Tonal Contrasts in Sherpa[1]

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This paper[2] describes pitch in Sherpa through the aid of computerized acoustic analysis. Unlike the "four box" description of Sherpa, the acoustic data point to the fact that pitch in open high register syllables is falling; pitch in closed high register syllables is level; and pitch in low register syllables is basically level. Pitch is predictable on the basis of register and syllable type, and is therefore viewed as phonetic. In a limited set of monosyllabic words, however, pitch is found to be contrastive within register (i.e., high and low pitch within a single register). This system is not operative through most of the language. Similarly, in a limited set of disyllabic words, pitch is contrastive on the second syllable. This paper points to the fact that, perhaps, one of the distinctives of Himalayan languages is that while they maintain consistant register contrasts through pitch and voice quality contrasts, they reserve tonal contrasts for a limited set of words.

1. Introduction

The "four box" system is used to describe the primary suprasegmental/prosodic characteristics of many of the languages of Nepal (i.e., the TGTh cluster, the so-called "Bhote" languages of Northern Nepal which fit within Shafer's (1955) South Bodish group within the Bodish Branch, as well as a language like Kham Magar with a genetic affiliation that is somewhat farther afield than the closely grouped Bodish languages). The four box system is illustrated below in table 1.

TABLE 1. FOUR BOX PROSODIC SYSTEM OF TIBETO-BURMAN LANGUAGES OF NEPAL.

	Moving	*Level*
Tense	CV	CV
Lax	CV	CV

It describes the intersection of two independent phonological values: melody (pitch) and register. There are reported to be two pitch melodies: moving and level; and two voice registers: tense and lax, or modal and breathy.These values are realized in a four way contrast on a single monosyllabic or polysyllabic word. The pitch melodies are reported to be more easily heard on polysyllabic words than on monosyllabic ones.

The languages which have been described using the four box system are reported as having a common voice register contrast, but they are often described differently in terms of the co-occurrence of certain types of onsets with a particular register. Thus, for example Lhomi is described as having a single voiceless obstruent series in onsets in

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[1] The dialect of Sherpa examined in this paper is the Solu dialect as spoken near Phaplu, SoluKhumbu District of Eastern Nepal. Sherpa is a southern Tibetan-type language that belongs within South Bodish of the Bodish Branch of Shafer's (1955) genetic classification.

[2] The research for this paper was conducted from August to November 1998 as part of a typological study of suprasegmental features in Bodish languages of Nepal under the auspices of the Central Department of Linguistics, Tribhuvan University, Kathmandu, Nepal. I am grateful to Mr. Tshering for working with me during this period and teaching me about his language. The acoustic data presented in this paper is based solely on recordings from Mr. Tshering.

lax register (Vesalainen 1976), but Kagate is described as having a voiced and voiceless series in lax register (Hari 1976). Then, there are languages like Kham which are described using the same four box system, but for which tonal behavior would appear to be very different. Pitch and voice register is contrastive with all onsets.

In general, languages in which a voicing contrast has been neutralized are much farther along in tonogenesis than languages for which the voicing contrast has not been neutralized, and tone will presumably behave differently in languages which are farther along in the tonogenesis process. This opens the possibility that while some Tibeto-Burman languages of Nepal are described using the four-box system, the tonal behavior may be different between each language depending on the extant to which pitch is associated with a particular onset.

In each of the languages for which the four box analysis is used, the pitch meody is described as level or what Hari (1979) has termed as "moving." This is to say that the pitch is either level, or it is either falling or rising, and this "moving" pitch contrasts with a pitch which is basically level. Each language is described as somewhat different in regard to the "moving" pitch. For example in Lhomi and Sherpa, tense "moving" pitch is described as rising, but "moving" pitch in Kagate is described as falling. The specific direction of movement in the contour melody is described somewhat differently for each language.

Another area which is described as differently for each language is the correlation of a particular melody (i.e., level or falling) with a particular rhyme type (open, short or long, closed). Languages for which a particular melody is idiosyncratic (i.e., not correlated with a particular rhyme type) are more tonal, and are likely to behave differently than their less tonal counterparts. In a study by myself of Dzongkha (1996), I found that while Dzongkha is described by Sun (1995) as being the furthest along in the scale of tonality among Tibetan languages, it is more accurately described as a phonation register language with incipient tone. This is to say that tone is largely predictable on the basis of its association with an onset type or with a particular rhyme type.

There are three principle areas that serve as useful points, then, around which to base a study of prosodic features of Sherpa (and the languages in the Himalayas): 1) the association of voice register and corollary pitch values with particular onsets; 2) the association of pitch melodies with particular rhyme types; and 3) the association of the direction of the movement of a pitch melody with a particular coda type.

In this current paper, I seek to more accurately characterize the phonological contrasts reported for Sherpa through acoustic analysis of fundamental frequency.[3] This kind of study I hope will help researchers to gain a better understanding of what kind of tonal phenomenon is encountered in the Himalayan languages, and as such will help them to more accurately come to terms with what they hear. Such a study also more accurately characterizes tonal phenomenon, and will help linguists to better understanding the tonogenesis process. Along more practical lines, this kind of study aids in the development of orthographies which are necessary for language development--a development which is now taking places in many Nepalese languages through NGOs established by linguistic/ethnic communities.

This paper will be organized according to the three points stated above beginning first with a brief discussion of vowels in Sherpa.

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[3] An acoustic analyis of voice quality is not possible at this time because I lack the proper computer programs or instrumentation which would make this possible. For the time being, my ear has to suffice.

2. Vowel Quality and Vowel Length

While this paper will argue for the view that tonal contrasts within a register are minimal, and that pitch is largely phonetic within a register, there are phonological distinctions between open syllables that are difficult to hear. In previous studies of Sherpa, these differences were sometimes perceived to be differences in pitch, and sometimes differences of vowel length. For example, Schoettelndreyer (1971) notes the difference between /ta/ 'horse', /taa/ 'sign' as a difference in vowel length, but notes the difference between /tsa/ 'blood vessel' (rising) and /tsa/ 'grass' (falling) as one of level/falling contrast.

In this paper, I posit that the difference between the monosyllables illustrated above and contrasts like these to be contrasts of vowel quality, vowel length, and syllable shape. However, vowel length differences are not always consistantly maintained. There is a decreasing difference in length from closed syllables to open syllables and syllables in high register to low register. The greatest difference in length between syllables is between high register closed syllables with an average difference of 2X (n=8). In high register open syllables, the average difference in length is 1.6X (n=10). In low register open syllables, however, the average difference in length is only 1.33X (n=15). In low register syllables, some short syllable words are almost as long as long syllable words--vowel length in short and long syllables is contiguous.

