահայերենի հնչերանգային առանձնահատկությունները: փորձառական-զուգադրական հետազոտություն]. Yerevan: Armenian SSR Academy of Sciences Press [Հայկական ՍՍՀ Գիտությունների Ակադեմիա Հրատարակչություն].

Greppin, John A. & Amalya Khachaturian. 1986. *Handbook of Armenian dialectology*. Delmar: Caravan Books.

Hacopian, Narineh. 2003. A three-way VOT contrast in final position: Data from Armenian. *Journal of the International Phonetic Association* 33(1), 51–79. https://doi.org/10.1017/S0025100303001154

Haghverdi, Vartan. 2016. *Armenian schwa: A phonetic and phonological analysis*. Master's Thesis at Rutgers University.

Hillenbrand, James, Ronald A. Cleveland & Robert L. Erickson. 1994. Acoustic correlates of breathy voice quality. *Journal of Speech, Language, and Hearing Research* 37(4), 769–778. https://doi.org/10.1044/jshr.3704.769

Hovakimyan, Knar. 2016. *Eastern Armenian consonant clusters*. Bachelor's Thesis, Reed College.

Hovhannisyan, Hasmik [Հովհաննիսյան, Հասմիկ]. 2014. *The role of the syllable in Armenian phonetics* [Վանկի դերը հայերենի հնչույթաբանության մեջ]. Yerevan: Yerevan State University Press [Երևանի Պետական Համալսարանի Հրատարակչություն].

Johnson, Wintler W. 1954. *Studies in East Armenian grammar*. Ph.D. thesis, University of California, Berkeley.

Jongman, Allard, Ratree Wayland & Serena Wong. 2000. Acoustic characteristics of English fricatives. *The Journal of the Acoustical Society of America* 108(3), 1252–1263. https://doi.org/10.1121/1.1288413

Karapetian, Shushan. 2014. *'How do I teach my kids my broken Armenian?': A study of Eastern Armenian heritage language speakers in Los Angeles*. Ph.D. Thesis, University of California, Los Angeles.

Kelly, Niamh E. & Lara Keshishian. 2019. The voicing contrast in stops and affricates in the Western Armenian of Lebanon. *Interspeech* 2019, 1721–1725. https://www.isca-speech.org/archive_v0/Interspeech_2019/pdfs/2529.pdf

Kelly, Niamh E. & Lara Keshishian. 2021. Voicing patterns in stops among heritage speakers of Western Armenian in Lebanon and the US. *Nordic Journal of Linguistics: Special issue on Bilingualism and Heritage Languages* 44(2), 103–129. https://doi.org/10.1017/S0332586521000093

Khachatrian, Amalya. 1996. Some peculiarities of literary Armenian voiceless stops. *Annual of Armenian Linguistics* 17, 47–53.

Khachatryan, Amalia & Albert Airapetyan. 1987. The main cues differentiating aspirated and unaspirated stops and affricates in Armenian. *Proceedings of the 11th International Congress of Phonetic Sciences*, 341–345.

Khachatryan, Amalia & Vladimir Ayrapetyan. 1971. *An experimental study of the consonant phonemes of the literary Armenian language* [Экспериментальное исследование согласных фонем литературного армуанского уазык]. Yerevan: Armenian SSR Academy of Sciences Press [Академиуа наук Армуанской ССР].

Khachaturian, Amalya. 1983. The nature of voiced aspirated stops and affricates in Armenian dialects. *Annual of Armenian Linguistics* 4, 57–62.

Khachaturian, Amalya. 1985. The phonology of the Armenian ə vowel in Modern East Armenian. *Annual of Armenian Linguistics* 6, 53–58.

Khachaturian, Amalia. 1992. Voiced aspirated consonants in the Nor Bayazet dialect of Armenian. In John Greppin (ed.), *Proceedings of the fourth international conference on Armenian linguistics*, 115–128. Delmar: Caravan Books.

Khanjian, Hrayr. 2011. Stress-dependent vowel reduction in Western Armenian. Ms., Massachusetts Institute of Technology.

Klatt, Dennis H. & Laura C. Klatt. 1990. Analysis, synthesis, and perception of voice quality variations among female and male talkers. *Journal of the Acoustical Society of America* 87(2), 820–857. https://doi.org/10.1121/1.398894

Kohler, Klaus J. 1994. Glottal stops and glottalization in German: Data and theory of connected speech processes. *Phonetica* 51, 38–51. https://doi.org/10.1159/000261957

Ladefoged, Peter & Ian Maddieson. 1996. *The sounds of the world's languages*. Oxford: Blackwell.

