

## SOME FEATURES OF TONE IN DANGME

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### 1. PITCH, TONE, AND KEY-CHANGE

#### 1.1 BASIC PITCHES

Several writers<sup>1</sup> have indicated that Dangme monosyllables carry a system of three contrastive tones. Thus,

- má (high) 'corn dough'
- mā (mid) 'herring'
- mà (low) 'town'

The present writer has also maintained<sup>2</sup> that the primary contrast is between high and non-high. That is, in a series of two or more syllables, the contrast between mids and lows on successive syllables is commonly neutralized, but the contrast between either of these and high tone is almost always maintained. In a tone group of more than one syllable, mid and low tones are distinguished on the final syllable, and (usually) on a syllable before high tone, but in a non-final series, adjacent mids and lows are not distinguished. In other words, on syllables in final position, there is a three term tonal system, high, mid and low, each of the three terms being fully contrastive with each of the others. This three term system also obtains on syllables immediately preceding a high tone. On syllables preceding a non-high tone, however, there is only a two-term system of contrast, high and non-high.

Apronti's acoustical data supports this description.<sup>3</sup> Dr Apronti made a set of 27 tonograms from his own speech (Ada dialect), which show a three-way contrast in the tones of Dangme monosyllabic tone groups.<sup>4</sup> The one-syllable group má 'corn dough' (7) had a sharply rising pitch contour, which moved from 90 to 130 Hz. mā 'herring' (4) was steady at 140 Hz. mà 'town' (1) rose in pitch from 110 to 130 Hz., and then fell off to 85 Hz. In monosyllables, then, the contrastive tone differences were realized more by pitch contour than by pitch frequency. High tone was slightly rising, mid tone was steady but not lower than high, and low rose and then fell quite drastically. All three syllables seem to have been aimed at a central pitch of around 130 or 140 Hz.

<sup>1</sup> Apronti 1967, Kropp 1971, Pupilampu 1953, Ward 1945.

<sup>2</sup> Kropp 1971.

<sup>3</sup> All of the acoustical data described and discussed herein is taken from Apronti 1967. I am extremely grateful to Dr Apronti for his permission to use his unpublished findings, on which this paper depends. I am also indebted to him for his comments at various stages of this work.

<sup>4</sup> The technique by which the tonograms were produced is described in Apronti 1967. Numbers in brackets indicate the number of the tonogram in Volume 2 of that work.

The tonograph apparatus could not handle utterances more than a few seconds in length. It was therefore not possible to obtain data for tone groups exceeding four or five syllables.

In longer groups, most of the pitch movement within the syllable disappeared. há fá 'broken knife' (9) was about 130 Hz. in the first syllable, and rose slightly to 140 Hz. in the second. pɛli 'wing' (5) was 130 Hz. in both syllables. A difference of only 10 Hz. seems to be insignificant for much of Dr Apronti's data, but in the contrast of pɛli and há fá the upward transition by this amount seems to have been crucial.

In sínó 'snake' (6), the first syllable was at 140 Hz. and the second at 160 Hz. In tábá 'tobacco' (3) the first syllable was at 120 Hz. and the second at 170 Hz. The consensus of these and other tonograms seems to be that a high tone syllable was consistently around 20 Hz. higher than a preceding mid tone, and 40 to 60 Hz. higher than a preceding low tone. A series of two highs was distinguished from a series of two mids by a slight upward tendency, more than by difference in actual frequencies. The frequencies of the mids and lows varied, but in most of these tonograms of short groups including highs and either mids or lows, mid tones were realized at about 130 or 140 Hz., and lows at about 120 Hz. (highest point).

In the group òkpò 'dove' (2) the first syllable was at 160 Hz., and the second started at 160 and fell to 90 Hz. It was thus actually much higher for most of its duration than há fá. In all of Dr Apronti's recordings, final low tones were distinguished from others by the fact that they always fell to below 100 Hz., wherever they may have started from. The penultimate low tone occurred at the same pitch as the final one began.