If the length of short and long syllables is contiguous in low register, why posit a category for length? In fact, I posit that it is not necessary to make such a distinction. However, the main criteria in initially positing the category for low register is the native speaker intuition that it exists. For example /da/ 'arrow' is regarded as short, and /thaa/ 'loom' is regarded as long. Under scrutiny of acoustic analysis, however, the vowels of both words are approximately 200 ms in length. The distinction between them, based on my transcription, is one of vowel quality. /da/ 'arrow' is more accurately transcribe as [nt̪ɐ˩] 'arrow', and /thaa/ 'loom' is more accurately transcribed as [tha̤˩]. This vowel quality difference is perceived as a vowel length difference by mother tongue speakers. The perception is acoustically accurate in high register, but not so for low register.

The vowels found in this study are given below.

SHERPA VOWELS

i	(y)		u
e	(ø)		o
ɛ		ɜ[1]	ɔ[2]
	æ[3]		ɐ
		a	

ɜ[1] Occurs only in closed syllables i.e., /tɜk˥˩/ 'tiger': underlying form /ɐ/.

ɔ[2] Occurs only after /[w]/ followed by /k/i.e., /k[w]ɔ˥ mi/ 'broom': underlying form /o/.

æ[3] Occurs after /j/ offglide in closed syllables i.e., /ŋk[j]æl˩ po˩/ 'king': underlying form /ɐ/.

() Occurs in Tibetan borrowings.

The short vowels /ɐ/ and /e/ in high register are realized as /a/ and /ɛ/ respectively when lengthened . In low register the contrast, as noted above, is noted primarily as vowel quality and not vowel length. These vowels are the only vowels which are in allophonic variation based on length. Given that vowel length differences are diminished in low register syllables, I would expect vowel quality differences to surface most clearly in this environment as they do between /ɐ/ and /a/ and /e/ and /ɛ/. However, I have not heard vowel quality differences with other vowels. In fact, there are no minimal vowel length contrasts in my data other than with words that have an /ɐ/ alternating with /a/ and /e/ alternating with /ɛ/.

I posit, therefore, that length is not contrastive in Sherpa, and that the salient contrast is one of vowel quality. This puts the salience of the contrast on vowels and not on syllable shape (i.e., not on CV and CVV). This suggests two monosyllabic syllable shapes--CV and CVC.

3. The Association of Register with Particular Onsets

In obstruents (plosive stops, affricates, and fricatives), there is only one voiced series, and this is among plosive stops. This series, however, is unique in that it is not fully voiced, and the phonation is what I call "pre-voiced." In the picture of the acoustic wave form of a pre-voiced obstruent in figure 1 as in the word for "arrow" [ntɐɬ], there is a small burst of voicing which begins the phonation of this segment. This voicing is minimal in comparison to the full voicing of a vowel as the syllable nucleus. This burst of voicing tapers to silence and then the stop is released as a voiceless plosive. It is apparent that voicing ends before the release of the plosive both in the diagram of the acoustic waveform, but also in fundamental frequency traces. In the picture of the fundamental frequency trace of a prevoiced segment, there is no FØ trace between the phonation of the pre-voiced segment, and the voicing of the vowel, and both voicing series exhibit diffirent pitch heights. The prevoiced series is sometimes fully voiced word medially, and there are a few examples of when it is fully voiced word initially, as well.[4]

With the exception of the prevoiced series, all other obstruents are voiceless. The voiceless obstruents are also the more common phonation in the obstruents. That is, in the 1,000 item word list studied for this analysis, there were many fewer prevoiced obstruents than the total number of voiceless obstruents. The acoustic wave forms of the voiceless, voiceless aspirated, and prevoiced stops are illustrated in figure 1.

Among sonorants, as would be expected, voicing is the predominate phonation. All nasals and semi-vowels are voiced. Laterals and flaps, however, are both voiceless and voiced.

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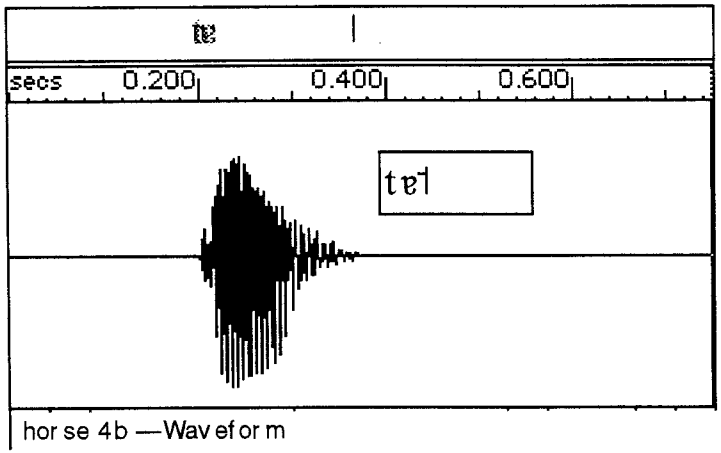
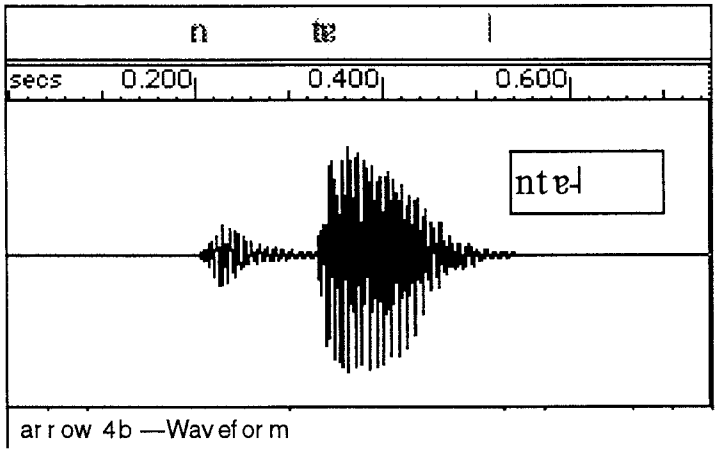
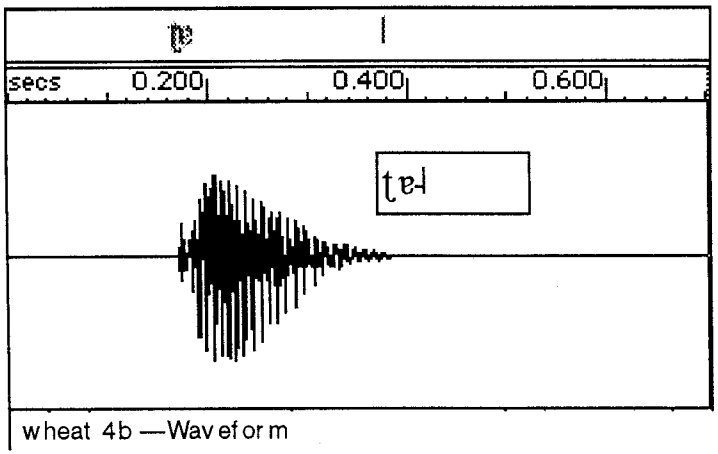
[4] While it is acoustically accurate to describe this series as prevoiced, it is just as well when using a Roman based orthography to write this sound as a voiced plosive, since it does not contrast with another voiced plosive series in the language.

