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Segmental and suprasegmental features of Brokpa

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ABSTRACT

This paper analyzes segmental and suprasegmental features of Brokpa, a Trans-Himalayan (Tibeto-Burman) language belonging to the Central Bodish (Tibetic) subgroup. Segmental phonology includes segments of speech including consonants and vowels and how they make up syllables. Suprasegmental features include register tone system and stress. We examine how syllable weight or moraicity plays a determining role in the placement of stress, a major criterion for phonological word in Brokpa; we also look at some other evidence for phonological words in this language. We argue that synchronic segmental and suprasegmental features of Brokpa provide evidence in favour of a number of innovative processes in this archaic Bodish language. We conclude that Brokpa, a language historically rich in consonant clusters with a simple vowel system and a relatively simple prosodic system, is losing its consonant clusters and developing additional complexities including lexical tones.

KEYWORDS

Parallelism in drift, pitch harmony, register tone, stress, suprasegmental

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*Segmental and suprasegmental features of Brokpa**

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1 Introduction

Brokpa, a Central Bodish language, has a complicated phonological system. This paper aims at analysing its segmental and suprasegmental features. We begin with a brief background information and basic typological features of Brokpa in §1. In §2, we introduce the consonant and vowel systems, and establish their phonemic status. The paper also examines how contrasts in voicing, tone, and aspiration encode grammatical information. In §3, we illustrate that tonal contrasts are limited to sonorant-initial words. In §4, we describe the stress pattern by giving acoustic evidence for light and heavy syllables. We posit that a phonological word has to have one stressed syllable and briefly examine the types of phonological words by giving evidence including stress and phonological processes. In the conclusions of §5 the findings and analyses in this paper are briefly summarized.

In this paper, the following diacritics and boundary symbols are used:

The diacritic (\acute{v}) over a vowel indicates high tone (or high pitch), (') and (,) before a syllable show primary stress and secondary stress respectively, and (.) marks a syllable break. The syllable break is used where necessary for clarity. The symbol (-) marks a boundary between root and affix, X=Y indicates that Y is phonologically a clitic to X, and X+Y shows that X and Y are the two components of a compound.

The underlying phonemic form (words, phrases) in the body of the text and inside the tables are enclosed in slashes //, and the surface phonetic forms in square brackets []. A phonetic form is provided only where necessary to specify the precise phonetic realization such as stress. The same square brackets in the underlying phonemic sentence examples indicate the boundaries of a syntactic realization of a constituent within a clause such as transitive predicate (TPR), intransitive predicate (IPR), and transitive object (O). The graphemic representations are shown within < >. Since tone is lexically contrastive exclusively on syllables with sonorant initials, only the vowel following a high-tone sonorant-initial is overtly marked for tone in the phonemic form. The low tone after a sonorant-initial is treated as the default tone and is left unmarked. Since stress is non-phonemic, it is indicated only in the phonetic transcription.

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1.1 *The Brokpa language and its relatives*

Brokpa belongs to the Trans-Himalayan (Tibeto-Burman) language family (van Driem 1991, 1994, 1998; Eberhard; Simons; and Fennig 2019). Within Central Bodish, Brokpa is classified as a Southern Central Bodish language (Eberhard; Simons; and Fennig 2019). Among the languages of Bhutan, Shafer (1955, 1966) classifies Dwags (Takpa/Dakpa) as an East Bodish language and Tshangla as a separate branch. When Shafer (1966:2) mentions ‘Bhutan’ as belonging to Central Bodish Unit, he is supposedly referring to all other Tibeto-Burman languages of Bhutan including Brokpa. Alongside Brokpa, van Driem (1991, 1994, 1998) includes five other languages of Bhutan—Dzongkha, Cho-ca-nga-ca-kha, Brokkat, Lakha, and Tibetan (Bökha)—in the same Central Bodish subgroup. Tournadre (2014) calls this language descriptively by the name ‘Mera Sakteng Brokpa-ke’ and groups it under ‘Southern section’ of Tibetic languages. The terms ‘Bodish’ and ‘Tibetic’ have the same meaning; the former is derived from the endonym Bod and the latter from the exonym Tibet, both referring to the same place.

Central Bodish (Tibetic) languages are often classified into ‘archaic’ and ‘non-archaic’ (Jäschke 1871, Róna-Tas 1966) on the basis of their phonological conservatism. These languages are also discussed in relation to tonality, that is, whether a language is ‘tonal’ or ‘non-tonal’ (Sprigg 1955, 1966, 1974; Róna-Tas 1967; Mazaudon 1977). The ‘archaic’ Bodish languages preserve onset and coda consonants as well as consonant clusters of Old Tibetan and Classical Tibetan and have simple vowel systems with no contrastive tone. The ‘non-archaic’ or the ‘innovative’ languages have simple onsets and codas but relatively complex vowel and prosodic systems. Brokpa is a language at an in-between stage, with two simple tones, contrastive on syllables with sonorant-initials, at the same time preserving some degree of consonant clusters and coda consonants.

1.2 *Background information on Brokpa*

Brokpa is spoken in Eastern Bhutan and in limited places of Arunachal Pradesh in Northeast India. In Eastern Bhutan, Brokpa is the language spoken of the highlands of Merak and its nearby tiny villages of Gengo, Khashateng, and Khiliphu; and it is spoken in Sakteng and its outlying villages of Thrakthri, Joenkar, and Moorbi. In Northeast India, Brokpa is the language of the small villages of Lubrung, Dirme, Sumrang, Nyokmadung, Undra, and Sengedrong in the West Kameng District, and of Lagam, Mago, Thingbu, and Lakuthang in the Tawang District (Dondrup 1993). Brokpa should not be confused with Drokpa, a Tibetan dialect spoken in the southwest of Tibet (Kretschmar 1986).

The total number of Brokpa speakers is estimated to be 5500 including the 1855 in Northeast India reported by Dondrup (1993). Brokpa exists in direct contact with Tshangla in Eastern Bhutan as well as with Dakpa (Dwags/Takpa), identified as an East Bodish language (Shafer 1955, 1966; van Driem 2001; Hyslop 2013), both in Bhutan and in Northeast India.

The only published material related to Brokpa is the Brokeh Language Guide by Dondrup (1993). This 60-page guidebook is based on a Brokpa dialect spoken in the village of Nyokmadung in Northeast India. The guidebook contains some common vocabulary items, phrases, and sentences and was apparently written for a non-linguistic audience.

The office of the Dzongkha Development Commission published a Dzongkha-Brokpa bilingual language book of which I and a colleague are the authors (Wangdi and Tashi 2018). It

contains a brief introduction of the grammatical features of Brokpa and colloquial phrases with Dzongkha translations. The language of analysis is Dzongkha.

This study is based on the primary data collection and original fieldwork in Merak and Sakteng in Bhutan, by means of immersion fieldwork and participant-observation for a period of six months in 2018. During that fieldwork, a total of 39 recordings of different genres (folktale, natural conversation, narrative, procedural) were made and 11 recordings were transcribed in the field. The corpus also includes a large size lexicon gathered through elicitation. Different speakers, men and women, in the age groups between twenty and seventy were consulted. I also made a brief visit to Merak and Sakteng in 2014 and made two short recordings which were transcribed during the second fieldwork in 2018. The examples in this paper are extracted from connected speech as well as elicited vocabulary from the corpus collected thus far. In addition, I am a native speaker of Tshangla, a language spoken in close contact to Brokpa. I also have a long-term experience of working with Dzongkha which is a close linguistic relative of Brokpa.

1.3 The main features of Brokpa

Brokpa is an agglutinating language with some fusional tendency. Word-formation in Brokpa involves a lexical root to which optional derivational processes apply including affixation, ablaut, suppletion, changing tone, compounding, and reduplication. That resulting stem receives obligatory inflections including case, grammatical number, and definiteness.

Brokpa uses a system of cases to mark its core arguments— A, S, and O. A stands for Subject of a transitive clause; S stands for Subject, the single core argument of an intransitive clause; and O stands for Object of a transitive clause. The marking of core arguments using the case system works in terms of the Absolutive/Ergative scheme. S and O are marked in the same way by absolutive (zero marking) and A differently by ergative case.

Brokpa exhibits ‘case syncretism’ (Aikhenvald 2015:120), that is, the ergative case marking a core argument, and the instrumental case marking a peripheral argument, share the same form. Brokpa exhibits ‘versatile case-marking’ whereby some case markers on NPs (noun phrases) are used to express temporal, clausal, or other relationships between clauses (Aikhenvald 2011). Nominalizers are extended to mark relative clauses, tense and/or aspect. The copulas and existential verbs function as grammatical markers of information source (evidentiality) and/or access to knowledge (egophoricity), over and above their primary function of marking a relation between copula subject and copula complement.

The preferred order of phrasal constituents is predicate-final, with A preceding O. The constituent order is not rigid as the core syntactic relations are shown by cases. The constituent order may be useful for disambiguating core arguments in the absence of overt case markers on NPs. The order of words within an NP is fairly rigid: demonstrative, possessive phrase, and relative clause precede the head noun in an NP; adjective, numerical classifier, number word, and quantifier follow the head noun; manner adverb and directional adverb precede the predicate within a clause.

