

# THE ASSOCIATION OF TONES IN TASHLHIYT BERBER

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## ABSTRACT

In this study we investigate the nature and distribution of an Intonation Phrase medial H tone in Tashlhiyt Berber. We analyse it as a right edge tone of an Accentual Phrase with a secondary association to a syllable with a sonorant nucleus. In the absence of such a syllable in the target word, H may align with a transitional vocoid, although its location is highly variable. Since these vocoids have no phonological status, the distribution of H lies at the phonetics-phonology interface: when H has no secondary association, there could be phonetic pressure to make it audible.

**Keywords:** Tone bearing unit, intonation, secondary association, tune-text association

## 1. INTRODUCTION

Berber is an Afro-Asiatic language spoken mainly in Morocco and Algeria. Tashlhiyt Berber (henceforth TB), the variety investigated here, is one of three major dialects in Morocco.

Research into the phonology of the language has mainly concentrated on phoneme inventory, syllable structure and sonority, its intonation having been somewhat neglected. Dell & Elmedlaoui (henceforth DE) sum up the situation “Stress and intonation in Tashlhiyt are still *terrae incognitae* [...]” [4: 14]. They point out that stress accent is likely to be a property of units larger than words rather than lexical. Their preliminary observations suggest that “the main pitch event in an intonational phrase occurs near its end, viz. on the last or next-but-last syllable nucleus which is sonorant.” [ibid.].

In this paper we investigate how far it is possible to account for the phonetic facts of tonal alignment in terms of association to the syllable, and - if a particular level of sonority is indeed required for the association of tones - what determines the location of the tones if this level is not reached.

Tashlhiyt Berber is notorious for its syllables without vocalic nuclei and is known to have particularly long consonantal sequences and vowel-less words (and sometimes words without even a sonorant). According to [4] and [8], in the competition for the status of syllable nucleus more sonorous segments are favoured over less sonorous neighbours and, in the absence of vowels, any consonant, even a stop, can be the syllable nucleus; see (1), where /b/ and /g/ are syllable nuclei:

(1) *tbdgt* = *tb.dgt* 'you are wet'

However, the syllabification of words like *tbdgt* has been subject to debate. They may surface phonetically with one or more schwa-like elements (henceforth @) between the stops. These @s have been interpreted by [2] as syllable nuclei. However, [8] discusses a range of arguments against a phonological treatment of these elements: Native speakers are largely unaware of them; they do not affect intuitions about syllabification; they do not contribute to syllable weight in versification of traditional songs; and phonological processes such as assibilation ignore them. Phonetically, they have been shown to be predictable from the laryngeal and supralaryngeal specification of the consonantal environment [7]. The bulk of arguments leads to the conclusion that these @s are transitional vocoids, and thus a matter of phonetic detail rather than phonological segments in their own right.

From a cross-dialectal perspective, in Ath Sidhar Rifian Berber, phonological epenthetic schwas (/ə/) coexist with non phonological transitional vocoids [4], suggesting variation in their phonological status across varieties of Berber.

DE [3: 119] provide an analysis of optional syllabification in Intonation Phrase final position which goes hand in hand with the association to intonational tones. For example, when the word *igidr* 'eagle' is at the end of a phrase with interrogative intonation, an H peak can occur on the final /r/, in which case it is analysed as a

syllable nucleus and thus a TBU. Alternatively, within this analysis, the final consonant can lose its syllabic status and be annexed to the previous syllable as a second coda consonant. In this case the peak is on the second vowel /i/.

It appears from the account of this particular intonation contour that there are two competing tendencies for tonal association. On the one hand the tone associates preferentially close to the end of the phrase, on the other it prefers to associate with a syllable in which the sonority of the nucleus is high. There could be phonetic grounding for both of these tendencies, final positions in phrases being salient by virtue of their position (recency); and a tone on a vowel is more salient than one on a segment with less energy.

