PHONETIC TRANSCRIPTION OF TONE IN THE IPA

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ABSTRACT

When conducting fieldwork on tone languages, the linguist choosing to use the IPA to make phonetic transcriptions of tone is presented with a challenge: Current methods of tone transcription in the IPA require a degree of phonological analysis before they can be applied and when applied they do not adequately display pitch distinctions relative to other pitches. I describe this challenge and the bar method as a proposed solution. The bar method visually presents F0 distinctions relative to other F0 expressions without ties to segments. I hope this solution facilitates the discussion of phonetic tone transcription without regard to phonological assumptions, linguistic tradition, or geographical area of research.

Keywords: tone, transcription, IPA, tone-height, encoding

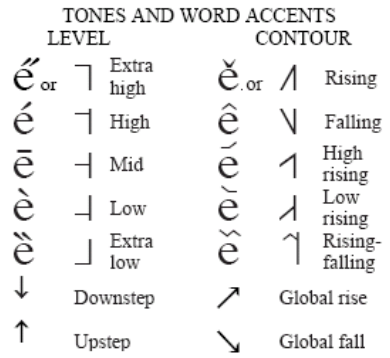
1. INTRODUCTION

The International Phonetic Alphabet (IPA) seeks to provide a consistent "way of representing the sounds of language in written form" [24]. Its design takes into account the needs of lexicographers, field linguists, and orthography developers. It enables them to "annotate acoustic and other displays in the analysis of speech" [24]. The IPA further enables researchers to present their data with or without various levels of phonological analysis. The IPA handbook discusses transcription styles in terms of both broad vs. narrow transcription and phonemic vs. phonetic transcription. Impressionistic transcription is often a case of narrow phonetic transcription, occurring while hypotheses are still being tested and before serious phonological analyses are proposed. Despite the claim that the IPA can be used for narrow phonetic transcription, the narrow transcription of tone is ambiguous with the IPA notation system because of a limited number of pitch heights and a limited number of contours provided by the current IPA methods. Since 1993 the Association has provided two methods for transcribing tone:

- tone letters
- various diacritics applied over segmental representations

These appear on the IPA chart as revised to 2005 and illustrated in Figure 1. For the most part these are also the tone marks described in the IPA handbook [24] on pages 14-5.

Figure 1: The tone chart used in the International Phonetic Alphabet (IPA 2005).



2. TONE TRANSCRIPTION

Following the IPA's distinction between tone and intonation, we still must answer the question: *What is a phonetic transcription of tone?* According to current methodologies in the IPA, one must first make a phonological distinction to determine which of the five heights of pitch to match a tone transcription to, and then once transcribed, one may apply square brackets ⟨ [ ] ⟩ to indicate that the transcription is phonetic. I propose that phonetic tone transcription should rather be a marking of pitch height relative to other pitch heights in the utterance, of course this may also include marking contours as they occur.

2.1. Pitch Height

Both IPA tone letters ⟨ ˥ ˦ ˧ ˨ ˩ ⟩ and the tone diacritics have five heights. The five level heights of tone have been argued [26] on theoretical [30] and typological [31] grounds to be sufficient to describe the world's languages. These arguments are based on phonological assessments rather than phonetic assessments. Even if claims that no language has more than five levels of phonological tone height obtain, the five level model's sufficiency is

challenged in phonetic transcription in the following environments:

- Tone systems with six level pitches [12, 56]
- Tone systems with contours which establish six levels of pitch [4, 10, 11, 43]
- Tone systems with upstep [38] or downstep [37, 49] processes which may raise pitch levels creating more than 6 levels

The challenge to the five pitch height systems is not geographically bound. Problematic cases can be found in Africa [12, 56], Asia [43], and the Americas [11, 38].

It may be argued that the IPA does provide diacritics for upstep ⟨ꜛ⟩ and downstep ⟨ꜜ⟩ that may be combined with tone letters or diacritics. Therefore by using additional diacritics an unlimited number of tonal heights may be represented. However, upstep [45] and (nonautomatic) downstep [9, 46] are considered phonological processes as apposed to phonetic processes. Therefore, strictly speaking, arrow diacritics would not be used in an impressionistic transcription of pitch, which occurs prior to a phonological analysis. Hence the transcriptionist is still presented with a dilemma when considering more than five phonetic pitch heights. Additionally, a purely phonetic interpretation of pitch height cannot determine the appropriate phonological height of a pitch [45]. That is, in some languages a downstep and upstep processes can create phonetic ambiguity. For instance, a high tone might be the same pitch as a mid tone [47]. A high tone may be the same pitch as low tone previously occurring in the utterance [45]. And also, an upstepped low tone might be the same pitch as a mid tone [1].

2.2. Limited Contours

If one solely looks at the IPA chart, one might assume that the diacritic method of marking tone is equivalent to the tone letter method. The IPA handbook is quick to point out that indeed they are not equivalent. With regard to the phonetic transcription of tone, the diacritic method is even more restrictive than the tone letter method. What the handbook does not point out is that within the diacritic method there is no way to indicate more than two contour pitches of the same kind (falling or rising) in a single language. That is, if a language has three or more rising pitch contours as is claimed in [10, 15, 40], or three or more falling contours as claimed in [11, 25, 40, 44] there exists no way to indicate these more intricate, but necessary distinctions between pitch contours with diacritics.

