

The Effect of Downdrift on Major Phrase Intonation in Japanese

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Although the Japanese pitch accent system has been the subject of intense study over the years, the focus has been on the accentuation of what McCawley (1968) calls 'minor phrases'. These are relatively short phrases consisting typically of one content word and its encliticized postpositions, if any. Although certain types of minor phrases have resisted elegant analysis (notably those containing Sino-Japanese compounds), the accentuation of the majority is well known. A minor phrase contains at most one accent which is signalled by a precipitous fall in pitch after the first mora of the accented syllable. Only the location of the accent, if there is one, need be marked in the lexicon; the pitch pattern can then be derived by rule. (There are rules in the language which manipulate accents but by the time the pitch assignment rules apply there will be at most one accent per phrase.) The pitch assignment rules ensure that all moras up to and including the first mora of the accented syllable will be high pitched and all others will be low except that the first mora of the phrase will be low unless it is itself accented (McCawley 1968:137).

The focus on shorter constituents has meant that very little attention has been paid to the effect of intonation on the pitch patterns of minor phrases when they occur in longer utterances. Investigation of the interaction between accent and intonation profitably begins with longer utterances where variation in the actual pitch levels of concatenated minor phrases can be attributed to intonation. McCawley uses the term 'major phrase' to refer to phonological phrases which contain one or more minor phrases. McCawley found that, when a major phrase consists of more than one minor phrase, only the leftmost contains high pitch while the second and subsequent minor phrases 'only go up to mid pitch [138]'. McCawley chooses to account for this fall in pitch through the manipulation of accents prior to the application of the pitch assignment rules. The appearance of mid-pitch in non-initial minor phrases is, McCawley says, a consequence of an accent reduction rule which applies cyclically first to the minor phrases and then to the major phrases reducing all but the leftmost accent in each constituent.

Example 1 (McCawley 1968:173): *kabutte mitara*

'if (I) were to try putting
on (a hat)'

	kabu'r	te	%	mi'	ta'ra
original accents	1			1	1
first pass through cycle:					
accent reduction	1			1	2
second pass through cycle:					
accent reduction	1			2	3

(' = accent; % = minor phrase boundary)

Later post-cyclic pitch assignment rules assign high pitch to all 1-accents, and mid pitch to all 2-accents. The 'tertiary accent' is not pronounced. No suggestion is made that the lowered pitch on the second minor phrase might be the result of phrase intonation and the handling of this phenomenon at the relatively high phonological level of accent manipulation rather than with a low level phonetic rule disguises the fact that it is intonation and not accent which is the reason for the decline in pitch. There are several things wrong with McCawley's analysis of the pitch patterns of major phrases, particularly to do with the erasure of minor phrase boundaries (see Shibatani 1972), but this paper will show that McCawley's analysis (and Shibatani's as well) makes the wrong predictions about the behaviour of pitch in some longer utterances. I believe that the phonetic facts suggest an intonational (phonetic) analysis rather than a phonological one. Such an analysis will account for these longer utterances as well as accounting for those which McCawley's accentual analysis handles adequately.

In major phrases consisting of only two minor phrases, such as Example 1, McCawley's analysis predicts the correct surface pitch pattern:

Example 1': bu
 ta
 ka tte mi ra

(McCawley's prediction as to the surface pitch pattern is correct in respect to the non-low pitches, he tells us nothing about the behaviour of the lows in such phrases.) The non-low pitch in the second minor phrase is lower than that in the first; this is McCawley's mid pitch. In major phrases consisting of more than two minor phrases McCawley's analysis cannot always predict the correct pitch pattern. McCawley explicitly states [138] that the mid pitch accent occurs on the second and subsequent minor phrases in a major phrase. Over the last two years I have subjected recordings of sentences obtained from native speakers of Japanese to an instrumental analysis which yields a trace of the fundamental frequency (F0) of the utterance. (Fundamental frequency is the primary acoustic correlate of pitch.) A careful examination of the F0 contours of longer utterances reveals that not only does pitch decline from the first to second minor phrase in a major phrase, it often declines over the length of the whole phrase. I suggest that this is the well-known pattern of F0 declination or downdrift which is found in many languages and which has even been suggested to have universal currency (Bolinger 1972). The effect of downdrift in Japanese can be seen from the examples below.

Example 2: *koogai ni Taroo wa ikimasita*

'Taroo went to the suburbs'

ko

Ta

ogai ni

kima

roo wa i

sita

If we assume that this sentence consists of a single major phrase there is no way for McCawley to account for the fall in pitch from *Taroo wa* to *ikimasita*. Using McCawley's boundary symbols, @ for major and % for minor phrase boundaries, we can represent the above sentence as: @*koogai ni* % *Taroo wa* % *ikimasita*@. According to McCawley's accent rules there would be a 1-accent on the *ko* of *koogai ni* and 2-accent on *Taroo wa* and *ikimasita*. The pitch assignment rules would yield HMM since the pitch on the non-initial phrases should be the same, both at mid pitch. Another possibility is that there is no % between *Taroo wa* and *ikimasita* since these boundaries can be optionally deleted.

For @*koogai ni* % *Taroo wa ikimasita*@ the accents would be 1-2-3 with the 3-accent not pronounced. The pitch on all the moras of *ikimasita* should then be interpreted as low since they follow the 2-accent on *Taroo wa*. The pitch rise from the first to second mora of *ikimasita* indicates that these moras are not all low and also indicates that the boundary must be there.

What if there is a major phrase boundary between *koogai ni* and *Taroo wa*? @*koogai ni* @ *Taroo wa* % *ikimasita*@ would yield the correct pitch pattern on the second and third minor phrases, but it would not account for the fall in pitch from the first to the second; both *koogai ni* and *Taroo wa* should contain high pitches if there is a major phrase boundary between them. There is no placement of boundaries which results in the correct pitches being assigned to this sentence.