So far, any discussion of intonational tones or pitch events in TB has been concerned with tones at phrase edges, thus making it difficult to determine conclusively whether they are actually associated to a TBU or simply edge aligned. This study is concerned with the alignment of a pitch event on Intonation Phrase medial words.

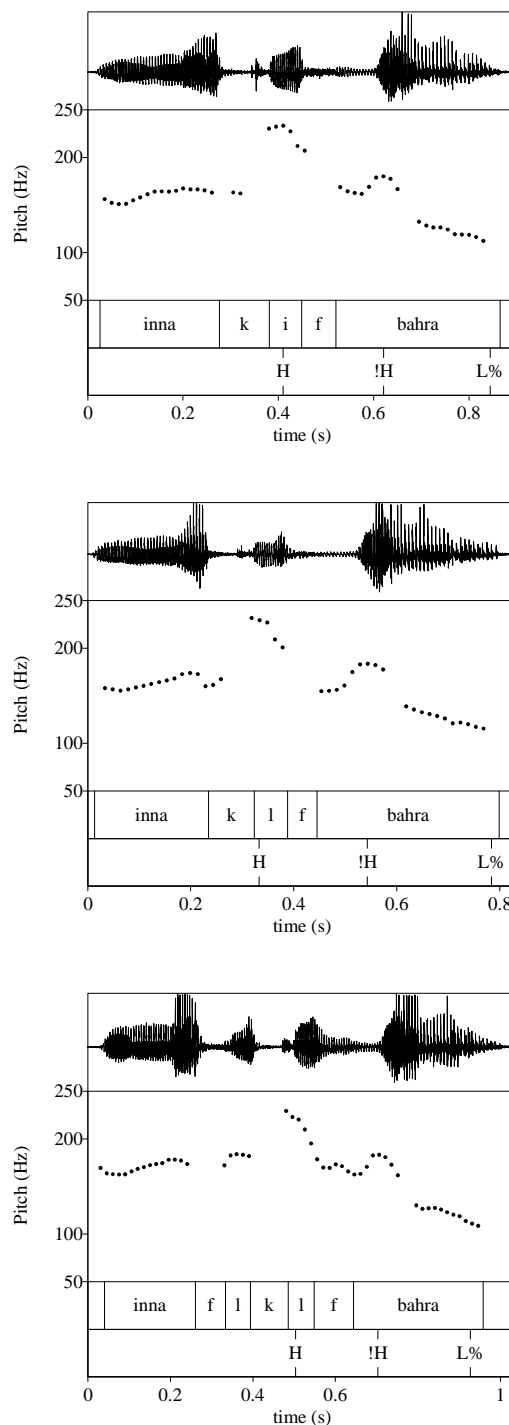
## 2. SPEECH MATERIAL

The primary data were recorded for the purposes of an independent articulatory study involving 42 target words varying in length and structure. Each target word was embedded in the carrier phrase *inna* \_\_\_ *bahra* ('He said \_\_\_ a lot'), such that it was two syllables away from the left and right Intonation Phrase edges. Since the carrier phrase remained constant, the target word was necessarily highlighted, being both new and contrastive in the experimental context. Three native speakers of TB produced each sentence seven times in randomised order resulting in 882 tokens.

## 3. RESULTS

*Carrier phrase:* Although our main concern is the alignment of pitch events with the target words, we first outline the tonal properties of the carrier phrase. As predicted by the literature [4], there was an intonational peak on the penultimate syllable of the intonation phrase, i.e. on the first syllable of *bahra*. It was usually downstepped in relation to a previous peak (!H). The end of the phrase was low (L%). The initial two syllables of the carrier phrase varied systematically, depending on the tonal properties of the target word. We return to this below.

**Figure 1-3:** Acoustic waveforms and f0 contours of the words *kif* 'same', *klf* 'to appoint' and *flklf* 'on skin patches', respectively, produced by speaker RR.



*Target words:* In all productions of monosyllabic or disyllabic target words with one sonorant nucleus (vowel or sonorant), the H peak was located on the nucleus (see fig. 1-2). This amounted to 31 target words (651 tokens)

In all productions of disyllabic target words in which both nuclei are sonorant, the H peak was on the second of the two (see fig. 3). There were 4 such target words (84 tokens).