Figure 1. ACOUSTIC WAVE FORMS OF SYLLABLES
BEGINNING WITH OBSTRUENTS







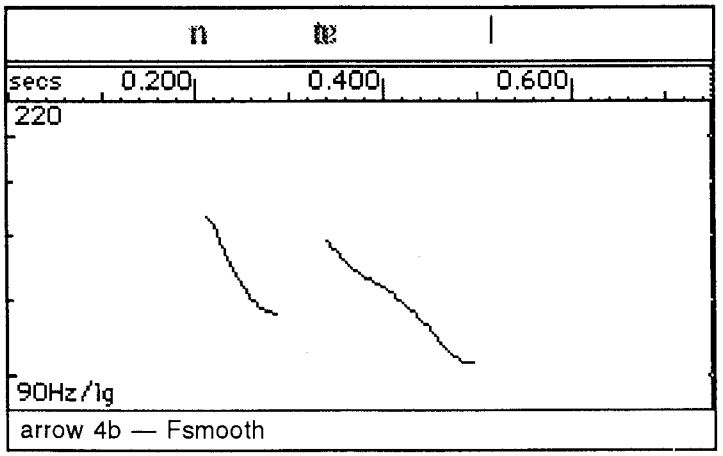


TABLE 2. THE INITIAL CONSONANT SEGMENTS OF SHERPA

		Bilabial	Alveolar	Retroflex	Alv-pal	Velar	Glottal
stops	voiceless	p	t	ʈ		k	ʔ
	aspirated	ph	th	ʈh		kh	
	prevoiced	mp/b	nt/d	ɳʈ/ɖ		ŋk/g	
affricates	voiceless		ts		tʃ		
	aspirated		tsh		tʃh		
	prevoiced				ntʃ/dʒ		
fricatives	voiceless		s		ʃ		h
nasals	voiced	m	n	ɳ	ɲ	ŋ	
liquids	voiceless		l̥ r̥				
	voiced		l r				
approximants	voiced	w			j		

The offglides /j/ and /w/ have a limited distribution:
obstruent stop, /k/ with /j/ and /w/; nasal stop, /ŋ/ with /j/; and all fricatives and affricates with /j/.

The first issue of this paper is to examine the association of voice register and corollary pitch values with particular onsets (i.e., Is there a particular register which always correlates with a particular onset? To what extant is the co-occurence of a register with a particular onset idiosyncratic?) This is one way in determining the extent to which Sherpa is a tonal language.

There are four onset series which always co-occur with one particular register. The prevoiced series and the voiced flap always co-occur with low register, and the voiceless flap and lateral always co-occur with high register. This is not unexpected since in many languages low pitch correlates with voiced sounds, and high pitch correlates with voiceless sounds. In this way, Sherpa demonstrates that voice in the onset continues to be the contrastive phonological articulation, but only in a limited series of sounds. In these series voicing has not been neutralized.

With the other series, the co-occurence of a particular onset with a particular register is not synchronically predictable. Voiceless obstruent stops in the onset position, for example, can co-occur with high and low register syllables, and voiced sonorants can occur with either register. In this way, Sherpa demonstrates that voicing in the onset has been neutralized and the phonological contrast is articulated by the articulatory correlates of register (i.e., voice quality and fundamental frequency). The predictability of a particular onset occuring with a particular register is illustrated below in table 3.

TABLE 3. PREDICTABILITY OF REGISTER
BASED ON PHONATION TYPE

Consonant Class	Register	Predictable
Plain Obs Stops, Affr, Fri	High, Low	No
Aspirated Obs Stops, Affr, Fri	High, Low	No
Nasals	High, Low	No
Laterals	High, Low	No
Prevoiced Obstruent	Low	Yes
Voiceless Lateral, Flap	High	Yes
Voiced Flap	Low	Yes

Given that the register of a syllable is not predictable for most phonation series in Sherpa, I now turn to an examination of pitch--one of the correlate values of register.[5] Examples of the fundamental frequency values for high and low register syllables are given on in figure 2 and 3 for syllables that begin with obstruents and sonorants. In figure 2, the fundamental frequency trace for [khɐ˥] 'mouth' is contrasted with that for [kha̤˩] 'snow'. During the full resonance of the vowel (between 30 ms to 120), the difference in fundamental frequency between low and high register is between four and five semitones. A similar distance between low and high register syllables is also maintained in syllables that begin with sonorants, and this is illustrated in figure 3 with the words [ŋɐ˥] 'drum' and [ŋɐ̤˩] 'I'. The difference in pitch in figures 2 and 3, as well as the accompanying voice quality differences, are found in numerous minimal pairs in Sherpa. For such pairs, voicing is neutralized in the onset and significant pitch and voice quality contrasts are clearly the salient contrast in the language.

The way in which Sherpa has neutralized voicing in the onset is different, however, than other related languages. In Lhasa Tibetan, voicing is reported to have been completely lost in obstruents with a resultant voiceless and voiceless aspirated series. These may co-occur with both high and low register. In Dzongkha, as reported by Weidert (1986), Mazaudon and Michailovsky (1988), van Driem (1992), and Watters (1996), there is a four way obstruent contrast: voiceless, voiceless aspirated, devoiced, and prevoiced/voiced.

Each of the obstruent onset series in Dzongkha can be demonstrated with a fair degree of accuracy to come from a particular Written Tibetan (WT) onset type. That is, voiceless onsets in Dzongkha come from voiceless WT onsets (i.e., either /p/ --> [p], or /ph/ --> [ph]), the devoiced onsets from WT simple voiced onsets (i.e., /b/ --> [p̤], and prevoiced series from WT complex voiced onsets (i.e., /Xb/ --> [mp]. Thus, one can predict what the register of the spoken form will be based on the onset of the WT form: WT voiceless onsets correspond with spoken high register syllables, and WT voiced onsets correspond with spoken low register syllables. This generalization is said to apply to all Tibetan languages.