Discourse particles may occur anywhere within a clause, but they always appear separate from grammatical words and never within a grammatical word. Content question words occupy the slots of core as well as peripheral NP arguments, although they have a tendency to immediately precede the predicate within a clause. Polar question markers and tag-questions, realized as particles, typically occupy the sentence-final position.

2 Segmental and suprasegmental phonology

2.1 Segmental phonology: consonant system

Brokpa has thirty-nine consonants and eight vowels. Table 1 presents the consonant phonemes in Brokpa. The columns show active and passive articulators and the rows show manner of articulation.

	labio-	apico-	apico-	lamino-	dorso-	glottal
	labial	alveolar	post-alveolar	prepalatal	velar	
Unaspirated voiceless stop	p	t	t̚		k	ʔ
Aspirated voiceless stop	p ^h	t ^h	t̚ ^h		k ^h	
Voiced stop	b	d	d̚		g	
Breathy-voiced stop	b ^{h̥}	d ^{h̥}	d̚ ^{h̥}		g ^{h̥}	
Unaspirated voiceless affricate		ts		tɕ		
Aspirated voiceless affricate		ts ^h		tɕ ^h		
Voiced affricate		dz		dʒ		
Voiceless fricative		s		ɕ		h
Voiced fricative		z		ʒ		ɦ
Nasal	m	n		ɲ	ŋ	
Voiceless lateral		ɭ				
Voiced lateral		l				
Voiceless tap		ɾ [ɻ]				
Voiced tap		r [r]				
Semi-vowel	w			y [j]		

Table 1. Brokpa consonant phonemes

There are four contrastive stops— unaspirated voiceless, aspirated voiceless, breathy-voiced (partially-aspirated), and voiced. Table 2 establishes the phonemic status of consonants by illustrating their contrasts in different points of articulation.

EXAMPLE	GLOSS	EXAMPLE	GLOSS	EXAMPLE	GLOSS
/pu/	‘body hair’	/ti:/	‘to roll up’	/ko/	‘to dig’
/p ^h u/	‘to blow’	/t ^h i:/	‘in accord with’	/k ^h o/	‘3:SG:MASC’
/bu/	‘insect’	/d̚a/	‘enemy’	/go/	‘head’
/b ^{h̥} u/	‘air’	/d̚ ^{h̥} a/	‘sound’	/g ^{h̥} o/	‘door’
/ta/	‘to see’	/ʔur/	‘to anoint’	/ɦur/	‘to boast’
/t ^{h̥} a/	‘to weave’	/da/	‘now’	/d ^{h̥} a/	‘arrow’

/tsoŋ/	‘to sell’	/ts ^h oŋ/	‘business’	/dzɔŋ/	‘fortress’
/teɑː/	‘metal’	/te ^h ɑ/	‘pair’	/dzaː/	‘to measure’
/so/	‘tooth’	/zo/	‘eat:IMP’	/zoː/	‘mistake’
/ɛur/	‘to descend’	/zur/	‘heap’	/hurku/	‘sunken eyes’
/ma/	‘mother’	/na/	‘to be sick	/fɪurkoŋ/	‘haughty’
/ɲɑ/	‘fish’	/ɲɑ/	1:SG	/l̥ɑ/	‘deity’
/laŋ/	‘to rise’	/raŋ/	‘self, REFL’	/rɑ/	‘hair’
/yáŋ/	‘prosperity’	/wáŋ/	‘power’		

Table 2. Phonemic status of consonants in Brokpa

Aspiration is contrastive even in the coda position, /tsap/ ‘substitute’ versus /tsap^h/ ‘chop’; /bruk/ ‘dragon’ versus /bruk^h/ ‘scratch’.

There are two degrees of pitch height, high and low, interacting with these four contrasting stops. Typically, the incipient high pitch is associated with unaspirated voiceless and aspirated voiceless and the incipient low pitch is associated with breathy-voiced and voiced phonation. This phenomenon has been observed in other related languages, albeit with different number and type of manner contrasts for stops (see Donohue 2018 for the relationship between pitch and voicing in Himalayan languages).

This correlation between pitch and voicing also exists for affricates and fricatives. The incipient high pitch is associated with unaspirated voiceless and aspirated voiceless affricates; and the incipient low pitch is associated with voiced affricates. In the same manner, the incipient high pitch is associated with voiceless fricatives and the incipient low pitch with voiced fricatives.

We can look at the number of pitch contrasts and phonation types of some other languages that are linguistic relatives of Brokpa. Dzongkha distinguishes four contrasts for stops and two degrees of pitch; unvoiced and aspirated stops are associated with high register and voiced and devoiced stops with low register (van Driem 1998; Watters 2018). Kurtöp (Hyslop 2009, 2017) has voicing distinction and contrastive aspiration for stops (three contrastive stops) and two degrees of pitch; and the pattern of pitch and segment interaction is the same: high pitch with voiceless and aspirated series and low pitch with voiced series. Barte (2007) posits a three-way pitch contrast (low, mid, and high) and a four-way contrast for stops in voicing, aspiration, and pre-nasalization for Dongwang, a sub-dialect of Khams Tibetan. In Dongwang, low tone and high tone (monosyllables with plosive onsets) interact with voiceless and mid tone with voiced stops.

The four contrasts found in Dzongkha are also evident in Brokpa. However, the “devoiced” series will be referred to here as “breathy-voiced”. This breathy voice is distinct from the South Asian breathy-voiced consonants found in Hindi. The breathy voice here is partially aspirated, followed by a breathy voice on the vowel. Brokpa does not have a breathy-voiced series in affricates and fricatives.

Brokpa also exhibits voicing contrast for laterals and rhotics, e.g. /ra/ ‘goat’ vs /rɑ/ ‘hair’; /læ/ ‘work’ vs /læ/ ‘to overflow’; /lo/ ‘age’ vs /lɔ/ ‘south’. Voicing contrast for sonorants is considered to be fairly rare cross-linguistically (Dixon 2010a:271).

2.2 Segmental phonology: vowel system

Brokpa has an eight-vowel system. Table 3 displays the inventory of vowel phonemes in Brokpa, with their phonetic values.

	front	near-front	near-back	back	
	unrounded	rounded	unrounded	rounded	
close	i	ü		u	high
close-mid	e	ö		o	high-mid
near-open	æ		a		near-low

Table 3. Brokpa vowel phonemes

Table 4 establishes the phonemic status of vowels illustrating the contrasts in both open and closed syllables.

EXAMPLE	GLOSS	EXAMPLE	GLOSS	EXAMPLE	GLOSS
/bri/	‘to sniff’	/eiŋ/	‘tree’	/di/	‘this’
/bru/	‘grain’	/euiŋ/	‘to hang’	/de/	‘that’
/t ^h i/	‘throne’	/sin/	‘during/while’	/t ^h iŋ/	‘blue’
/t ^h ü/	‘gadget’	/sün/	‘to be fed up’	/t ^h eŋ/	‘times’
/zi/	‘four’	/tiŋba/	‘heel’	/re/	‘to rely’
/zo/	‘curd’	/toŋba/	‘void’	/ru/	‘horn’
/ɖi/	‘knife’	/zanziŋ/	‘tangled’	/tek ^h /	‘stool/support’
/ɖa/	‘enemy’	/zanzan/	‘excess’	/tuʔ/	‘existential cop’
/ts ^h e/	‘life’	/kyen/	‘condition’	/ʃa/	‘deity’
/ts ^h ö/	‘estimate’	/kyön/	‘defect’	/ʃo/	‘south’
/ra/	‘goat’	/k ^h a+pap ^h /	‘lips’	/ramba/	‘dried bamboo’
/ru/	‘horn’	/k ^h a+pup/	‘upside down’	/romba/	‘drain’
/bemo/	‘plumpish girl’	/t ^h or/	‘to scatter’	/bre/	‘measuring bowl’
/bembu/	‘duvet’	/t ^h ur/	‘downhill, bridle’	/bræ/	‘to scratch’
/k ^h o/	cf Table 2	/k ^h yo/	cf Table 2	/zet/	‘nail’
/sok ^h a/	‘spring (season)’	/p ^h a/	‘father’	/zærba/	‘wart’
/sök ^h a/	‘petition prayer’	/p ^h ræ/	‘to meet’		
/yár/	‘to borrow’	/yær/	‘summer’		

Table 4. Phonemic status of vowels in Brokpa

The three vowels, /ü/, /ö/, and /æ/ are hypothesized to be innovative vowels in Brokpa. There are two possible pathways that explain their development. One pathway is through the loss of coda consonants. For example, the word for ‘smoke’ written <dud.pa> in Classical Tibetan is /dur.pa/ in the Sakteng dialect and /düzak/ in the Merak dialect in which the loss of /d/ or /r/ has led to the development of a close front round /ü/ of the first syllable in Merak. The word /t^höpa/ ‘offering’ in Brokpa is written <mchod pa> in Classical Tibetan suggesting that the syllable final /d/ has developed into the close-mid near-front rounded /ö/. The other pathway is through crasis, fusion of

two vowel qualities or contraction of diphthongs, as in /mo=gi/ > > /moi/ > > /mö/ ‘3SG:ERG’; /ŋagi/ > > /ŋai/ > > /ŋæ/ ‘1:SG:ERG’.