Lisker, Leigh & Arthur S. Abramson. 1964. A cross-language study of voicing in initial stops: Acoustical measurements. *Word* 20(3), 384–422. https://doi.org/10.1080/00437956.1964.11659830

Macak, Martin J. 2016. *Studies in Classical and Modern Armenian phonology*. University of Georgia. https://esploro.libs.uga.edu/esploro/outputs/doctoral/Studies-in-classical-and-modern-Armenian-phonology/9949333392802959#details

Macak, Martin J. 2017. The phonology of Classical Armenian. In Jared S. Klein, Brian D. Joseph & Matthias Fritz (eds.), *Handbook of comparative and historical Indo-European linguistics*, 1037–1079. Berlin/Munich/Boston: Walter de Gruyter. https://doi.org/10.1515/9783110523874-016

Maniwa, Kazumi, Allard Jongman & Travis Wade. 2009. Acoustic characteristics of clearly spoken English fricatives. *The Journal of the Acoustical Society of America* 125(6), 3962–3973. https://doi.org/10.1121/1.2990715

Margaryan, Alek'sandr [Մարգարյան, Ալեքսանդր]. 1997. *Contemporary Armenian language: Phonology* [Ժամանակակից հայոց լեզու. Հնչյունաբանություն]. Yerevan: Yerevan State University Press [Երեւանի Պետական Համալսարանի Հրատարակչություն].

Martirosyan, Hrach. 2014. The place of Armenian in the Indo-European language family: The relationship with Greek and Indo-Iranian. *Litres* 10, 85–137. https://doi.org/10.31826/jlr-2013-100107

Martirosyan, Hrach. 2019. The Armenian dialects. In Geoffrey Haig & Geoffrey Khan (eds.), *The languages and linguistics of western Asia: An areal perspective*, 46–105. Berlin/Munich/Boston: Walter de Gruyter. https://doi.org/10.1515/9783110421682-003

McCarthy, Owen & Jane Stuart-Smith. 2013. Ejectives in Scottish English: A social perspective. *Journal of the International Phonetic Association* 43(3), 273–298. https://doi.org/10.1017/S0025100313000212

Namboodiripad, Savithry & Marc Garellek. 2017. Malayalam (Namboodiri Dialect). *Journal of the International Phonetic Association* 47(1), 109–118. https://doi.org/10.1017/S0025100315000407

Racine, Isabelle & François Grosjean. 2005. Le coût de l'effacement du schwa lors de la reconnaissance des mots en français. *Canadian Journal of Experimental Psychology/Revue canadienne de psychologie expérimentale* 59(4), 240–254. https://doi.org/10.1037/h0088052

Sak'apetoyean, Ṙowbēn [Սաքապետոյեան, Ռուբէն]. 2011. *New Western–Eastern Armenian dictionary* [Արեւմտահայերէն-արեւելահայերէն նոր բառարան]. Yerevan: Tigran the Great Press [«Տիգրան Մեծ» հրատարակչություն].

Samvelian, Pollet, Pegah Faghiri & Victoria Khurshudyan. 2023. On the persistence of SVO: The case of Modern Eastern Armenian. *Linguistics* 61(3), 459–497. https://doi.org/10.1515/ling-2021-0013

Sayeed, Ollie & Bert Vaux. 2017. The evolution of Armenian. In Jared S. Klein, Brian D. Joseph & Matthias Fritz (eds.), *Handbook of comparative and historical Indo-European linguistics*, 1146–1167. Berlin/Munich/Boston: Walter de Gruyter. https://doi.org/10.1515/9783110523874-021

Schertz, Jessamyn. 2013. Exaggeration of featural contrasts in clarifications of misheard speech in English. *Journal of Phonetics* 41(3–4), 249–263. https://doi.org/10.1016/j.wocn.2013.03.007

Schirru, Giancarlo. 2011. Osservazioni sui riflessi armeni delle occlusive sorde indoeuropee, con alcune proposte etimologiche. In A. Manco & D. Silvestri (eds.), *Atti del XXXV convegno della società italiana di glottologia*, 279–288. Rome: Il Calamo.

Schirru, Giancarlo. 2012. Laryngeal features of Armenian dialects. In Benedicte Nielsen Whitehead, Thomas Olander, Birgit Annette Olsen & Jens Elmegård Rasmussen (eds.), *The sound of Indo-European: Phonetics, phonemics, and morphophonemics*, 435–457. Copenhagen: Museum Tusculanum Press.