[5] The computer program CECIL (Computerized Extraction of Components and Intonation of Language, ©SIL) was used for the study of pitch given in this paper. The data presented in this paper is based on an analysis of some 1000 utterances digitized in the Macintosh version of CECIL.

Figure 2. PITCH TRACTS OF SYLLABLES
BEGINNING WITH OBSTRUENT ONSETS

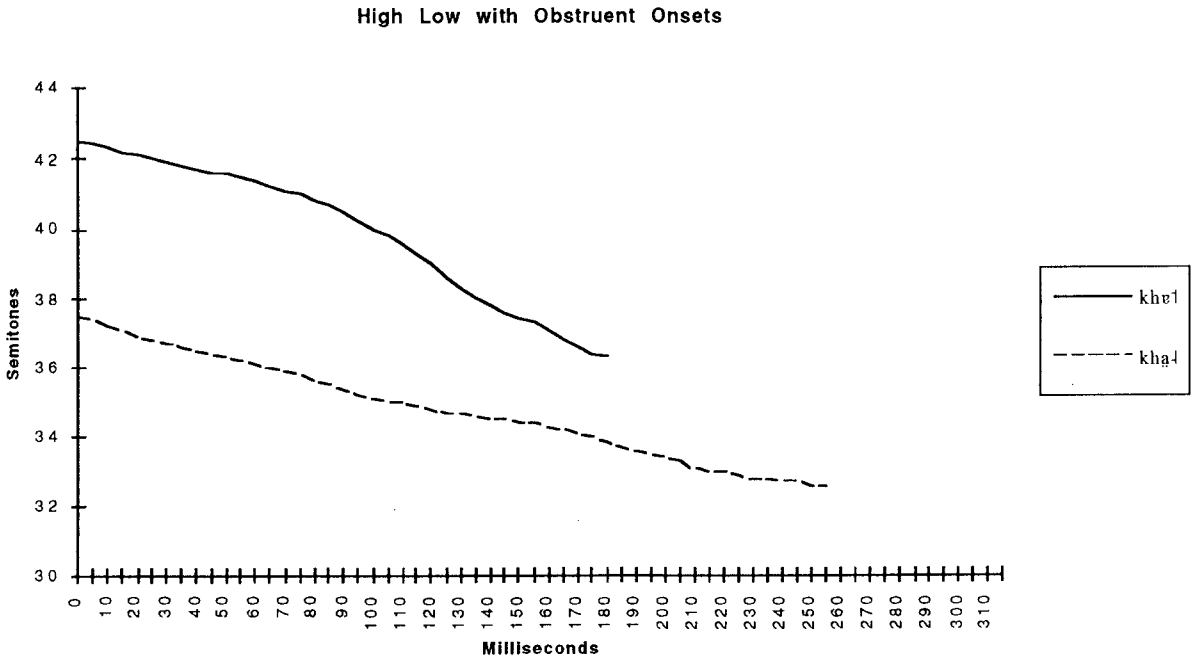
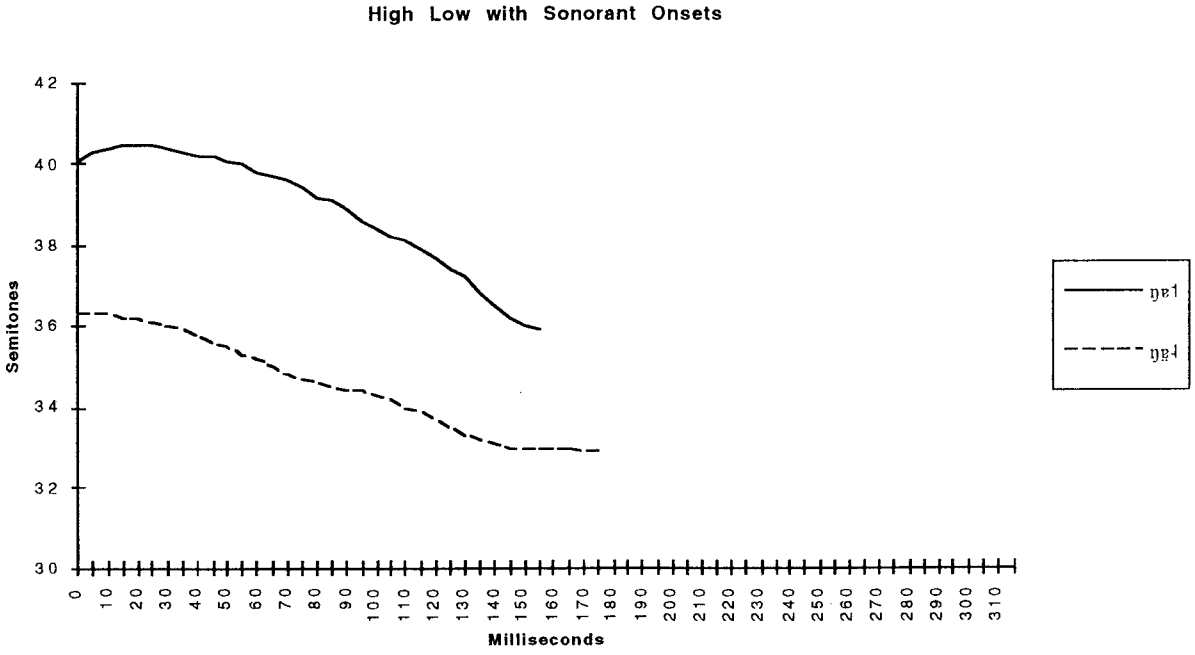


Figure 3. PITCH TRACTS OF SYLLABLES
BEGINNING WITH SONORANT ONSETS



In Sherpa, voiceless, voiceless aspirated, and prevoiced onsets can co-occur with low register syllables. That is, Sherpa like Dzongkha, retains voicing in one series in low register, but like Lhasa Tibetan, voicing has been neutralized in some WT onsets and aspirated onsets co-occur with low register syllables. In terms of voicing neutralization, it is somewhere between Lhasa Tibetan and Dzongkha. However, Sherpa demonstrates an interesting development in voicing neutralization that is not reported for Dzongkha or Lhasa Tibetan. If the WT onset is voiceless and aspirated, the accompanying register in the Sherpa syllable is not predictable--the register can be either low or high, and this is illustrated in the table below. With the other onset series, however, there continues to be a register/WT voicing correlation.