The five vowels, /i/, /u/, /e/, /o/, and /a/ are the archaic vowels in Brokpa and their qualities in IPA are [i], [u], [e], [o], and [ɐ] respectively. The quality of innovative vowel /ü/ is quite close to [y:], /ö/ to [ø:], and /æ/ to [ɛ:].

2.3 Syllable structure and consonant clusters

The syllable templates possible in Brokpa are shown in Table 5 with examples. ‘C’ indicates a consonant or a glide, ‘V’ a vowel, ‘V:’ stands for a long vowel, and VV a diphthong; ‘OP’ stands for ‘open’ syllable type, ‘CL’ for ‘closed’ syllable, ‘L’ stands for ‘light’ syllable and ‘H’ for ‘heavy’ syllable. The segments C1C2 correspond to onset, V to nucleus, and C3C4 to coda. All syllables in Brokpa must minimally consist of an onset and a nucleus, C1V. There are no syllables which consist of only a vowel.

	TEMPLATE	EXAMPLE	MEANING	TYPE	WEIGHT
(a)	C1V	/ʔe/	‘grandmother’	OP	L
(b)	C1C2V	/bru/	‘grain’	OP	L
(c)	C1VC3	/nám/	‘sky’	CL	H
(d)	C1C2VC3	/bruk ^h /	‘scratch’	CL	H
(e)	C1VC3C4	/d ^h ans/	‘memory’	CL	H
(f)	C1V:	/k ^h a:/	‘snow’	OP	H
(g)	C1C2V:	/bre:/	‘divorce’	CL	H
(h)	C1V:C	/go:m/	‘evening’	CL	H
(i)	C1VV	/láu/	‘easy’	OP	H
(j)	C1C2VV	/ploi/	‘roll’	OP	H

Table 5. Syllable templates in Brokpa

The syllable types (a), (b), (f), (i), and (j) are open and (c), (d), (e), (g), and (h) are closed. Only the first two syllable types, (a) and (b), are light (containing one mora) and all other syllable types are heavy (containing two moras). This light versus heavy syllable distinction or the distinction of moraicity is important for stress assignment in Brokpa (§4.1).

The CV and CVC are the most frequent syllable structures. The CCV and CCVC structures also occur fairly frequently. The CVCC is the least frequent syllable structure.

Any of the thirty-nine consonants can fill the C1 slot; only approximants— /r/, /l/, /w/, and /y/— may fill the C2 slot. The glides /w/ and /y/, as phonemes, are more restricted to word-initial and word-medial positions and their occurrence in the C2 slot (consonant plus glide cluster word-initially) is very infrequent, found only in some speakers. The C3 slot may be filled by any of the following: voiceless, both unaspirated and aspirated, stops /p/, /p^h/, /t/, /t^h/, /k/, /k^h/; nasals /m/, /n/, /ŋ/; apico-alveolar fricatives /s/ and /z/; and two voiced liquids /r/ and /l/. A severe restriction applies on which consonant can fill the C4 slot. Only two, the voiceless apico-alveolar fricative /s/ and the voiceless lamino-palatal fricative /ç/ can occupy the C4 slot.

A word in Brokpa can consist of one or more of these syllable types. In a polysyllabic word, one syllable type can recur or it can co-occur with another syllable type. Examples of some polysyllabic words are /p^hak.pa/ ‘pig’, /kyap.te^hok.pa/ ‘handsome, beautiful’, /lɑŋ.bo.te^he/ ‘elephant’, /nor.bu.si.li/ ‘rhinoceros’. The breathy-voiced stops are disallowed in the word-medial position in a polysyllabic word. The voicing distinction for stops is neutralized word-finally, and every stop consonant is realized as voiceless at the end of a word.

Brokpa allows clusters of bilabial stops plus liquids, and dorso-velar stops plus liquids and glides in the onset position. Only a stop plus approximant clusters are allowed. Even within these allowable sequences, there are constraints on consonants that can combine with the two C2 consonants or the two glides as C2 members. Table 6 shows the permissible sequences of consonants in the onset /pr/, /pl/, /p^hr/, /br/, /bl/, /kr/, /ky/, /k^hy/, /gl/, and /gy/ with examples.

CLUSTER	EXAMPLE	MEANING
/p/ + /r/	/preŋbu/	‘poor’
/p/ + /l/	/ploi/	‘to roll’
/p ^h / + /r/	/p ^h ræ/	‘to meet’
/b/ + /r/	/brukor/	‘grain collection’
/b/ + /l/	/bluk ^h /	‘to burst’
/k/ + /r/	/krapkrup/	‘crispy’
/k/ + /y/	/kyowa/	‘sadness’
/k ^h / + /y/	/k ^h yeŋ/	‘to fill’
/g/ + /y/	/gyuk ^h /	‘to run’

Table 6. Onset consonant clusters in Brokpa

The occurrence of C4 is rare. Brokpa allows only limited possibilities for consonant clusters in the coda position. There are severe constraints on which C3 can combine with the two C4 consonants to create coda clusters. There are clusters of only stops plus fricatives, and nasals plus fricatives in the coda position.

Only /k/ can form a sequence with /s/ and /ɛ/, e.g. /doks/ ‘to arrive’, /dzike/ ~ /zike/ ‘to be afraid’. Likewise, only /n/ and /ŋ/ can form a sequence with /s/ in the coda position, e.g. /ʔotɛins/ ‘like this/that’, /yoŋs/ ‘to come’.

The occurrence of coda clusters is minimal and Brokpa already reveals a clear tendency to simplify these, as indicated by the free variation between /ʔotɛins/ ~ /ʔotɛis/ ‘like this’. There is also some tendency to reduce consonant clusters in the onset position by some younger generations of speakers, e.g. /bru/ ~ /qu/ ‘grain’, /bruk/ ~ /duk/ ‘dragon’. It is probably a sociolinguistic tendency toward sounding like Dzongkha.

Clusters with apico-alveolar stops as initial consonants, such as /tr/, /t^hr/, /dr/, do not exist because they have phonemicized into retroflex stops. The syllable-initial (onset) clusters correspond to the word-initial clusters, and the syllable-final (coda) clusters correspond to the word-final clusters in polysyllabic phonological words.

contrast in initial position, the intransitive member correlates with a voiced verb root and the transitive one with a voiceless verb root, e.g. intransitive /bap/ ‘to descend, to decrease’ versus transitive /p^hap/ ‘to reduce (an NP)’.

We can also find evidence for tone distinguishing transitivity. When the transitivity distinction is made by tone, the intransitive member is found to correlate with low tone and the transitive member with high tone, e.g. /laŋ/ ‘wake up’ which is an intransitive verb root versus /láŋ/ ‘wake (someone) up’ which is a transitive verb root.

2.5 Vowel length

The five archaic vowels, /i/, /u/, /e/, /o/, and /a/ are contrastive for length in open monosyllabic lexemes. The closed syllables can be short or long, but there is no phonemic length contrast in closed syllables. The three innovative vowels, /ü/, /ö/, and /æ/ are phonetically long. Table 8 presents minimal pairs showing vowel length contrasts in open syllables in Brokpa.

SHORT VOWEL		LONG VOWEL	
Example	Meaning	Example	Meaning
/tsi/	‘to consider’	/tsi:/	‘astrology’
/zu/	‘bow (archery)’	/zu:/	‘to dive’
/bre/	‘measuring bowl’	/bre:/	‘to divorce’
/tsa/	‘grass’	/tsa:/	‘to search’
/p ^h o/	‘male’	/p ^h o:/	‘thorax’

Table 8. Contrastive vowel length in open syllables in Brokpa

As Table 9 shows how vowel length is contrastive both in open and closed syllables in Dzongkha which is genetically related to Brokpa. In the Dzongkha phonemic transcription, (ˈ) indicates high tone, the diacritic over a vowel (ˆ) indicates falling contour, and (˘) devoicing.

OPEN SYLLABLE		CLOSED SYLLABLE	
Short	Long	Short	Long
/bˈu/ [b̥u] ‘son’	/pû/ [pu:] ‘wrap around’	/tsip/ [tsɪp] ‘stone wall’	/tsîp/ [tsi:p] ‘astrologer’
/bˈa/ [b̥ɜ] ‘cow’	/bã/ [b̥ɛ:] ‘wool’	/map/ [mɜp˥] ‘husband’	/mâp/ [mɛ:p˥] ‘red’
/bˈo/ [b̥o] ‘call’	/pô/ [pɔ:] ‘pluck’	/num/ [num] ‘oil’	/nûm/ [nu:m] ‘younger sister’

Table 9. Contrastive vowel length in open and closed syllables in Dzongkha

The vowel length contrast in closed syllables in Dzongkha can be attributed to the fact that many historically disyllabic lexical cognates between Brokpa and Dzongkha are realized as disyllabic in

Brokpa and as monosyllabic in Dzongkha. Table 10 presents some lexical cognates which are realized as disyllabic in Brokpa and monosyllabic in Dzongkha (Dzongkha data including the transcription rules are from Watters 2018; lexeme for ‘Dharma practitioner’ is my addition).