In cases where there was no sonorant in the target word (7 target words, 147 tokens), the position of the H peak was variable. It was either on a vocalic nucleus of the previous word, i.e. in the carrier phrase (see fig. 4), or on a transitional vocoid (@) (see fig. 5). Table 1 gives an indication of the variability in distribution of the two patterns, both within and across speakers.

**Figure 4-5:** Acoustic waveforms and f0-contours of the word *tbdgt* 'you are wet', produced by speaker LB. Transitional vocoids indicated by @. In fig. 4 H peak on *inna*; in fig. 5 H peak on a transitional vocoid between /d/ and /g/.

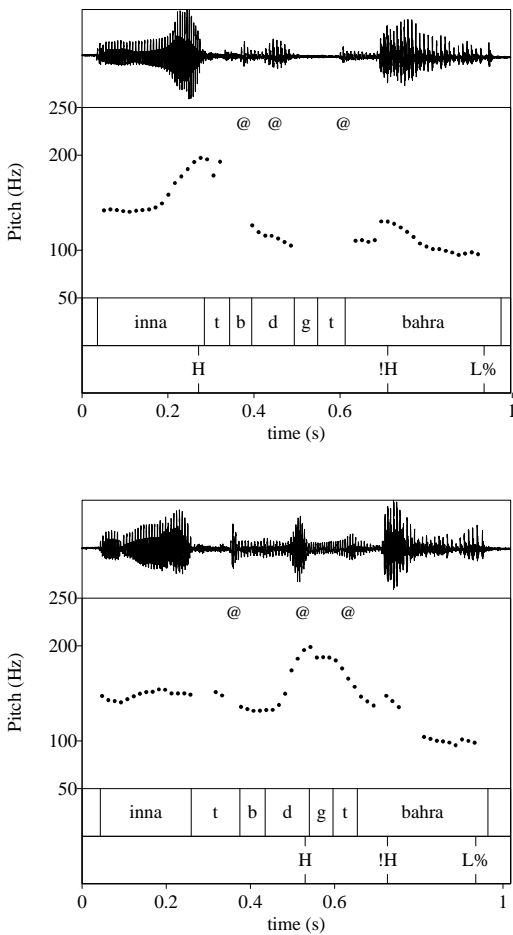


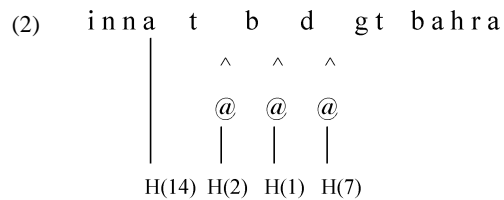
Table 1 does not, however, capture the exact location of the peak. Interestingly, even within one and the same word, *tbdgt*, the H peaks could be found on a @ between /t/ and /b/, /b/ and /d/ or /d/ and /g/. Moreover, RF sometimes produced sentences with two peaks (on the preceding word

as well as @, see last column of table 1) and occasionally no clear peak at all.

**Table 1:** H peak location for seven target words (rows 1-3 entirely voiceless, rows 4-7 mixed voicing), three speakers; pre = peak on last vowel of previous word; @ = peak on transitional vocoid. Translations: *tft* 'you give', *ktft* 'attach him', *tkft* 'you attach', *bkst* 'belt it', *tbkst* 'you belt it', *bdgt* 'wet it', *tbdgt* 'you are wet'.

target word	speakers						
	RR		LB		RF		
	pre.	@	pre.	@	pre.	@	pre. + @
tft	7	-	7	-	4	-	-
ktft	7	-	7	-	6	-	-
tk.ft	6	1	7	4	-	-	-
b.kst	7	-	3	4	2	-	-
tb.kst	7	-	1	6	2	-	-
b.dgt	7	-	1	6	2	1	2
tb.dgt	7	-	2	5	1	1	4

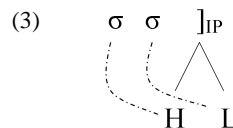
The H peak location in *tbdgt* pooled across speakers is depicted in (2).