TABLE 4. UNPREDICTABILITY OF SHERPA REGISTER AND WT ASPIRATED ONSET

English	Sherpa	Dzongkha	Tibetan	Wylie
pig	phɜk˥ pɐ˥	phɜp˥	phak˥ pa	PHAG PA
hearth	thɜp˥	thɜp˥	thɐp˥	THAB
mouth	khɐ˥	kha˥	kha˥	KHA
come [hon] (v)	phep˩	phep˥	phep˥	PHEBS
half	phɛ˩ ka˩	ptʃhe:ʔ˥ ka˥	tʃhe˥ ka	PHYED KA
parents	ˈphɜm˩ mɐ˩	phɜm˥		PHAM
loom	tha̤˩	thɜk˥		THAGS
thick	thuk˩ pu		thuk˥ po	MTHUG PO
house	khɐŋ˩ bɐ		khɐŋ˥ bɐ	KHANG PA
husband	khʲɐ̤˩ wɐ̤˩		khʲo˥ ka˩	KHYO GA
snow	kha˩	khau˥		KHAW
fever, cold	tshɐ̤˩	tshɜu˥		TSHAW
color	tsho̤˩		tshø˥ tok˩	TSHOS MDOG
toward here	tshʲṳr˩	tshu:˥	tshu:˥	TSHUR

In table 4, the WT spelling is transliterated in Wylie transliteration and given in the rightmost column. The leftmost column contains the English gloss. The three middle columns contain the modern pronunciation of the WT words in Sherpa, Dzongkha, and Tibetan. The table is divided into an upper and lower half as indicated by the double line towards the middle of the table. The words in the top half are words in which the register for all three languages corresponds with the general tendency for WT aspirated onsets to correlate with high register syllables (i.e., WT /KHA/ --> Sherpa [khɐ˥], Dzongkha [kha˥], and Tibetan [kha˥]). The words in the bottom half illustrate that while this generalization is true for Dzongkha and diaspora Tibetan, it is not true for Sherpa. Many aspirated WT onsets are now pronounced in Sherpa as a low register syllable (i.e., WT /KHAW/ --> Dzongkha [khau˥], but Sherpa [kha˩]).

The idiosyncratic nature of register following the voiceless aspirated series is not commonly documented for the Tibetan languages. What is commonly found in the Tibetan languages is a close association of the WT form and the voice register of the spoken form. However, while voicing has not been completely neutralized among obstruents in Sherpa (vis a vis the presence of the prevoiced series), register has taken on increasing salience in the language and overriden diachronic processes, so that the

register of a syllable cannot be predicted on the basis of WT onsets (at least in the case of WT aspirated onsets).[6] The pitch differences illustrated in figures 2 and 3 and the accompanying voice quality contrasts are now primary contrasting phonological features.

4. The association of pitch melodies with particular rhyme types.

One of the controversies in tonal studies of Tibetan languages is whether or not there exists a melody contrast within a single register. Mazaudon and Michailovsky demonstrate there is a level/falling contrast in melody in certain rhyme types in the dialects of Dzongkha spoken in Chapcha and Thimphu dialect. In another acoustic study of tone in the Buxa dialect of Dzongkha by Watters (1996), I demonstrate that there is difference in pitch between short and long syllables, but that there is no melody difference between syllables of like-type (i.e., pitch is not phonemic, but phonetic). These studies indicate that tone is by no means a uniform phenomenon even within a language spoken within a fairly localized geographical area.

In the research undertaken for this study of Sherpa, I find that there is a limited pitch contrast within registers, and that there is no contrast in pitch between open short and long syllables. The overlap in fundamental frequency traces between short and long syllables is demonstrated in figure 4.

In figure 4, there are four pairs of pitch traces. Each pair corresponds to the upper and lower pitch ranges of a syllable type. Syllabes are divided according to whether they are high or low register, and whether they are acoustically short or long (recall that short and long correspond to the vowel quality alternations described above). For example, the pitch traces represent syllables that are high register and short (H short), or low register and long (L long) (for each syllable category n>=8).

It can be clearly seen in figure 4 that the pitch range between short and long syllables within a single register is overlapping. Furthermore, figure 4 illustrates that there are no melody contrasts. That is there are no height or contour contrasts in pitch between different open syllable types. Pitch in high register is falling, and pitch in low register is more level than high register, but still somewhat falling. I do not find any minimal pairs of falling/level pitches in open monosyllables.

Another observation that can be made from figure 4 is that the acoustic difference between pitch in high and low register is often minimal. While figures 2 and 3 above, demonstrate that in some cases there is a considerable acoustic space between high and low register (i.e., 4,5 semitones), figure 4 illustrates that there is a considerable range in fundamental frequency within a register. A high register word uttered at the lower range of fundamental frequency is only 1 or 2 semtones higher than a low register word uttered at the upper range of fundamental frequency. Given that such a range is acceptable, it leaves little room for contrastive pitch heights to develop within a register. I will come back to this point later in the paper.