BROKPA	DZONGKHA	MEANING
/tsi.pa/ [ˈtsi.pə]	/tsip/ [tsi:p]	‘astrologer, accountant’
/már.bo/ [ˈmár.bo]	/mâp/ [mɛ:pʰ]	‘red’
/nou.mo/ [ˈnou.mo]	/nûm/ [nu:m]	‘younger sister’
/tɛ ^h os.pa/ [ˈtɛ ^h os.pə]	/tʃ ^h ôp/ [tʃ ^h o:p]	‘Dharma practitioner’

Table 10. Some lexical cognates realized as disyllabic in Brokpa and monosyllabic in Dzongkha

Considering the orthographic representation of these words in Classical Tibetan, <rtsis pa> ‘account/astrologer’, <nu mo> ‘younger sister’, and <chos pa> ‘Dharma practitioner’, Brokpa has retained the number of syllables of the shared proto-language whereas Dzongkha has reduced the number of syllables and innovated vowel length contrast in closed syllables. Kurtöp (Hyslop 2017:50-51) is similar to Brokpa with contrastive vowel length only in open syllables.

3 Tone

Brokpa has two register tones, distinguished by pitch height applied over a syllable within a phonological word. Syllables with obstruents have an inherent pitch value, whereas syllables beginning with sonorants are contrastive for pitch. The phenomenon of pitch in Brokpa can be understood in terms of the ‘onset voice effect’ (OVE). This is a phenomenon that has been well documented in many languages where there is a strong correlation between vowel pitch and the phonation class of the consonant which precedes it (Kirby and Ladd 2015). This has been documented for non-tonal languages like English and French (Hombert 1978 and Hombert et. al 1979), and in Dzongkha (Watters 2018). The OVE can also be seen in languages that are developing tonal contrast (Howe 2017).

In Brokpa, the voiceless stops have corresponding high pitch, and the voiced stops have corresponding low pitch and breathy voice on the vowel. Pitch in this context is not contrastive, and will not be illustrated in this paper. Pitch that follows sonorant consonants, however, is contrastive, and will be referred to as tone.

Since tone is contrastive exclusively on syllables with sonorant-initial consonants in Brokpa, only the vowels following high-tone initial sonorants are overtly marked in the working orthography. The low tone after sonorant-initials is treated as the default tone and is left unmarked orthographically. Pitch is not marked on words where it corresponds to the phonation type of the onset. Table 11 shows contrastive tone on words with sonorant initials.

HIGH TONE		LOW TONE	
Lexeme	Meaning	Lexeme	Meaning
/már/	‘red’	/mar/	‘butter’
/máŋ/	‘base’	/maŋ/	‘to be in excess’
/núp/	‘west’	/nup/	‘to set’
/ŋú/	‘silver’	/ŋu/	‘to cry’
/já/	‘edge’	/ja/	‘fish’
/lók/	‘to recite’	/lok/	‘to return’
/yár/	‘to borrow’	/yar/	‘to run’
/wón/	‘power’	/won/	‘hole’

Table 11. Contrastive tone on sonorant-initial words in Brokpa

Pitch height in lexemes beginning with rhotic /r/ is not contrastive. It exhibits the OVE distribution of stops, i.e., /ra/ ‘goat’ vs /ra/ ‘hair’, /raŋ/ ‘self’ vs /raŋ/ ‘to swell’. However, voicing and pitch are contrastive in words commencing with the apico-alveolar lateral /l/, e.g., /la/ ‘mountain’ vs /la/ ‘deity’, /læ/ ‘karma’ vs /læ/ ‘to overflow’. The pitch contrasts between these words are phonologically the same as the /lok/ /lók/ pair illustrated in Table 11.

To illustrate the differences in pitch heights in high-tone and low-tone words commencing with sonorants, the pitch of three pairs of words spoken by a 63-year-old female from Sakteng were analyzed. These words provide characteristic examples. It is fairly easy to perceive the difference in high versus low tone contrast on words with sonorant-initials even without a pitch analysis.

Figure 1 gives a visual representation of the pitch contrast between high and low tone. Table 12 shows numerical data that further illustrate the contrasts in the maximum pitch heights of the syllable. Figure 1 illustrates the pitch traces of the high-tone word /lát.pa/ ‘brain’ and the low-tone /lak.pa/ ‘hand’. Pitch height is measured on the y axis in hertz, and duration is measured on the x axis in milliseconds.

The pitch traces show a second short trace following a longer one; this second trace is the pitch of the syllable /pa/. The focus of comparison is on the first trace which overlies the syllable /lát/ and /lak/. The pitch trace for /lát/ rises through the /l/, is level over the /á/, and then falls to meet the /t/. The maximum pitch is realized in the vowel, and its value is 252 Hz. The pitch trace for /lak/ remains level throughout the syllable, and the maximum pitch in the vowel is 191 Hz. The difference between maximums is approximately 60 Hz, a difference that is perceptually robust. The rise in pitch through the /l/ in /lát/ is a case of pitch assimilation, wherein the pitch of the sonorant rises in anticipation of the high tone of the vowel.

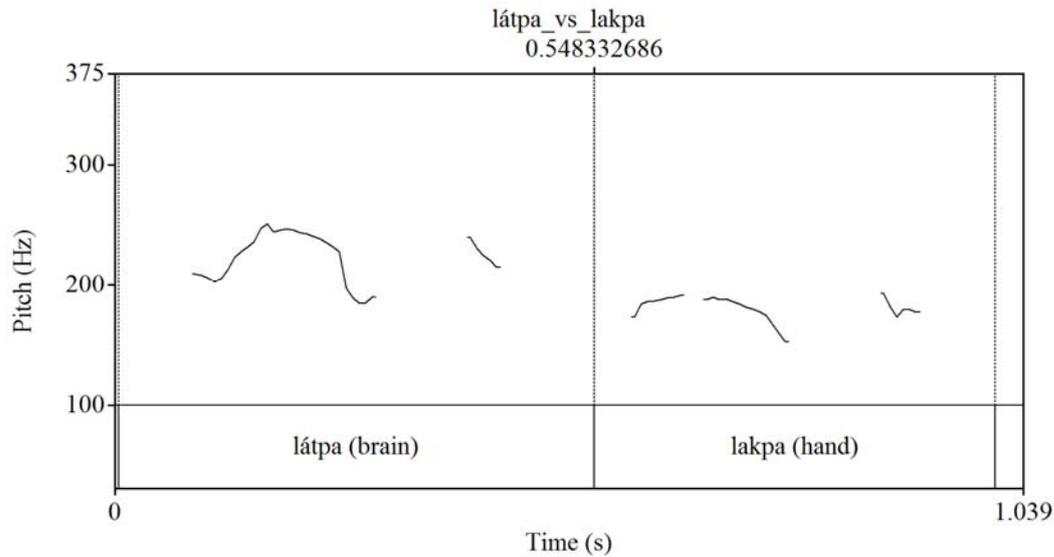


Figure 1. Pitch contours of *látpa* 'brain' versus *lakpa* 'hand'

Table 12 gives the maximum pitch for high and low tone words. While the number of contrasts is small, it confirms what was learned while living in situ among community members. The pitch values of words with high tone are consistently higher than those with low tone. The average difference in maximum pitch between these pairs is 72.28 Hz. Again, this is a perceptually robust difference.

	HIGH (HT)		LOW TONE (LT)		Difference (HT-LT)
	Example	Max pitch (Hz)	Example	Max pitch	
1)	/ló/ 'lung'	261.20	/lo/ 'year'	214.97	46.23
2)	/ŋú.na/ 'sweat'	324.66	/nu.ma/ 'breast'	215.47	109.19
3)	/lát.pa/ 'brain'	252.56	/lak.pa/ 'hand'	191.12	61.44

Table 12. Comparative pitch analysis of high tone vs low tone

Figure 2 shows the pitch values of the three pairs of words (1, 2, and 3) provided in Table 12.

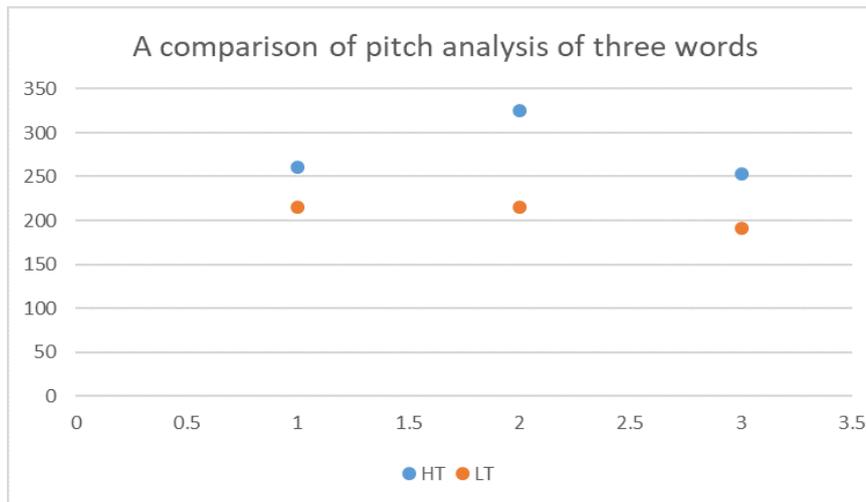


Figure 2. Comparative pitch values of high-tone words versus low-tone words

There are a number of areas that require further confirmation of in situ learning, and mother-tongue knowledge of related languages. One of these is that Brokpa has a prosodic assimilatory process occurring over the negation and verb stem boundary which can be referred to as ‘pitch assimilation’. A low-register verb stem takes the negation prefix /ma-/ or /mi-/ with a low pitch, as in /ma-gya/ ‘NEG-do’, /mi-qo/ ‘NEG-go’.