3. BAR NOTATION AS A SOLUTION

The IPA handbook recognizes the special status of suprasegmentals. As evidenced in the literature, many phonologists have also struggled with tone's "special status" causing some to ask "is tone different" from segments, and to conclude that indeed it is different [22]. On these grounds I find no reason why separate systems of notation should not be employed in different stages of analysis (i.e. phonetic vs. phonemic). The current systems for transcribing tone do not allow for the transcriptionist to easily recognize patterns of pitch that span across sets of segments. They also require the transcriptionist to first make a categorical commitment among the five possible phonological pitch heights. It may seem superfluous to propose another tone notation system for the IPA, but the existing systems all are dependent on the orthographical occurrence of segments. The bar system, removes segments and allows the transcriptionist to express pitches relative to other pitches within the prosodic unit of comparison. These 'bars' function not as diacritics, but as pitch letters in and of themselves. Various pitch heights are demonstrated in (A-C) of Figure 2, taken from [45], [5], and [47] respectively.

Figure 2: Examples of the bar notation method in use.

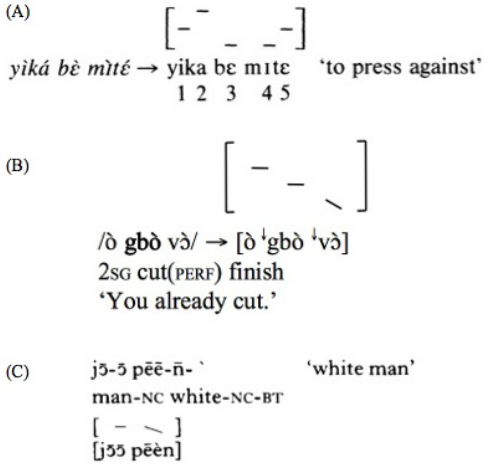


Table 1 compares the three methods of indicating tone across the following dynamics: the ability to express phonetic pitch height (independent of phonological pitch height), the ability to display more than two contour tones, the ability to express pitch height relative to other pitches, and the ability to typeset the pitch indicator with respect to a particular segment.

Table 1: Comparison of tone transcription systems.

	Phonetic pitch height	2+ contours	Iconic pitch height	Segmental attachment
Tone letter	-	+	+	-
Diacritic	-	-	-	+
Bar notation	+	+	+	-/+

Best practices for tone analysis call for the elicitation of tone in a variety of frames [1, 23, 51]. Frames are the contexts where impressionistic transcription of tone are most common, and perhaps most useful. Post phonological analysis, other transcription systems, such as the diacritic and tone letter methods, may be more appropriate for presenting data when using phonemic transcriptions which may combine the presentation of tone and segments.

An important question remains: *How many pitch heights should a transcriptionist be able to indicate?* Hyman [23] indicates that he uses the bar method to represent the five heights already available in the IPA systems. However, Anderson [2] argues that the levels of phonetic pitch should be boundless based on languages, which use upstep or downstep to create more than five phonetic pitch levels. It seems to me that most utterances in frames, even if the language has terraces, will not have more than nine variations in height.

Contour lines between the pitch heights are also called for, as some languages clearly do have contour pitches. However, unlike the diacritic method currently in the IPA, the quantity of pitch contours needed must be sufficient to connect the various pitch heights much like the tone letter method currently does via ligatures.

Bar notation is not new. Maddieson [32] illustrates its use in the Kiel report from the suprasegmentals group. Evidently, bar notation was not considered at Kiel for inclusion in the IPA as a possible method for phonetic pitch transcription. The bar notation's use in publications is not infrequent and includes: Anderson [2], Aziza [3], Beavon-Ham [5], Bird [6], Clark [7], Cline [8], Connell [9], Festen [13], Fromkin [14], Hombert [16], Hyman [17-21, 23], Laughren [27], Lim [29], Leben [28], Maddieson [32], Meyers [33], Moore [35], Pike [39], Pulleyblank [41], Snider [45-48, 50-51], Sprigg [52], Vanvik [53-55], and Yip [57].

In terms of efficiency for the transcriptionist, the bar method allows for relative tonal transcription, by hand. This means that pitch height is transcribed relative to preceding or following pitch expressions. When using other IPA notation systems that require commitment to an absolute scale, the relative nature of pitch is lost. When hypotheses about pitch height are revisited, a single adjustment may mean that an entire session of transcription needs to be revised. However, communicating via digital means with the bar notation system remains a challenge because the characters have not been proposed to the Unicode standard. Previous publications have relied on non-Unicode fonts or other typesetting means to create the needed layouts. As an organization, the International Phonetic Association carries significant weight in introducing phonetic symbols into the Unicode standard, a necessary component of linguistic data interoperability. The design purpose behind the IPA has been to grant flexibility to the alphabet in order to provide mechanisms to mark crucial distinctions within a single language. However, the IPA is increasingly a critical asset to those who use it to make assessments across language boundaries, such as typologists [34] and those who study related languages via corpora [36, 42]. Not only is the IPA a foundation for the codification of phonetic differences discussed among phoneticians, but is also a foundational element of data exchange for the rest of the linguistic sciences. The bar notation method enables researchers to discuss tonal phenomena more clearly, without bias to phonological claims. Having it as a formal option within the IPA would clarify the scientific communication conducted in the process of researching a great many languages.

4. CONCLUSION

Tone is argued to inherently be an expression of pitch that contrasts with other expressions of pitch. Tone is not merely pitches expressed within an absolutely defined perceptual space (even if there is an upper and lower bound to the range of biologically possible frequencies used). Nor is tone a system of pitches expressed relative to a single segment in segmentally based minimal pairs (even if there are interactions between tone and segments). The bar method allows for these ideas to be expressed in orthographic form.

I have shown here that there are some insufficiencies with the current IPA transcription systems with regard to tone, affecting the research of a great many languages. I have argued from a position that tone is best phonetically analyzed relative to the other F0 segments that it is in sequence with, rather than as a segmental attachment. Finally I have presented the bar notation method, a widely used transcription system that

visually presents F0 distinctions relative to other F0 expressions without ties to segments - though of course it could be and has been used in conjunction with segmental transcriptions.

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