In two tonograms of utterances consisting of a high tone syllable followed by a low, the high tone was distinguished by being higher than the highest pitch of the following low, but was nevertheless much lower than the first low of òkpò. Thus in há sè 'knife's blunt edge' (11), the first syllable was only 140 Hz., and the second fell from 110 to 85 Hz. In áńó 'cat' (8), the high again was 140 Hz., and the low ended at 85 Hz. In má á 'the corn dough' (19), the first, high, syllable was about 170 Hz., but the difference between it and the second syllable was less, since the mid was realized at about 145 Hz. Thus the contrast between mid and low tone on a syllable adjacent to one with high tone is realized by relative distance in pitch from the high tone, and (group finally) by whether or not the syllable pitch is falling (low), or steady (mid).

When no high tone is present, the contrast on group final syllables depends entirely on whether or not the feature of fall is present. Dr Apronti made tonograms for several multi-syllable groups that end in mid tone:

òkpò ɔ̄ bā 'the dove came' (24)

l̄ nā òkpò ɔ̄ 'I saw the dove' (26)

n̄m̄l̄ nānē 'human leg' (10)

All of these utterances were at level pitch throughout, at about 140 Hz. No constant difference was detectable in the recorded pitches for syllables that are generalized as mid or low. However, in the utterance òkpò ɔ̄ jè 'the dove left' (25), the pitch level (130 Hz.) is almost the same as in the preceding, but the last syllable falls to 90 Hz. If a final series of non-high tones ending in a low is preceded by a high tone, the fall may actually be in progress throughout the series, particularly if the consonants are sonorant. This appeared in the following tonograms:

ó m̄m̄m̄ 'your blossom' (12)

The first syllable began at 170 Hz., fell to about 120 Hz., and the fall continued to 85 Hz. at the end of the group.

mò àgbò' n5 ò 'big (person) that you are' (27)

The first (low) was about 140 Hz., the second 130 Hz., the third (low-high) went from 120 Hz. to 165 Hz. The fourth (mid) continued up to 180 Hz. and then fell to 110 Hz., and the last syllable continued the fall, to 85 Hz. A gradual downdrift was thus detectable also in the series of lows that precedes the high tone.

## 1.2 RAISED HIGH TONES

In terms of basic pitch frequencies, mid tones seem most closely related to high tones. Both seem to gravitate to about the same level, which in Dr Apronti's data was around 130 or 140 Hz. High tones were only realized at a higher pitch if it was necessary to distinguish them from mids, or to provide the necessary frequency range for a series of descending lows.

The high tones may be raised quite considerably when it becomes necessary to allow for more than one key lowering. The highest pitched high tones seem to have occurred when they were followed by non-highs and then another high. Thus in ó wǒmí 'your book' (13), ó was realized at 180 Hz., and mí at 160. In tǎjí pòpùé 'wet donkey' (22), the first two syllables were realized at 170 Hz., much higher than há in há sè at only 140 Hz., but the same as ó in ó mǒmǒ. The two lows were at about 110 Hz., and the final high rose to 160 Hz. This rise actually began on the preceding syllable, so that the downdrift of consecutive lows observed in the first three syllables of mò àgbò' n5 ò did not occur. The final low-high contour of 110-160 Hz. is about the same as was registered in the tonogram for mǔtù flákú 'morning porridge' (15). There the low syllables began at 110 Hz., rose to 120 Hz., and the high tones were at 160 Hz.

It seems likely that for an individual speaker the pitch levels of final tones are standard, or the basic ones, and the pitches of preceding tones must be adjusted upwards where necessary to preserve contrasts.<sup>5</sup> Hence from the point of view of the speaker the process is one of key raising, and the "basic tone levels" are the levels of tones occurring late in the tone group, after all lowering has been performed. The lowest key in the group is the speaker's "normal" one. The speaker about to produce a tone group containing high tones needs to choose a key that will allow him to end in his normal one.