A high degree of variability in peak location on words with no sonorant nucleus has thus been observed, as has an apparent preference for the peak to be on a syllable before the target word.

#### 4. INTERPRETATION OF RESULTS

The tones in Intonation Phrase final position (on *bahra*) conform to the description in DE [4]: there is a pitch event (in this case a peak) on the penult. This can be tentatively analyzed as an Intonation Phrase edge tone sequence, (!)HL, with a secondary association for each tone as in (3). Secondary association involves an additional linking of edge tones to tone bearing units lower in the prosodic hierarchy [6]. For tonal sequences, temporal ordering is preserved (here H before L).



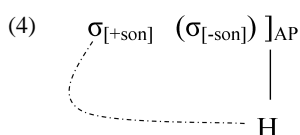
However, as pointed out above, as long as the syllables are the last two in a phrase, it is difficult to test empirically for secondary association

against, for instance, a simple alignment of two concatenated tones to the edge of the domain.

We now turn to the phrase medial tone in the target words. The peak on the target word (or just before it) appears to have a highlighting function. Of areal interest, medial words which are highlighted, or focused in some way, also have a H peak in Moroccan Arabic, although this peak is on a lexically stressed syllable [1: 356]. (Note that Moroccan Arabic has been in contact with TB and other Berber dialects for centuries.)

As TB is reported to have no lexical stress, the question arises as to the nature of this H tone. There is evidence of a pull to the right: as long as the syllables have sonorant nuclei (fig. 5), H prefers to dock onto the rightmost one. This suggests an analysis as a right edge tone of a phrase lower than the IP in the prosodic hierarchy. Since there is no evidence of a phrase break between *inna* and the target word, we tentatively refer to the phrase containing these two words as the Accentual Phrase, in line with previous analyses of the Tamashek Berber variety [5].

As long as the H is on a sonorant nucleus, its alignment is systematic and predictable, at least in our data. We account for this alignment as a secondary association of an AP right edge tone to a TBU. This analysis provides a unified account of final and medial tones in the IP: Both are edge tones of a prosodic constituent, and both seek secondary association on a preceding syllable with a sonorant nucleus; see (4).



Our data suggest a possible prominence-lending function and may correspond to what DE referred to as the stress accent as a property of units larger than words (discussed in the introduction above).

This phonological analysis is unable to account for H obtained on transitional vocoids. Since these elements have not been found to be relevant at any other level of prosodic phonology, and since their presence does not even affect the phonetic duration of words [7], they should not be able to function as a syllable nucleus, let alone a TBU.

One might argue that if intonational tones can condition resyllabification at IP boundaries, then IP-medial tones may be able to do the same. Recall that, according to DE, the intonational context is

able to trigger a reduction in the syllable count by annexing a phrase-final consonant leading to a complex coda.

A resyllabification in the context of our data would mean that what we have been referring to as a transitional vocoid (@) would have to be reanalysed as a phonological schwa. Apart from the fact that the intonation would be introducing an otherwise illegal syllable type into the language, it is incompatible with the within and across-speaker variability in the location of the H observed (as shown for example in (2))

Another way of dealing with the location of H in the absence of sonorous syllables involves the division of labour of phonology and phonetics. If no tone bearing unit is available, then the phonological planning does not involve the placement of the H tone. However, it is not a truly floating tone, as it is primarily associated to a right edge. The phonetic implementation could reflect functional pressure to highlight the word (especially in the contexts used for elicitation, where it is contrastive) and thus be responsible for making sure the tone is salient. This can be achieved by placing the H peak on a part of the signal which is periodic enough and possibly loud enough to make the pitch peak clearly perceptible.

Here we took a first look at intonational tones on target words with no sonorant nucleus. Since these were recorded for other purposes, this study was necessarily exploratory in nature. More controlled recordings are underway.

## 5. REFERENCES

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