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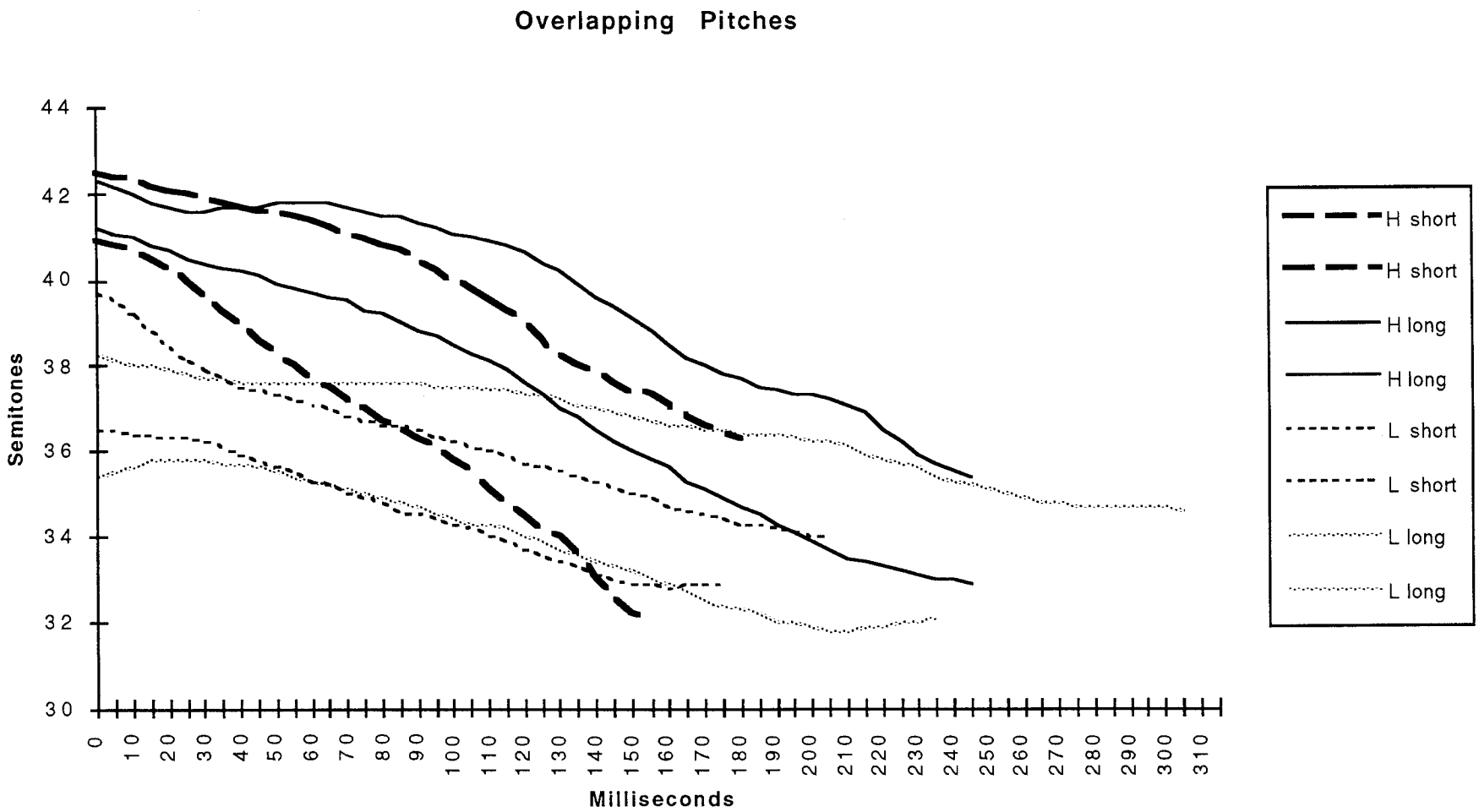
[6] The focus of this discussion has been on the overriding of diachronic processes in the obstruent series. However, tonal "flip-flops" are well attested for syllables beginning with sonorants.

Figure 4. OVERLAPPING PITCH TRACTS OF
DIFFERENT SYLLABLE TYPES



In summary, the fundamental frequency traces given here do not support the general claim that there are melodic differences within register in Sherpa. There are no significant or consistant differences in slope or pitch height that are contrastive or that can be corollated with a particular syllable shape in open mono-syllables. Pitch in Sherpa monosyllables is either high falling or low level (not unlike the proto tones proposed by Benedict (1973) for Tibeto-Burman).

5. Direction of Movement

In the previous section, it was established that pitch in open monosyllables is falling in high register and basically level in low register. I now turn to a look at closed syllables to examine the affect of a coda consonant on the pitch of a monosyllable. Syllables are divided according to the type of consonant that appears in the coda: those syllables ending in voiceless obstruents (unreleased /p/ and /k/) and those ending in sonorants (/m/, /n/, /ŋ/, /ɾ/, and /l/). The pitch traces of these syllable types are illustrated in figure 3 and 4.

The most apparent difference between the two types of syllables is a difference in length of voicing. This difference clearly lies in the sonority difference between voiceless obstruents and sonorants. There appears to be no contrast, however, in pitch between the two types of syllables. The pitch tracts of both syllables types is level.

There is a difference in pitch, however, between the pitch of closed syllables and open syllables in high register. Open syllables are falling in pitch and closed syllables are level. All pitch tracts in low register are level. While the pitch tracts of open and closed syllables are contrastive in high register, the contrast is viewed as phonetic since the appearance of the contrastive melody can be predicted on the basis of syllable shape (i.e., CV or CVC).

6. Summary of Pitch in Monosyllables

A summary of the acoustic data presented in this paper is presented in table 5 below. The pitches are given according to the Chao (1930) number system (1 = low and 5 = high, and the first and second numbers indicate beginning and end points of the tone trajectory).

TABLE 5. PITCH IN OPEN SYLLABLES (in Chao Numbers)

	CV	Ca/Cɛ	CVC
High Register	42	42	44
Low Register	22	22	22

Pitch in open high register syllables is falling; pitch in closed high register syllables is level; and pitch in low register is always level. Pitch is predictable on the basis of register and syllable type, and is therefore viewed as phonetic.

7. Pitch in Disyllable Words

In the four box system, it is reported that a contrast between level and falling syllables is more easily heard on polysyllabic words. The acoustic data used for this paper supports the claim that there is a level/falling contrast in polysyllabic words. The pitch tracts of disyllable words are illustrated in figures 5 and 6.

The level/falling contrast is most apparent in words where both onsets of a disyllable word begin with a sonorant, as in [miɬ lamɬ] 'dream' and [mɐɬ liɬ] 'earring'. The pitch of the first syllable for both words is basically level, although the pitch of the first syllable in [miɬ lamɬ] falls slightly and the pitch of the first syllable in [mɐɬ liɬ] rises slightly to meet the pitch of the second syllable.

The pitches of the second syllable, however, are clearly different--[mɐɬ liɬ] is slightly rising, and [miɬ lamɬ] is falling. A similar pitch pattern is evident in the words [teɬ rupɬ] 'give' and [teɬ riɬ] 'all' in high register, and [pʊ̯ɬ lɐŋɬ] 'cow' and [pʊ̯ɬ pʊ̯pɬ] 'descend' in low register, as in figure 6.

Words which have a high second syllable are limited to a fairly small set of words. Of the 1,000 words studied for this paper less than forty words fit into this category. The majority of words are falling in pitch throughout the word.

It has been established for Lhasa Tibetan by a number of researchers that the tone of polysyllabic words is best described in terms of word templates (Geziben 1996, Sun 1995). Pitch is contrastive on the first syllable, and on non-initial syllables pitch always patterns after the pitch levels of high register, regardless of whether that syllable is high or low register in citation form (within a metrical domain) (Geziben 1996). In the system as it is described for Lhasa Tibetan, there is no contrast in register in non-intial syllables (within a metrical domain).

In Sherpa, however, as illustrated in figures 5 and 6, the pattern with multisyllable words is different than that posited for Lhasa Tibetan. Pitch is potentially contrastive on the second syllable as found in a small set of words. A falling pitch throughtout the word, however, is the dominant pitch pattern in Sherpa.

8. A Few Oddities

While this paper has argued that there is no tonal contrast within register, there are a few pairs of words that contradict this assertion. For example, speakers of the Solo dialect of Sherpa consistantly make a pitch difference between [sʲerɬ] 'hail' and [sʲerɬ] 'gold' in high register, and between [dʒi̯ɬ] 'onyx' and [dʒiɬ] 'four' in low register. The difference in pitch is illustrated in figure 7.