Example 3: *kyoo masaaki ga kusa o uma ni ataeru*

'Today Masaaki feeds hay to the horses.'

kyo sa
 a sa
 o ma o ma
 ki (ku) u taeru
 ga ni a

This is a slightly more complex example. While the fact that *kyoo* and *Masaaki ga* go up to the same pitch level suggests that there is a major phrase boundary between them, there is no placement of boundaries which will account for the steady decline in pitch from *Masaaki ga* to the end. The simplest explanation for the pitch contour of sentences like the above, and for McCawley's examples, is downdrift. Chew (1961:7ff) gives several examples that look much like Example 3 above and which also suggest that downdrift is the normal phrase intonation of Japanese. Of these he says,

Within the same accent phrase each successive high pitch and low pitch is lower than the preceding one [7].

Chew puts no limit on the number of minor phrases which can occur in an accent phrase (=major phrase) — pitch declines

throughout the phrase. Chew uses this 'normal accent phrase' pattern as a tool for determining the location of major phrase boundaries and as an indication of their deletion in the case of his emphasis transforms (Chew 1961:Sec.14). If the pitches of a non-initial phrase are at the same height as they would be in utterance initial position then an accent phrase boundary must occur directly to the left of the non-initial phrase. This confirms the placement of the @ I proposed for Example 3. While Chew makes no specific mention of downdrift, it is clear from his discussion that downdrift would be a reasonable explanation for what he describes as the normal accent phrase.

Haraguchi (1977) does formulate a downdrift rule to account for the decline in pitch which characterizes major phrases, a very late rule which imposes a falling contour on the high and low pitches which are assigned to the moras of the utterance. Unfortunately, Haraguchi's downdrift rule cannot account for the pitch contours I have obtained in my research. While he admits that the example used by McCawley and Shibitani (Example 1 above) might have the surface pitch contour LHLMLL in 'deliberate and relatively slow speech [30]', he claims that the most natural surface melody would be

bu

ka tte mi

tara

The high pitch on *mi* is lowered to the level of the low pitch of the preceding phrase and the low pitch on *tara* is lower still. In a major phrase in which the second minor phrase is medially accented, Haraguchi claims that a rise in pitch from the first to second mora of that phrase 'is crucially dependent on the presence of a pause in front of the initial mora [31]'. There is no evidence in my data that this pause is necessary. In fact, when one speaker, who spoke very deliberately, did insert pauses between phrases the resulting contour looked more like it was the result of the stringing together of major phrases with high sequences reaching the same level throughout the utterance. This could only be considered a very marked intonation contour which probably resulted from the recording situation. Normally people do not enunciate the words of a sentence so carefully with pauses in between each item. Most of my data consist of sentences

spoken at a careful but not especially slow rate. The non-initial highs do decline but not to the extent that they reach the level of immediately preceding lows and the non-initial minor phrases still retain a pitch rise from the first to second mora even without pause. It is possible that downdrift is a gradient phenomenon whose effect is determined to some extent by style and speed of speech but by insisting that highs downdrift to the level of immediately preceding lows, Haraguchi has put his case too strongly. The downdrift rule should simply state that each successive sequence of high and low pitches within a single major phrase will be realized at a lower pitch than the preceding one. In extreme cases this might result in highs being realized at the same pitch as immediately preceding lows.

It is worth saying something here about the function of downdrift in Japanese. The decline in pitch in major phrases knits together the elements of the phrase. A break in the line of declination indicates, as much as pause, the presence of a major phrase boundary. Example 4 exhibits just such a break in the intonation contour.

Example 4: *kyoo otoko wa kusa o uma ni ataeru*

'Today the men feed hay to the horses.'

kyo

sa

toko

ma

o

o u

tae(ru)

o

wa (ku)

ni a

The decline in pitch from *kyoo* to *otoko wa* and the abrupt rise in pitch from *otoko wa* to *kusa o*, even though it does not rise to the level of *kyoo*, suggests the following boundary placement @*kyoo* % *otoko wa* @ *kusa o* % *uma ni* % *ataeru*@. Downdrift applies to both major phrases and the break in the line of declination indicates the major phrase boundary.

There is some evidence to suggest that the decline in pitch which characterizes major phrases in Japanese may also be involved in the achievement of sentence prominence. Warkentyne (1978) claims that in Japanese, 'the pause group consists of a series of accent phrases, the last of which contains the primary

accent [219]'. Warkentyne's accent phrase corresponds to my major phrase and his pause group to some larger unit which can contain more than one major phrase. Speakers of Japanese can place major phrase boundaries, without resorting to pause, in such a way as to bring different sentence elements under the primary accent. If the line of pitch declination is reset this indicates that a major phrase boundary occurs at that point. Warkentyne believes that the initial minor phrase in the major phrase which contains the verb is the one with the most prominence. In Example 4 above *kusa o* would be prominent. Chew (1961) in his discussion of emphasis transforms in Japanese suggests something similar [89ff]. Since word order is relatively free in Japanese, this means that by manipulation of the order of minor phrases and the placement of major boundaries, prominence can be achieved without resorting to anything other than normal phrase intonation.

I have tried to show, based on acoustic phonetic data, that a phonetic rule of downdrift is preferable to McCawley's accent rules in accounting for the pitch patterns of major phrases in Japanese. My data also indicate that the downdrift rule proposed by Haraguchi is too strong, though it may account for some pitch patterns found in very rapid speech. Finally I suggest that downdrift will indicate where major phrase boundaries occur in longer utterances without the need for pause and also speculate that a normal phrase intonation characterized by downdrift, together with boundary placement, is sufficient to signal prominence in Japanese.

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