On the other hand, a high-register verb stem takes negation prefix /má-/ or /mí-/ with a high pitch, as in /má-yúk/ ‘NEG-shake’, /má-lúk/ ‘NEG-pour’. This assimilation of pitch from the verb stem to the negation prefix occurs in words with sonorant-initials with lexically contrastive tone, e.g. /má-náj/ ‘NEG-give:HON’; it also occurs in words with obstruent-initials without lexically contrastive tone, e.g. /má-ploi/ ‘NEG-roll’. Therefore, this process may be described as ‘pitch assimilation’ instead of ‘tone spreading’.

Another of these is the study of tonogenesis which has been documented for many other Trans-Himalayan languages in the neighbourhood. Hyslop (2009) succinctly explains the interaction of tone and voicing in Kurtöp. Besides the loss of initial voicing contrast and loss of coda consonants, tonogenesis in the Trans-Himalayan languages is said to be involving several other pathways. Tonogenesis can be from stress to pitch, as suggested by Caplow (2016) on the basis of the Balti stress pattern, from length to pitch as suggested by Watters (2018) on the basis of Dzongkha, or breathy voice alone could trigger tonogenesis, as asserted by Suzuki (2015) based on mBrugchu Tibetan. All these pathways are within the bounds of possibility for tonogenesis in Brokpa.

Brokpa can be said to be exhibiting characteristic symptoms of all these processes of tonogenesis on account of the following: the presence of breathy phonation; the contrastive length only for the archaic vowels and not for the innovative vowels; the onset clusters with stops as initial consonants; the preservation of remnants of coda clusters and coda consonants; the partially contrastive tone; and the conflation of stress and tone on sonorants. As Matisoff (2003) postulates for Tibeto-Burman languages, tone could be an independent development in Brokpa not just through one tonogenetic principle—namely the loss of initial voicing contrast—, but by means of one or more, or all, of these processes. The process of tonogenesis may well be an instance of what Sapir (1921:2) calls ‘parallelisms in drift’ in which genetically related languages pass through strikingly similar phases of development.

4 Stress and phonological words

4.1 Stress

Stress serves as a useful criterion for a phonological word in Brokpa. Stress is not contrastive but it serves as a non-phonemic boundary signal and helps to identify phonological words, fulfilling ‘delimitative function’ (Trubetzkoy 1939; Aikhenvald 2015). Stress in Brokpa is a kind of (prosodic) feature that makes the language sound more natural and native-like. If an utterance is not in line with its generally-accepted stress pattern, it runs the risk of sounding unnatural. For example, if words like /brɛŋga/ ‘chest’ and /ŋar^hi/ ‘roar’ which have stress on the first syllable, [ˈbrɛŋ.gə] and [ˈŋər.p^hi], are stressed on the second syllable, [*brɛŋ.ˈgə] and [*ŋər.ˈp^hi], they will sound odd although their meanings may be understood. Therefore stress in Brokpa is to be considered as an essential feature of the language.

Some other Bodish languages such as Kurtöp (Hyslop 2017) and Dzongkha (Watters 2018) are also reported as having stress accent, albeit non-phonemic. Dongwang Tibetan, a sub-dialect of Kham described as having three phonemic tones, is reported as a language with non-phonemic stress (Bartee 2007).

Caplow (2016) asserts that stress in Balti is contrastive and suggests that tonogenesis in Tibetan must take account of transphonologization of stress to tone. Watters (2018:69) presumes that length, which he finds as analogous to stress in Dzongkha, could be “a manifestation of transphonologization from length to pitch”.

In Brokpa, a disyllabic root takes a single stress which is the primary stress; but longish roots of three or more syllables take a primary and a secondary stress. A syllable bearing primary stress is one with greater force of respiratory energy and an increased tension of the vocal folds (Ladefoged and Disner 2012:23). A syllable bearing secondary stress in Brokpa is the one which has relatively less energy than the one receiving the primary stress but more strongly than an unstressed syllable within a phonological word.

Tone and intonation are manifested by pitch measured in terms of the fundamental frequency of sound waves while loudness, measured in terms of intensity (acoustic energy), is considered to be indicative of stress (Ladefoged 2003:90). While loudness (intensity) is an acoustic correlate of stress in Brokpa, the stressed syllables also correlate with high pitch and vowel length. A stressed syllable is likely to be some combination of increased pitch, length, and loudness (Ladefoged 2003).

It turns out that stress in Brokpa is more influenced by the phonemic structure of the rhyme. The stress placement in Brokpa is sensitive to the syllable weight or the moraic structure; that is, whether a syllable is light or heavy. A distinction between a light versus a heavy syllable in Brokpa was made under the syllable structure in §2.3. To recapitulate, a light syllable is any open syllable in which the rhyme is occupied by a short vowel, that is any one of /i, e, a, u, o/. An open syllable in which the rhyme consists of either a long vowel or a diphthong is a heavy syllable. In other words, all closed syllables are heavy; and open syllables with long vowels or diphthongs are also heavy.

The study of the stress patterns in Brokpa is based on the analysis of the intensities of some twenty-four pairs of disyllabic words, involving different syllable types and combinations, spoken by

a male speaker (Speaker 1) and a female speaker (Speaker 2). Speaker 1 is from Merak and Speaker 2 is from Sakteng.²

Both speakers were in their early fifties. The words of Speaker 1 were extracted from a connected speech and those of Speaker 2 were recorded in isolation. The findings are also consistent with my perception, based on careful observation and listening and articulatory imitation, as well as the perception of the two native language consultants who helped me with transcription. The intensity analyses of the total of twenty-four words by the two speakers are grouped into the following syllable combinations: $\sigma 1.\sigma 2$ heavy.light; $\sigma 1.\sigma 2$ light.heavy; $\sigma 1.\sigma 2$ light.light; and $\sigma 1.\sigma 2$ heavy.heavy.

The number of tokens from each type of word are quite small but all the tokens covered in this analysis show direct correlation between loudness and syllable weight. The tokens covered also match with my own perceptions, and mother-tongue intuitions of my consultants. Figure 3 gives a visual representation of the stress pattern in disyllable words. The first syllable always takes primary stress unless the word has a $\sigma 1.\sigma 2$ light.heavy structure in which case it is the heavy syllable that is stressed.

Thus, in Figure 3, each graph shows an oscillogram with an overlay of intensity levels, as measured in dB (decibels). The intensity of the first syllable is greater than the second syllable in /kyespa/ 'man' (top left), /bomo/ 'daughter/girl' (bottom left), and /d^ho:=teik/³ 'a friend' (bottom right). This pattern contrasts with the intensity of the word /nilam/, wherein the intensity of the second syllable is greater than the first. The numerical values of words with differently weighted syllables are given in Tables 13 through 16.

²Merak and Sakteng are the two main Brokpa-speaking villages in Bhutan.

³This is a phonological word formed by adding an enclitic to a monosyllabic stem. Note that an enclitic is not stressed and cannot constitute a phonological word on its own; and an enclitic typically does not bear stress when it forms a unit of a phonological word with a stem preceding it. However, when an enclitic is added to a monosyllabic stem, the stress may fall on the enclitic if the preceding monosyllabic stem is a light syllable.