Seyfarth, Scott & Marc Garellek. 2018. Plosive voicing acoustics and voice quality in Yerevan Armenian. *Journal of Phonetics* 71, 425–450. http://doi.org/10.1016/j.wocn.2018.09.001

Seyfarth, Scott & Marc Garellek. 2020. Physical and phonological causes of coda /t/ glottalization in the mainstream American English of central Ohio. *Laboratory Phonology: Journal of the Association for Laboratory Phonology* 11(1), 24. https://doi.org/10.5334/labphon.213

Skopeteas, Stavros. 2021. Distinguishing tonal events within word-final stress: Focus and question intonation in Eastern Armenian. Ms., University of Göttingen.

Tahtadjian, Talia. 2020. *Western Armenian rhotics: A differential phonetic study*. B.A. Thesis, Carleton University.

Tahtadjian, Talia. 2021. *Phonetic interference in the production of stops by Western Armenian bilinguals*. M.A. Thesis, University of Toronto.

Tahtadjian, Talia & Alexei Kochetev. 2021. *A preliminary investigation of stop VOT in Western Armenian spoken in Canada*. Poster presented at the 4th Phonetics and Phonology in Europe.

Thomson, Robert W. 1989. *An introduction to Classical Armenian*. Delmar: Caravan Books.

Toparlak, Tabita. 2017. *Etude phonétique des consonnes occlusives de l'arménien oriental*. Paris: Université Paris III Sorbonne Nouvelle.

Toparlak, Tabita. 2019. *Etudes phonétiques en arménien*. Mémoire de master II recherche. Paris: Université Paris III Sorbonne Nouvelle.

Toparlak, Tabita & Hossep Dolatian. 2022. Intonation and focus marking in Western Armenian. In Öner Özçelik & Amber Kennedy Kent (eds.), *Proceedings of the 4th conference on Central Asian languages and linguistics (ConCALL-4),* 81–94. Indiana University, CeLCAR.

T'oxmaxyan, Ṙobert [Թոխմախյան, Ռոբերտ]. 1983. *The accentology of contemporary Armenian* [Ժամանակակից հայերենի շեշտաբանությունը]. Yerevan: Armenian SSR Academy of Sciences Press [Հայկական ՍՍՀ Գիտությունների Ակադեմիա Հրատարակչություն].

T'oxmaxyan, Ṙobert [Թոխմախյան, Ռոբերտ]. 2015. The phonetic system of Syrian Armenian [Սիրիայի հայերենի հնչյունական համակարգը]. In Արտեմ Սարգսյան &. In Արտեմ Սարգսյան & Ռոբերտ Թոխմախյան (eds.), *The current state of Western Armenian in the Syrian Armenian community* [Արեվմտահայերենի արդի վիճակը սիրիայի հայ համայնքում],, 17–21. Yerevan: NAS RA Language Institute named after H. Acharyan [ՀՀ ԳԱԱ Հ Ամառյանի Անվան Լեզվի Ինստիտուտ].

Vaux, Bert. 1998. *The phonology of Armenian*. Oxford: Clarendon Press.

Vaux, Bert. 2003. Syllabification in Armenian, Universal Grammar, and the lexicon. *Linguistic Inquiry* 34(1), 91–125. https://doi.org/10.1162/002438903763255931

Vogel, Irene & Angeliki Athanasopoulou. 2018. Prosodic rhythm in Turkish and Armenian. Paper presented at the *3rd bi-annual conference on Central Asian languages and linguistics*, Bloomington, IN.

Vogel, Irene, Angeliki Athanasopoulou & Nadya Pincus. 2016. Prominence, contrast and the functional load hypothesis: An acoustic investigation. In Jeffrey Heinz, Rob Goedemans & Harry van der Hulst (eds.), *Dimensions of phonological stress*, 123–167. Cambridge: Cambridge University Press. https://doi.org/10.1017/9781316212745.006

Weitenberg, Jos. 2002. Aspects of Armenian dialectology. In Jan Berns & Jaap van Merle (eds.), *Present-day dialectology: Problems and findings*, 141–157. Berlin: Mouton De Gruyer. https://doi.org/10.1515/9783110904765.141

Weitenberg, Jos. 2017. The dialectology of Armenian. In Jared S. Klein, Brian D. Joseph & Matthias Fritz (eds.), *Handbook of comparative and historical Indo-European linguistics*, 1132–1146. Berlin/Munich/Boston: Walter de Gruyter. https://doi.org/10.1515/9783110523874-020

Xačatryan, Amalya [Խաչատրյան, Ամալյա]. 1988. *Phonetics of contemporary Armenian* [Ժամանակակից հայերենի հնչույթաբանություն]. Yerevan: Armenian SSR Academy of Sciences Press [Հայկական ՍՍՀ Գիտությունների Ակադեմիա Հրատարակչություն].

https://doi.org/10.1017/S0025100323000130 Published online by Cambridge University Press