The difference between [sʲerɬ] 'hail' and [sʲerɬ] 'gold' at full resonance of the vowel is about three semitones. The pitch of [sʲerɬ] 'gold' is pronounced at the lower ranges of high register, and the pitch of [sʲerɬ] 'hail' is pronounced at the upper ranges of high register. Similarly [dʒi̯ɬ] 'onyx' and [dʒiɬ] 'four' are contrastively pronounced at the lower and upper ranges of pitch in low register.

Figure 5. PITCH TRACTS OF DISYLLABLES WORDS
BEGINNING WITH NASAL ONSETS

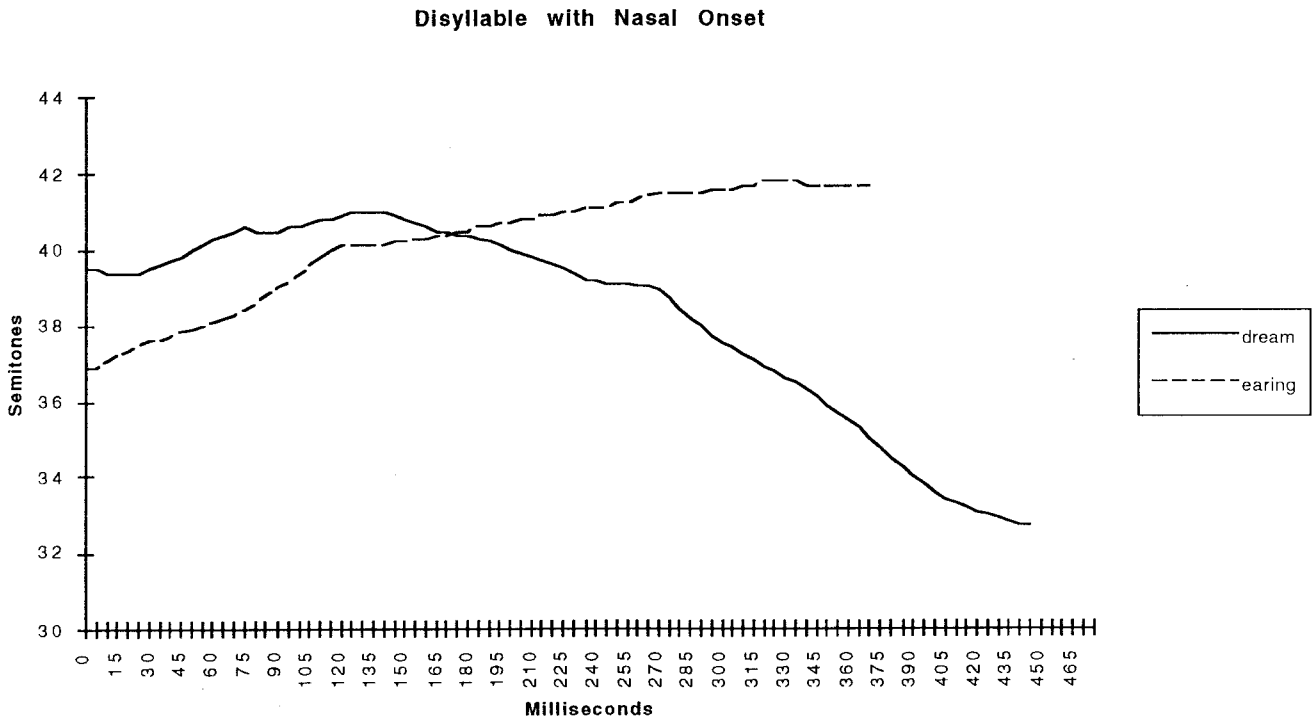
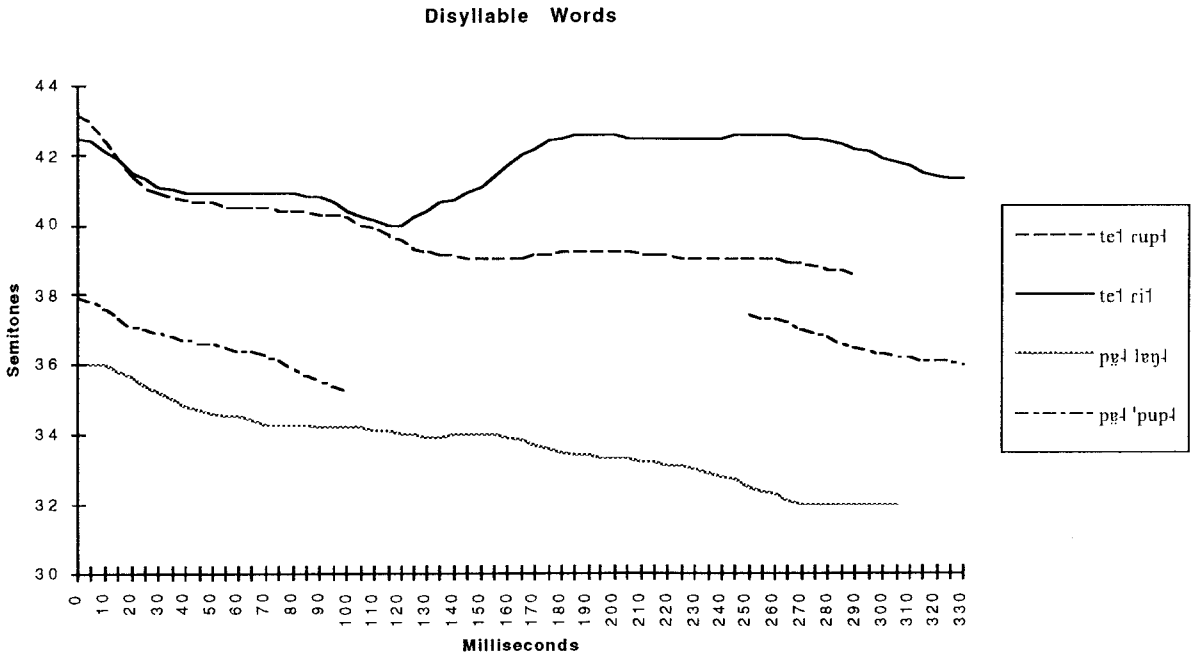
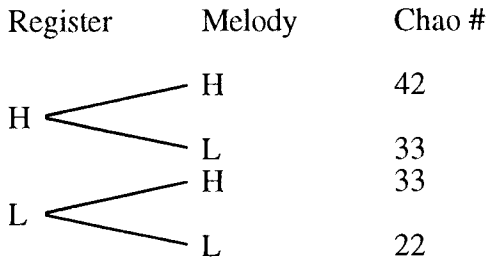


Figure 6. PITCH TRACTS OF DISYLLABLE WORDS
IN HIGH AND LOW REGISTER



The difference between pairs of words illustrated in figure 7 suggests the existence of a three level tonal system for a limited set of words. This limited set makes a contrast between high and low melody in high and low register. The low melody of high register and the high melody of low register overlap in pitch, as illustrated below.