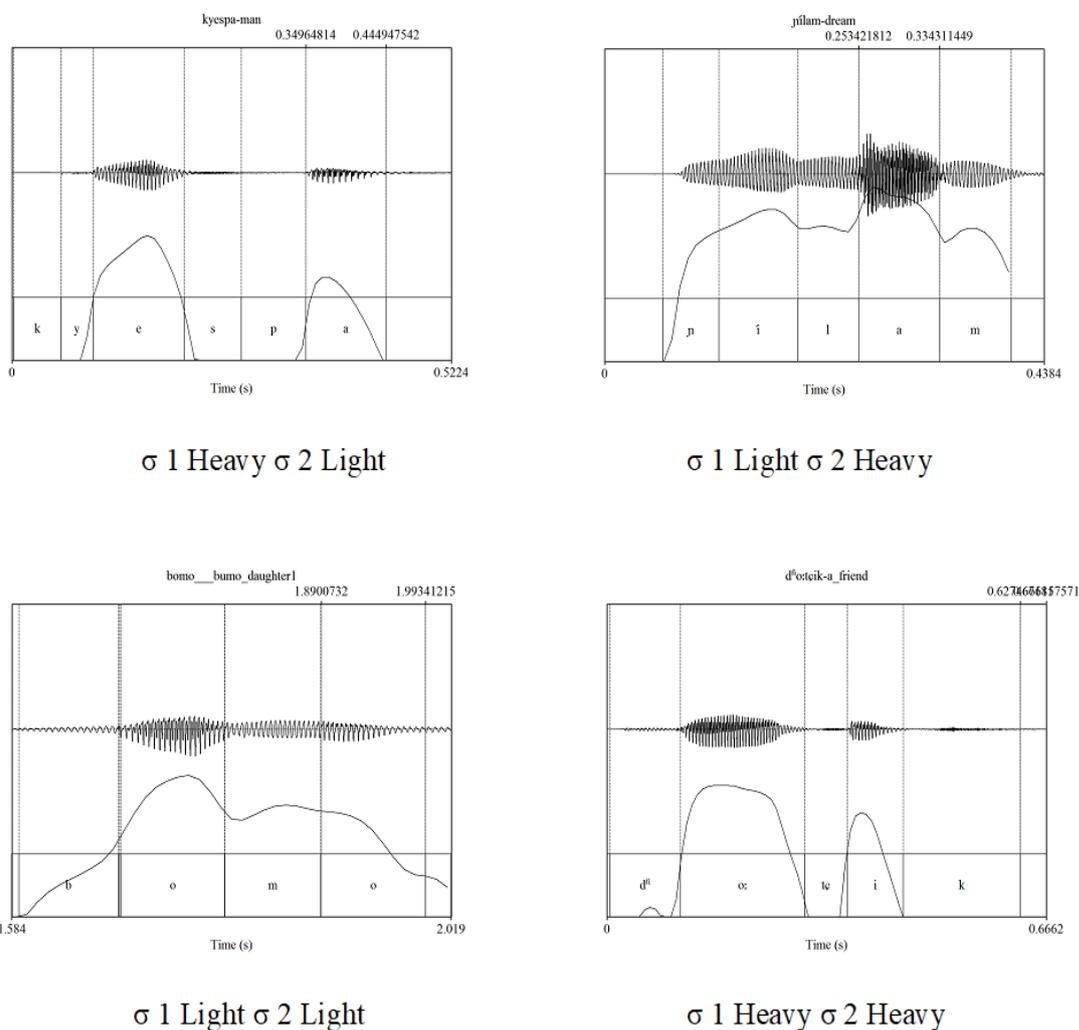


Figure 3. Visual representation of the four possible word structures vis-à-vis syllable weight

A. Where σ 1. σ 2 has a heavy.light structure:

Table 13 gives the values of the highest intensity of each syllable of the three pairs of words for Speaker 1 and Speaker 2. The first column gives the Brokpa word and gloss, followed by the measurements of the maximum dB level for each syllable. The difference in dB level is given in the rightmost column. The data show that the intensity of σ 1 is greater than σ 2 in all the words spoken by both Speaker 1 and 2. The average difference in maximum intensity for Speaker 1 is 3.64 dB and 5.22 dB for Speaker 2.

	EXAMPLE	$\sigma 1$ (HEAVY)	$\sigma 2$ (LIGHT)	DIFFERENCE (dB)
				($\sigma 1 - \sigma 2$)
Speaker 1	/tun.dɛ/ ‘discussion’	73.20	69.74	3.46
	/yak.po/ ‘good’	67.51	64.68	2.83
	/tem.re/ ‘celebration’	70.97	66.33	4.64
Speaker 2	/kyes.pa/ ‘man’	69.94	63.39	6.55
	/k ^h a.ma/ ‘kidney’	74.06	68.62	5.44
	/muk.ki/ ‘itch’	79.29	75.61	3.68

Table 13. Intensity (dB) in words where $\sigma 1.\sigma 2$ has a heavy.light structure

B. Where $\sigma 1.\sigma 2$ has a light.heavy structure:

Table 14 gives the values of words where syllable $\sigma 1$ is light and $\sigma 2$ is heavy. Here, there is change in pattern, and it is $\sigma 2$ that is greater in loudness. The difference between $\sigma 1$ and $\sigma 2$ is a negative value. That is, $\sigma 1$ is less than $\sigma 2$ for both Speaker 1 and 2. The average negative difference in loudness for Speaker 1 is 3.31 dB and 3.19 dB for Speaker 2. Note that the average differences are still comparable with the other word structures.

	EXAMPLE	$\sigma 1$ (LIGHT)	$\sigma 2$ (HEAVY)	DIFFERENCE (dB)
				($\sigma 1 - \sigma 2$)
Speaker 1	/de.næ/ [de.nɛ:] ‘then’	75.73	78.98	-3.25
	/ri.ma:/ ‘shadow’	72.95	77.78	-4.83
	/pe.tam/ ‘saying’	73.30	75.17	-1.87
Speaker 2	/be.tsa:/ ‘sand’	68.66	72.15	-3.49
	/diriŋ/ ‘today’	73.32	75.73	-2.41
	/ɲi.lam/ ‘dream’	74.36	78.05	-3.69

Table 14. Intensity (dB) in words where $\sigma 1.\sigma 2$ has a light.heavy structure

C. Where $\sigma 1.\sigma 2$ has a light.light structure:

Table 15 gives the values of words where both syllables are light. Once again, the data show that the intensity of $\sigma 1$ is greater than $\sigma 2$ in all the words spoken by both Speaker 1 and 2. The average difference in loudness for Speaker 1 is 4.83 dB and 4.11 dB for Speaker 2.

	EXAMPLE	$\sigma 1$ (LIGHT)	$\sigma 2$ (LIGHT)	DIFFERENCE (dB)
				($\sigma 1 - \sigma 2$)
Speaker 1	/k ^h a.da/ ‘scarf’	75.15	72.99	2.16
	/mu.zu/ ‘other’	73.38	65.48	7.90
	/de.ga/ ‘exactly’	69.27	64.83	4.44
Speaker 2	/bo.mo/ ‘daughter’	72.65	66.78	5.87
	/tsi.ma/ ‘rib’	74.37	70.05	4.32
	/so.la/ ‘charcoal’	71.27	69.11	2.16

Table 15. Intensity (dB) in words where $\sigma 1.\sigma 2$ has a light.light structure

D. Where $\sigma 1.\sigma 2$ has a heavy.heavy structure:

Similarly, Table 16 gives the values of words where both syllables are heavy. The data show that the intensity of $\sigma 1$ is greater than $\sigma 2$ in all the words spoken by both Speaker 1 and 2. The average difference in loudness for Speaker 1 is 4.30 dB and 7.89 dB for Speaker 2.

	EXAMPLE	$\sigma 1$ (HEAVY)	$\sigma 2$ (HEAVY)	DIFFERENCE (dB)
				($\sigma 1 - \sigma 2$)
Speaker 1	/dze:=zik/	80.52	78.76	1.76
	/top.teæ/ [‘top.teɛ:] ‘food’	69.97	66.17	3.8
	/dik-næ/ [‘dik.nɛ:] ‘arrange-SEQ’	70.91	63.57	7.34
Speaker 2	/gyap.teŋ/ ‘back’	73.25	65.24	8.01
	/gaŋ.t ^h aŋ/ ‘all’	72.72	61.41	11.31
	/d ^h o:=teik/ ‘a friend’	71.01	66.66	4.35

Table 16. Intensity (dB) in words with $\sigma 1.\sigma 2$ heavy.heavy structure

In summary, the intensities of the disyllabic words show a relative difference in intensity between syllables of different weight. The first syllable always has greater levels of intensity, unless the word is a light.heavy structure, in which case it is the heavy syllable which takes greater intensity levels. We take this pattern to be an acoustic indicator of phonological stress.

Preliminary elicited data show secondary stress in longish roots of three or four syllables. It is particularly rare to find roots with more than four syllables, disregarding the compounded or reduplicated stems. Secondary stress operates in two instances: when a single lexeme is trisyllabic or quadrisyllabic; and when a resulting form is trisyllabic or quadrisyllabic after the morphological process of affixation/cliticization has applied to a monosyllabic or a disyllabic root. Affixes and clitics

may take secondary stress or primary stress in isolated instances, depending on the number of syllables the resulting form has and their position in a string of affixes and/or clitics.

In compounded or reduplicated words/stems, the primary stress applies independently to each component of a compound or on each reduplicand; and the secondary stress may apply only if each component/reduplicand involves three or four syllables. However, there are some compounds which have undergone complete lexicalization and behave as indivisible lexemes with polysyllabic roots to which secondary stress may apply.

The placement of secondary stress in Brokpa is contingent upon the primary stress and is reasonably straightforward. If the primary stress on a trisyllabic or quadrisyllabic word is on the first syllable, the secondary stress always falls on the third syllable. The secondary stress bearing unit will be the final syllable in case of a trisyllabic root, e.g. /lɔŋ.bo.tɕʰe/ [ˈlɔŋ.bo.tɕʰe] ‘elephant’ and the penultimate syllable in case of a quadrisyllabic root, e.g. /ko.ka.li.ko/ [ˈkɔ.kɕ̥.li.kɔ] ‘crow/squawk’, /ɕeu.za.kuk.pa/ [ˈɕeu.zɕ̥.kuk.pɕ̥] ‘hoopoe’. If the primary stress in a trisyllabic root is on the second syllable, there is no discernible secondary stress, e.g. /kʰa.rak.pa/ [kʰɕ̥.rək.pɕ̥] ‘quiet’. If the primary stress is on the second syllable of a quadrisyllabic root, then secondary stress is on the fourth syllable which will be the final syllable, e.g. /ta.lai.zik.pa/ [tɕ̥.ˈlɕ̥i.zik.pɕ̥] ‘centipede’.