## 1.3 LOSS OF CONTRAST

It has been said that high and mid tones in the tonograms tended to have the same pitch, except when the necessity arose of distinguishing them in a sequence. In that

<sup>5</sup> Stewart (1971) accepted the opposing and usual view, that the earliest occurrences in the group are to be treated as the basic tone levels, and later ones as "lowered counterparts of the basic levels other than the lowest", where "the lowest" is low tone (Stewart 1971, p. 195). At present this approach is certainly descriptively more convenient.

Stewart (op. cit.) treats the group-final fall of low tone as a manifestation of key lowering. It is not convenient to do this in Dangme, because lowering also follows mid, which is never falling, and because in the "normal" (two syllable) key the pitch of low is different from mid. Hence mid is not low tone minus its fall, as had been thought. (See Kropp 1971, pp. 112-113, the basis of Stewart 1971, p. 212.)

case, the mid remained at about 140 Hz., and the adjacent high was raised, to about 170 Hz., in *má á*. If it followed the mid the high was raised only to about 160 Hz., as in *siné*. Thus, downdrift or key-lowering in Dangme occurs after mid tones. Dr Apronti provides a tonogram that reflects the difference in pitch of a high tone before and after a mid. In *ó wómí* 'your book' (13), the first syllable was at 180 Hz., the last at 160 Hz. The middle syllable was also at 160 Hz. Assuming a basic frequency of 140 Hz. for the mid, this means that when a higher than normal key was chosen, the mid tone itself was raised, so that a nearly normal pitch difference of not more than 30 Hz. was maintained between the mid and the preceding high, at the expense of the distance between the mid and the following high, which was in the "normal" key, and so the last two syllables were realized at the same pitch.

When a high tone preceded a final low tone it was not raised, because the pitch difference in the normal key was sufficient to distinguish them. Following a low tone, however, high tones were raised, to 160 or 170 Hz., that is, to approximately the same pitch as they have after a mid. For the operation of key lowering a raised key must be chosen for a high tone that precedes a low-high sequence. Thus, in *téji pòpùé*, the first two syllables were at 170 Hz., the last at 160 Hz. The difference between the pre- and post-low tone high seems to have been less than the pre- and post-mid tone highs. The reason may be that more adjustment is required to distinguish high from mid than from low.

So far, it has been shown that mid tone is phonetically associated with high tone, not low. Nevertheless, in respect of the maintenance of contrasts, mid tone is more closely associated with low tone, in opposition to high tone. Loss of contrast between high and mid tone in consecutive syllables is always avoided by raising the high tone if it precedes the mid, but if it follows the mid, contrast may be lost, as in *ó wómí*, where *wó* and *mí* have both been raised, by the same amount.<sup>6</sup>

On the other hand, contrast between mid and low is always lost when syllables carrying these tones occur in a series, except on the pre-high or final syllable. Since mid and low syllables are considerably more numerous in the language than syllables with high tone, this is a common occurrence. It is very likely that the contrast is also frequently lost in normal speech before a high tone. In Dr Apronti's tonogram for *mò ágbò' nǝ́* (27), the pre-high sequence of lows showed gradual descent from 140 to 120 Hz., before the rise to 165 Hz. It is not clear that there is contrast between the low-high sequence here, and the mid-high sequence in *òkpò ǝ lá* 'the dove cooed' (23), which was also measured at 120-160 Hz. It has also been noted that in *téji pòpùé* and *mòtù flákù* the lows did not descend, and the interval was the same. If it is true that maintenance of the contrast between mid and high at the end of a non-high series before a high is optional, then there is no essential contrast between mid and low elsewhere than at the end of a tone group, and before a high tone when tone group-initial or preceded by a high. The contrast between low and high on a syllable followed by a high is never lost. The phonetic

<sup>6</sup> This pronunciation is a stylistic option. In deliberate speech the mid tone syllable may be heard at a pitch lower than either of the highs, but normally it is pronounced as in the tonogram. In a series of two or more mids between high tones, the mid tones are always lower. The set of tonograms does not include one of a sequence of this type.

feature allowing loss of contrast between mid and low seems to be absent in this position of the characteristic fall of final low tones. No tonograms of high-low-high sequences are available in evidence, but it seems likely that maintenance of all contrasts between the second and third syllables is possible because in normal key, the difference between the highest pitch of a low tone and the lowest pitch of a following high is always greater than the difference between the pitches of a mid and a following high.<sup>7</sup>

In tonograms of sequences of non-high tones, the frequencies ranged between 110 and 140 Hz. This covers the "basic" frequencies both of mid tones and of low tones before their fall. Syllables occurring before a non-high tone therefore have a two-term system of tone, high and non-high. It would be inaccurate to say that the non-high term was either the mid or the low of the final or pre-high system, since it seems to include some of the phonetic realizations of both, but without contrast among them.