However, as previously illustrated in figure 4, most words do not separate into contrastive tone levels. Rather, the pitch level at which words are uttered can vary a great deal within a single register, and consequently makes it impossible to establish any kind of distinctive pitch height levels. In fact the acoustic space between registers leaves little room for distinctive pitch height levels at all. And yet, it must be acknowledged that there are words that illustrate a contrastive tonal pattern not commonly found in the language.

9. Summary

In summary, the acoustic analysis of Sherpa illustrated in this paper does not support the "four box" description of pitch for monosyllables. Rather, pitch in open high register syllables is falling; pitch in closed high register syllables is level; and pitch in low register syllables is basically level. Pitch is predictable on the basis of register and syllable type, and is therefore viewed as phonetic.

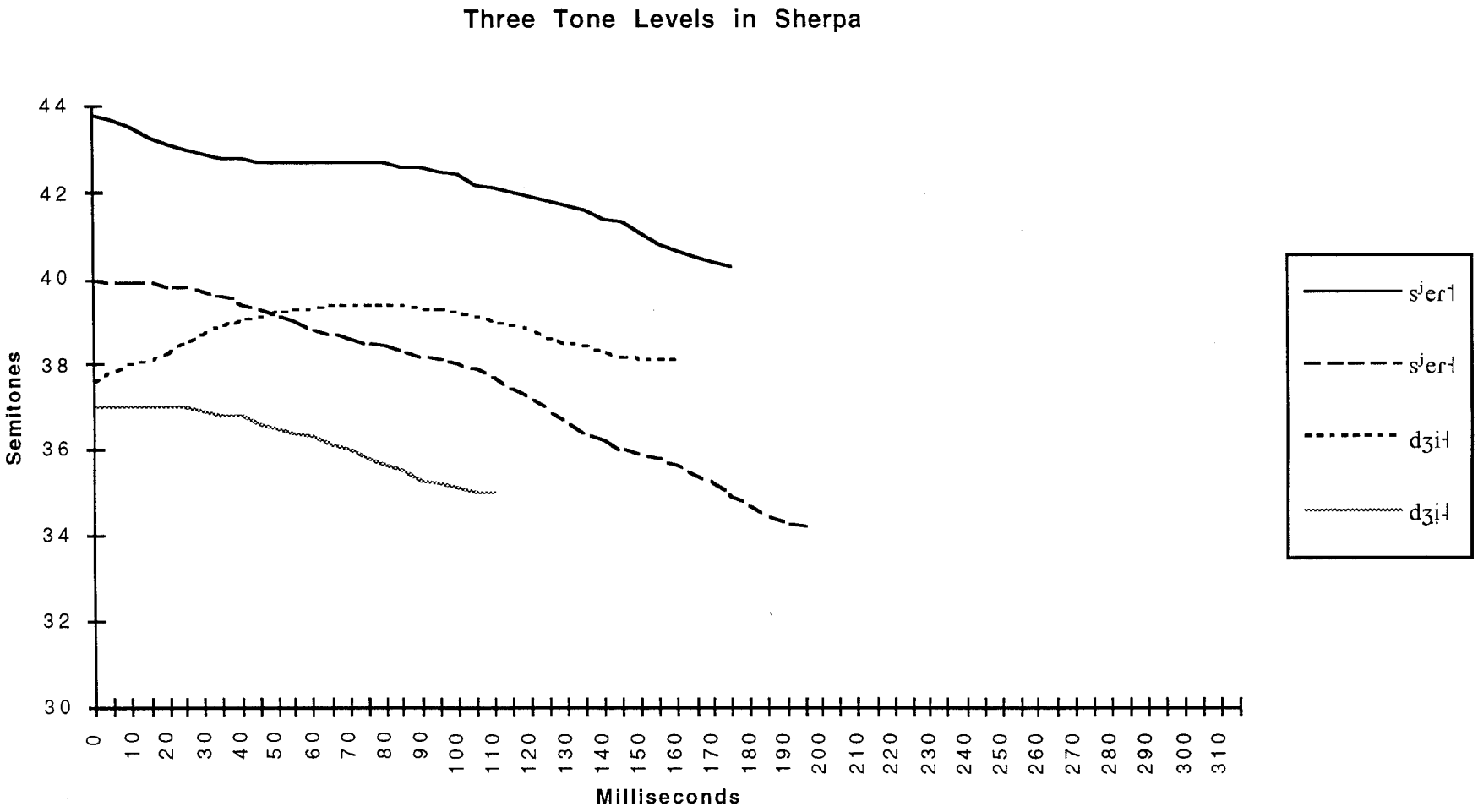
However, pitch is not predictable on the basis of most onset phonations. Similarly, register cannot be synchronically predicated, in most cases, on the bases of onset phonation. This paper also demonstrated that for the WT aspirated series, there is no diachronic correlation between voicing and register. Rather pitch is closely linked to register, and register and its acoustic correlates are the salient contrast in the language.

Pitch in disyllable words, unlike that reported by Sun (1995) and Geziben (1996) for Lhasa Tibetan, is demonstrated to be contrastive on the second syllable for a limited number of words. Some words are found to maintain the pitch height of the beginning syllable, while most words are falling in pitch. This is more in keeping with the "four box" description which describes a level/falling contrast.

In a limited set of monosyllabic words, pitch is found to be contrastive within register (i.e., high and low pitch within a single register). This system is not operative through most of the language.

Sprigg (1966) similarly reports a limited set of tonal contrasts for Balti and Lepcha. Mazaudon and Michailovsky (1988) report a level/falling contrast in monosyllable words in Dzongkha in a limited syllable environment. In the current study of Sherpa, and its limitation to one speaker, I am not able to determine an environment that triggers these limited contrasts. It may be ad hoc, or these contrasts may turn out to be conditioned by synchronic or diachronic factors. But, perhaps, one of the distinctives of Himalayan languages is that while they maintain consistant register contrasts through pitch and voice quality contrasts, they reserve tonal contrasts for a limited set of words. The trick is finding what that limited contrast is and how pervasive that contrast is in the language.

Figure 7. THREE TONE LEVELS
IN LIMITED PAIRS OF WORDS



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