The stress pattern in Brokpa is such that the primary stress can be either on the first syllable or on the second syllable. Likewise, the secondary stress can be on the final syllable or on the penultimate syllable. We can recognize a phonological word in Brokpa by suggesting that every phonological word contains just one primary stress and a secondary stress for words with three syllables and beyond. In that way stress functions as non-phonemic word boundary signal in Brokpa.

4.2 Phonological words

Considering the stress pattern described in §4.1, there is a marked tendency for the primary stress to fall on the first syllable and the secondary stress to fall on the final syllable. When the primary stress is on the first syllable, it signals the beginning of a phonological word; and when the primary stress falls on the second syllable it marks the vicinity of the beginning of a phonological word (Trubetzkoy 1939:278). In the same manner, the secondary stress marks the end of a phonological word or the vicinity of the end of a phonological word. In words beginning with sonorant initials, high tone also helps to recognize the beginning of a phonological word boundary. In addition to these suprasegmental features, segmental features such as phonotactic restrictions and phonological rules such as resyllabification may signal a phonological word boundary.

Every monomorphemic lexeme in Brokpa has conventionalized coherence and meaning, without any pause within a word, and has the ability to stand alone as a complete utterance (Dixon 2010b) and therefore is a grammatical word. Similarly, every monomorphemic lexeme in Brokpa bears a primary stress, and potentially a secondary stress, and is a phonological word. Which syllable receives the primary (and secondary) stress, as indicated by the stress pattern, is determined by the number of syllables a monomorphemic lexeme contains, the weight of each syllable and their position within a word.

- (3) *par.pun.tsʰan* *yóm*
 ['pər.pʊn. tsʰən] ['jóm]
 sibling other
 'The other sibling'

In (3), there are two monomorphemic words /parpuntsʰan/ 'sibling' and /yóm/ 'other' forming two distinct phonological words with the former bearing both primary and secondary stress and the latter a single primary stress. The word /yóm/ also commences with a glide, a sonorant, and a high tone which is evidence for a phonological word.

The suffixes in Brokpa cohere with the host to which they attach for the purpose of stress placement and form a unit with a phonological word preceding them. The primary stress falls on the stem, in accordance with its stress pattern, and a suffix may receive a secondary stress depending on the number of syllables in the resulting form of a phonological word, as in (4).

- (4) *za:-go-ro*
 ['zɛ:.gɔ. rɔ]
 keep-MOD:OBLIG-FIN
 '(We) must keep'

In addition to stress, the evidence for a phonological word involving a stem and suffix(es) can be found in resyllabification. If a stem ends in an open syllable and if a suffix is of CV template, the final vowel from the suffix may be omitted and the remaining consonant resyllabifies as part of the stem, /dɔ-sa/ ~ /dɔs/ ['dɔs] (go:NOMZ) 'destination'; /tɛʰa:-ma/ ~ /tɛʰa:m/ ['tɛʰə:m] (sweep:NOMZ) 'broom'; /tsa:-næ/ ~ /tsa:n/ ['tsə:n] (search-SEQ) 'after/by searching'.

In general, enclitics also do not bear primary stress and cohere with the host and form one phonological word with the stem. The primary stress falls on the stem, the position of which is determined by the stress placement rules, and constitutes a phonological word, as in (5)⁴.

- (5) *bomo* *ni=la*
 ['bo.mo] ['ni.lə]
 girl two=DAT
 'To the two girls'

In (5), the boundary of the two phonological words, /bomo/ 'girl' and /ni/ 'two', can be discerned from the location of the primary stress. The dative enclitic /=la/ prosodically coheres with the stem /ni/ and form one phonological word with it. The commencement of the second phonological word in (5) can also be understood from phonotactic restriction. In Brokpa, certain phonemes have a tendency to occur only in the syllable-initial position. One such phoneme is the lamino-palatal nasal /ɲ/.

As the word /yóm/ 'other' in example (3) and /ni/ 'two' in example (5) illustrate, high tone on sonorant-initials also helps to recognize phonological word boundary. In example (6), /ɲén=gi/ is one phonological word, formed by the stem /ɲén/ 'marriage' and the cohering genitive enclitic /=gi/, and

⁴ The bracketing in the phonetic transcription marks the boundaries of phonological words, not morphological structure.

the stem /jén/ has a high tone. Tonal system relating to the phonological word is reported for Lhasa Tibetan (Sprigg 1955) which is a close linguistic relative of Brokpa.

- (6) *dirij* *jén=gi* *temre*
 [di.'rɨŋ 'jén.gi 'tem.rɛ]
 today marriage=GEN celebration
 'The wedding ceremony today...'

An enclitic may bear secondary stress if a resulting form after encliticization contains three or four syllables, but a secondary stress does not engender a separate phonological word. As in a polysyllabic but monomorphemic lexeme, an enclitic bears a secondary stress within a single phonological word.

- (7) *ta* *ní=zam=zík=ki*
 ['tə:] ['ní.zəm. zík.ki]
 horse two=APPROX=INDEF=GEN
 'About two horses.'

Further evidence for the relevance of a phonological word involving a stem and an enclitic comes from diphthong formation. If a stem ends in an open syllable and the following enclitic is of CV sequence, the initial consonant from the enclitic may be omitted and the resulting vowel fuses with the stem forming a diphthong, e.g. /k^ho=gi/ ~ /k^hoi/ ['k^hoi] 'his'; /dɔŋbo=gi/ ~ /dɔŋboi/ ['dɔŋ.boi] 'ancient' (lit. 'of the past'). If a stem ends in a closed syllable, diphthong formation is not permitted, e.g. /mákpon=gi/ '(general=GEN) 'of general' cannot be /*mákpoi/.

Most grammatical categories in Brokpa are marked by suffixes and enclitics. Similarly, most word-class-changing derivations are achieved by means of suffixes. The markers of only one or two grammatical systems are realized as prefixes. One is negation. Brokpa has two prefixes for negating predicates, /ma-/ (PERV) and /mi-/ (IMPERV). These two prefixes apply directly to the verb root. Only the prefix /ma-/ is used to negate some adjectives morphologically like verbs, especially those from the VALUE and SIMILARITY semantic types.

Another type of phonological word in Brokpa can be a prefix plus stem. The prefix /ma-/ or /mi-/ forms a prosodic unit or a phonological word with the stem, irrespective of whether the stem is a verb, as in (8a) and (8b) or an adjective, as in (8c). The stress assignment is in accordance with its stress patterns and the stress may or may not fall on the prefix.

- (8) a. *ma-zin*
 [mɛ.'zɨn]
 NEG-complete
 'Did not complete'
- b. *mi-za*
 ['mi.zɛ]
 NEG-eat
 'Will not eat'

- c. *ma-yakpo*
 [mɐ.ˈjək.pɔ]
 NEG-good
 ‘Bad’

If the stem is a heavy syllable, and the CVC structure is like in (8a), then the stem is stressed but the prefix still is part of one phonological word with the stem. There is no pause and nothing can intervene in between the prefix and the stem. If the stem has a light CV syllable structure and is without any affix or an enclitic, the negation prefix is stressed, like in (8b). The main stress falling on the prefix when a grammatical word consists of a prefix plus stem only is reported for Limbu (Hildebrandt 2007).

There is another noteworthy prefix in Brokpa. In order to create a semantic effect of intensification, the morpheme /man/⁵, homophonous with negative copula /man/, is prefixed to a negated adjective or a negated predicate. In such constructions, the morpheme /man/ is functioning as a grammaticalized prefix bringing about a semantic effect of intensification on adjectives and emphasis on verbs. Then we have a form involving a stem and a sequence of two prefixes. The first prefix /man-/, glossed as ‘INTENS’, does not cohere. It is a heavy syllable forming an independent constituent within a phonological phrase, as in (9a) and (9b).

Example (9b) is a complex verb stem meaning ‘dishearten’ formed by incorporating the noun /k^hot^ha/ ‘hope’ into the verb /tɛ^hæ/ literally meaning ‘to cut/stop’. The stress rules apply independently on the incorporated noun, the intensification prefix /man-/, and on the verb stem after the morphological process of negation has applied. In such a compound, the negation prefix /má-/ always appears together with the verb root suggesting that they have formed a prosodic unit before the morphological process of compounding. The entire resulting form in (9b) is one lexical unit consisting of three phonological words.

- (9) a. *man-ma-ɖau*
 [ˈmən.mɐ.ˈɖəu]
 INTENS-NEG-same
 ‘Totally different’
- b. *k^hot^ha+man-má-tɛ^hæ*
 [ˈk^hɔ.t^hɐ.ˈmən-mé-ˈtɛ^hæ]
 hope+INTENS-NEG-cut
 ‘Not be (really) disheartened’

Another possible phonological word in Brokpa can be a stem with prefix(es) and suffix(es) and/or enclitic(s). The prefixes and suffixes/enclitics cohere with the stem. The placement of stress is again dictated by the syllable structure and the primary stress does not always fall on the prefix.