#### 1.4 OBSERVATIONS

In summary, I wish to make two points here. The first is, that at least in this language, the key lowering system requires the speaker to carry out a process of key raising. In any tone group that includes high and non-high tones, the first step (except in a group consisting of a series high-low), is to raise the high tone. An earlier high tone, preceding the non-high, must then be raised even higher. The pitch range within which adjustments are made presumably depends both on the length of the group and on physiological characteristics of the individual speaker, and must be divided in such a way that the speaker can place his final non-high tones in his personal "normal" pitch. This "normal" pitch is that in the vicinity of which he pronounces monosyllables. In the idiolect for which these tonograms were made, the normal pitch had a measured frequency of 130 to 140 Hz.

The second point is that the statement that mid tone is basically associated with low tone in opposition to high tone needs qualification. It is true that loss of contrast between mid and low is a common occurrence, since the circumstances that allow it are of common occurrence.<sup>8</sup> But there is also an acoustical link between mid and high, as a result of which there is a restricted situation in which contrast between mid and high is partly lost, on a syllable followed as well as preceded by a high. Contrast between high and low is never lost under any circumstances.

## 2. FLOATING TONES

### 2.1 DOWNSTEP

From the foregoing section it is evident that Dangme may be regarded as a three tone language with downdrift, as these terms are generally used, although the three term system is frequently replaced by a two term system. The language also has what is commonly known as downstep, that is, downdrift or key lowering that results in a contrastive

<sup>7</sup> See fn. 5, last sentence.

<sup>8</sup> The fact that mid and low have merged completely in Dangme's (only) sister language, Ga, indicates that these circumstances have applied throughout the history of Dangme.

pitch difference between adjacent high tones. It is not however of very frequent occurrence. In a trivial way it occurs whenever a mid tone occurs between two high tones. As described in 1.3 above, such a mid tone tends to be realized at the same pitch as the following high tones. Thus the mid tone has the same pitch relation to the preceding high tone as does the following high tone. In the usual terminology it has thus "become" a downstepped high tone, but it is misleading to say that the mid is assimilated to the following high. In a tone marking that reflects contrasts as realized in pronunciation, rather than generalizations about the behaviour of particular syllables, ó wómí 'your book' and kòffí yē nǝ 'Kofi ate' would be transcribed respectively ó 'wómí and kòffí 'yē nǝ.

## 2.2 FLOATING HIGH TONE

As compared to Ga, Dangme has relatively few floating tones, by which I mean tones that are to be regarded as features of specific morphs, but are not attached to a specific segmental syllable. One such tone is the marker of potential aspect,<sup>9</sup> and consists of high tone. This is added to the syllable that happens to precede the verb. If that syllable is not normally high, it is lengthened to provide a carrier for the high tone. Thus,

wà nà 'we saw', wǎá nà 'may we see!'

òkpò nà 'a dove saw', òkpòó nà 'may a dove see!'

Another floating tone occurs as part of the exponence of the determiner 'nǝ 'this', which is always preceded by a high tone. In this it resembles Ga 'lè 'the'. When 'nǝ follows a high tone, there is no discernible effect on the preceding word. Thus, má 'corn dough', and má nǝ 'this corn dough'. When it follows a low tone, a high tone is added to the preceding syllable, as with the marker of potential aspect, so that it has a low-high rising tone. Thus, òkpò 'dove' and òkpòó nǝ 'this dove' and mà 'town' and màá nǝ 'this town'.