⁵ The morpheme /man/ appears to be from the adverb /maneraŋ/ ‘never’. Whereas the adverb /maneraŋ/ occurs as a stand-alone lexical grammatical word, the form /man-/ cannot stand on its own and is prefixed to a negated verb or to a negated adjective. There is no pause between the prefix /man-/ and the following stem. In contrast, there can be a pause between the adverb /maneraŋ/ and the following verb stem.

But they form a prosodic unit with the stem as in (10a) and (10b). Even when the prefix is unstressed, it combines with a fully stressed root syllable forming ‘bulging monosyllables’ or ‘sesquisyllables’ (Matisoff 2001).

- (10) a. *ma-næn-næ*
[mɐ.ˈnɛ:n.nɛː]
NEG-listen-SEQ
‘Without listening/by not listening’
- b. *ma-dau=zik*
[mɐ.ˈdau.ziʔ]
NEG-same=INDEF
‘A different (one)’

Several publications on word, particularly those concerning Tibeto-Burman and South-Asian languages, mention the fact that prefixes in general do not cohere and remain unlicensed at the level of a phonological word (Bickel 1998; Hildebrandt 2007, 2014; Hall and Hildebrandt 2008; Hall; Hildebrandt; and Bickel 2008). Hildebrandt (2007) finds one particular morphological domain, prefix plus stem only, in which the prefix does cohere with the stem in Limbu. A prefix [ɟa:-] in Yidij is also reported to be non-cohering (Dixon 1977). As shown in (9), the prefix /man-/ in Brokpa conforms to this general tendency in that it does not cohere with the host to which it attaches and licences its own phonological word. Dixon (1977:162) suggests a plausible reason for the Yidij prefix [ɟa:-] not cohering, namely, that it may have an underlying disyllabic form /ɟawa/.

It is likely that if a prefix in Brokpa is a heavy syllable containing CVC syllable structure, it will be non-cohering; and if a prefix is a light syllable with CV syllable structure then it will cohere and form one phonological word with the stem, albeit that stress will be determined by its stress pattern.

There is some evidence suggesting that prefix and stem harmonization is possible in Brokpa. One is regressive pitch assimilation discussed in §3 whereby high pitch spreads leftwards from root (inherently high register stem or high-tone stem) to the prefix. As example (11) shows, the pitch assimilation does not affect the nominalizing suffix /-ŋai/ even though it is part of the phonological word with the stem and prefix.

- (11) a. *má-taŋ-ŋai*
[mé.ˈtəŋ.ŋɛi]
NEG-send-NOMZ.PERV
‘Did not send/not sending’
- b. *má-náŋ-ŋai*
[mé.nəŋ.ŋɛi]
NEG-give:HON-NOMZ.PERV
‘Did not bestow/not bestowing’

Further evidence suggesting prefix and stem harmonization comes from the phonological process of consonant epenthesis. A consonant, glossed as a linker, can be inserted between gender morpheme which is prefixed to an adjectival root. In order for the prefixed component and the stem to form a single prosodic unit, it undergoes phonological adjustment across the prefix-stem boundary.

- (12) a. *p^ho-p-zəŋ*
 [ˈp^hop.zəŋ]
 MASC-LINK-to.be.good
 ‘Handsome’
- b. *mo-b-zəŋ*
 [ˈmob.zəŋ]
 FEM-LINK-to.be.good
 ‘Beautiful’

Further evidence comes from phonemic assimilation across the boundary of two words. One is /mal/ → /mæs/ ‘downwards’. The morpheme /mal/, originally formed by the combination of /ma/ ‘down’ and the locative/allative enclitic /=la/, functions as a directional adverb. The final /l/ assimilates into the initial sound of the following word, e.g. /mal Sakteŋ=la/ is realized as /mæs Sakteŋ=la/ ‘Towards Sakteng’.

We also see a phonological fusion taking place across an adverb /lok/ ‘again’ and the verb /yoŋ/ ‘to come’ followed by suffix /-næ/ which marks non-finite clauses/clause chaining, glossed as a sequential marker. Like the adverb /mal/, the adverb /lok/ precedes an NP argument or a verb phrase in predicate slot. What is /lok+yoŋ-næ/ [ˈloʔ.ˈyoŋ.næ:] (return+come-SEQ) ‘by/after returning’ in slow register is rendered as [ˈlo:ŋ] in rapid register. Two phonological words are reduced to one with a single stress.

The morphological processes of compounding, reduplication, and noun incorporation (lexical compounding) will be an instance of one grammatical word involving more than one phonological word. Stress rules operate independently on each component of a compound as in (13a), on each reduplicant as in (13b), and on an incorporated noun and verb root as in (13c).

- (13) a. *samba+nakpo*
 [ˈsəm.bə.ˈnək.pə]
 thought+black
 ‘Cruel’
- b. *ŋarmu-ŋar-kyəŋ*
 [ˈŋər.mu.ˈŋər.kjəŋ]
 sweet-sweet-SUPER
 ‘Extremely sweet’
- c. *ɛa+za-m-gan*
 [ɛɐː.ˈzəm.gən]
 meat+eat-LINK-NOMZ
 ‘Non-vegetarian’

An exception in which stress does not operate independently on each component of a compound or each reduplicant can be the fully lexicalized compounds as in (14a) and some lexemes with inherent reduplication, as opposed to morphological reduplication as in (14b).

- (14) a. *p^ha+ma*
[ˈp^hɛ.mɛ]
father+mother
'Parents'
- b. *rap ~ rip*
[ˈrɔp.rɪp]
? ~ ?
'Unclear, foggy'

A compound such as in example (14a) has undergone full lexicalization forming one phonological word and takes only single primary stress. There is no discernible meaning of the reduplicant in (14b) and the entire inherently reduplicated form functions as a single phonological word.

5 Conclusion

If we compare the phonology of Brokpa with that of Old Tibetan (Hill 2010) and of Classical Tibetan (DeLancey 2003; Beyer 1992), Brokpa can be said to be partially conservative. And in comparison with Dzongkha (Mazaudon and Michailovsky 1989; van Driem 1998; Watters 2018; van Driem and Tshering 2019), one of its close linguistic relatives, Brokpa retains some features of Old Tibetan and Classical Tibetan phonology, such as the onset clusters, coda consonants, and even some coda clusters. It is reasonable to assume that Brokpa was a language rich in consonant clusters, as is typical for many Bodish languages, with a simple vowel system; and, conceivably, without contrastive tone. But now Brokpa is in the process of simplifying its consonant clusters, losing coda consonants and developing into a tonal language from a non-tonal proto language, akin to the origin of tones in Vietnamese (Matisoff 2001, 2003; Haudricourt 1954).

Some phonological features we have seen in Brokpa include four contrasting stops and a two-register tone system. Breathily-voiced or the partially-aspirated stops contrast with regular stops, simple unaspirated voiceless stops, and voiceless aspirated stops. Register tone is lexically contrastive only in words with sonorant-initials. In words with obstruent-initials, register tone is a function of OVE and only allophonic. Typically, high register tone is associated with unaspirated voiceless stops and aspirated voiceless stops; and low register tone is associated with voiced stops and breathily-voiced stops. The same principle applies to words with affricates and fricatives in the word-initial position.

Aspiration is an important feature in the grammar of Brokpa. Besides differentiating lexical words, aspiration encodes grammatical information such as transitivity. There is also some evidence for tone marking transitivity.

Vowel length is contrastive only in open syllables. Brokpa also has voicing contrast for some sonorants, namely rhotics and laterals.

Stress is an important criterion for a phonological word. Every phonological word bears a single primary stress. Secondary stress occurs on trisyllabic or quadrisyllabic words. The position of stress is determined by the number of syllables in a phonological word and their moraic structure. More often than not, primary stress signals the beginning of a phonological word. The suffixes and enclitics generally cohere with the stem and form a phonological word with the stem. The negation prefixes also form a prosodic unit with the stem. The negation prefixes cohere with the host for the purposes of stress placement and forms a phonological word with it, although it may or may not directly bear stress. We have seen that one prefix /man/ which typically precedes negation prefixes do not cohere. It is a heavy syllable with an independent stress and forms its own phonological word.

ABBREVIATIONS

1	first person	LINK	linker
3	third person	LOC	locative
APPROX	approximative	MASC	masculine
COND	conditional	MOD	modal
COP	copula	NEG	negation
DAT	dative	NOMZ	nominalizer
ERG	ergative	O	transitive object
FEM	feminine	OBLIG	obligation/necessity (modality)
FIN	finite	PERV	perfective
GEN	genitive	REFL	reflexive
HON	honorific	S	intransitive subject
IMP	imperative	SEQ	sequential
IMPERV	imperfective	SG	singular
INDEF	indefinite	SUPER	superlative
INTENS	intensifier	TPR	transitive predicate
IPR	intransitive predicate		

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