When 'nǝ follows a mid tone, the mid is actually replaced by the high. Thus, kpēnǝ 'chin', but kpēnǝ nǝ 'this chin'. If the mid tone is preceded by a high tone, however, the high tone derived from 'nǝ is never as high as the preceding high. That is, it is realized as a lowered high tone: ákò 'parrot' and á'kó nǝ 'this parrot'. This indicates that the mid tone is not simply replaced, but remains in its effect on the replacing tone. It may be regarded as having been displaced to the left, in between the high and the new high syllable: ákò and á'kó nǝ.

## 2.3 GROUP-INITIAL LOWERED HIGH TONE

The phenomenon described at the end of 2.2 is of course not rare. The same kind of thing happens in Ga, before 'lè, so that we have bíí bà 'children came', but bíí 'lè bà 'the children came', i.e. bíí 'lè bà. In Dangme, the displaced mid tone is also contrastive initially in the tone group. mà 'herring' apparently acquires high tone in má nǝ 'this herring'. However, the pitch distance between the two syllables is less than in má nǝ 'this corn dough', where má 'corn dough' is always high. In the latter, má is higher,

<sup>9</sup> As defined in Dakubu 1970.

Therefore 'this herring' must be regarded as commencing on a lowered high tone, i.e. 'má n5, from 'má n5. That is, there is a contrast between group-initial key lowering and its absence.<sup>10</sup>

Stewart describes key lowering in Kwa languages as occurring at the end of a low (i.e., non-high) tone syllable which is not followed by another low tone syllable, and sometimes also at the point of transition from one high tone syllable to another high tone syllable.<sup>11</sup> To cover the situation in Dangme, we would have to add that lowering sometimes occurs initially in a tone-group, lowering a high tone syllable that is not preceded by any syllable, although it can still be considered as preceded by a non-high tone. As far as I am aware, such a situation has not previously been reported.

### 3. CONCLUDING REMARKS

The situation implies that in a Dangme tone-group containing 'n5, key raising at the beginning has to be high enough to allow for the floating high tone to be accommodated in a lower key than earlier high tones. It might then be expected that the pitch difference in 'má n5 would turn out to be a normal high-mid difference, but that the range in má n5 is unusually great. However, this does not seem to be the case. There is a clear auditory impression that má n5 'this corn dough' and ákõ 'parrot', have the same intonation, but that the first syllable of 'má n5 'this herring' is different. The pitch of 'má in the latter group seems to be lower than má in 'this corn dough', and the same as 'má in hé 'má n5 (hé 'má n5) 'buy this herring!', where it follows a high tone. In hé má n5 'buy this corn dough!', both hé and má are as high as hé in hé 'má n5.

This means that when the high tones are raised, they are probably not raised by a constant factor. That is, it is probably not true that in a sequence of tones, high non-high high non-high high non-high, the first high is always at  $n + 3x$  Hz., the second at  $n + 2x$  Hz., the third at  $n + x$  Hz., the final non-high commencing near  $n$  Hz. if mid, slightly lower if low. It seems more likely that the last high is raised by a more or less fixed amount, and the first (when non-high tones intervene) by another amount that is also relatively fixed. In the tonograms examined here, a high after a non-high was always 160 or 170 Hz., and a high before a mid was 180 or 170 Hz. A high before low was only raised if another tone followed, in which case the highs had the same pitches as in the neighbourhood of mids. (See Tonograms 6, 8, 12, 13, 19). Any intervening lowered highs are apparently fitted into the pitch space thus created, so that when a lexically mid tone is raised, as in hé 'má n5, no special allowance is made for it in the raising scheme. hé is only raised by the amount that it would be raised before a final mid tone. Presumably, the more lowered high tones in a group, the smaller the intervals between them, but at present no relevant acoustical measurements are available.

<sup>10</sup> This is true at any rate of conscious productions of these contrasting utterances. Dr Apronti doubts whether a native-speaker-hearer could always distinguish them if elicited under less structured circumstances.

<sup>11</sup> Stewart 1971, p. 185. See fn. 5 above, paragraph 2.

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