TONES IN MPUR (West Papuan Phylum)*

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ABSTRACT

An experiment has been carried out in order to verify the number and types of lexical tone contrasts in *Mpur*. Words in presumed minimal tone pairs were presented to native listeners in original and manipulated versions. The tasks were to translate the words from *Mpur* into Indonesian and back. The results justify classifying *Mpur* as a language with lexical tone contrasts.

BACKGROUND

Mpur (West Papuan Phylum, Bird's Head Superstock, Amberbaken Stock-level isolate (Voorhoeve 1994:73ff) [1]), in the literature often referred to as *Kebar* or *Amberbaken*, is spoken by ca. 5000 speakers in the Kebar Valley and Amberbaken (northeast Bird's Head, Irian Jaya) and one of the few languages with lexical tone contrasts in the area. It has two dialects: Sirir (on the coast) and Ajiw (in the mountains) (cf. Kalmbacher 1990:2 [2]).

THE QUESTION OF TONE

During fieldwork (1993/94) I recorded spontaneous texts (myths of origin, folk tales, daily life stories), a vocabulary (2000 entries) and some prepared texts. Evidence for phonemic tone was easily found in word strings with tonal opposition, but number and types of tone had to be specified yet (cf. Kalmbacher 1990:18ff [2]). Instead of impressionistic data described from hearing, an experimental phonetic approach of the issue, in which presumed types of tone are verified in perception experiments with native listeners, would enable me to give a description of types of phonemic tone with phonetic specifications. Experimentally verified data of tone, expressed in relative values (see below), will then be fully accessible and can be reproduced. I conducted an experiment in which words, classified into perceptually and phonetically similar types of pitch level and pitch movement, were presented to native listeners in original and manipulated versions. For the classification I selected 119 words in isolation and 112 words in a small context, pronounced by one female and two male native speakers after an Indonesian translation. The corpus consisted of 91 monosyllabic, 105 disyllabic and 35 trisyllabic words; a total of 406 syllables. The selection of words was made on the basis of two criteria: i) the occurrence of a word in minimal pairs (70 words), triplets (30 words), quadruplets (16 words) and quintuplets (5 words); ii) the types of pitch level or movement in mono-, di- and trisyllabic words, which did not occur in word strings with tonal oppositions (110 words). The classification procedure was as follows. I stylized pitch movements in all 231 words by means of the analysis-by-resynthesis stylization method developed at IPO (Eindhoven, The Netherlands), described in 't Hart et al. (1990) [3]. In this method, measured fundamental frequency (F0) curves (Hermes 1988 [4]) are replaced by the smallest number of straight-line segments which still yield perceptual equality with the original F0 curves. The stylized fragment, represented on a logarithmic scale in semitones, can be made audible and compared with the original F0 curve of the same fragment; no differences may be audible. If pitch in a syllable could be stylized into a level straight-line segment without audible difference with the original pitch, it was defined as a *level* pitch; otherwise pitch was defined as a pitch *movement*. If native listeners consistently distinguish between these types of pitch level and pitch movement, in a phonemic representation types can be defined as level tones and contour tones, respectively. On the basis of the stylizations I classified syllables that were phonetically similar into types of pitch level or pitch movement. The relative values of pitch in each syllable in semitones enabled me to classify similar syllables pronounced by speakers with different pitch ranges. For the 406 syllables, the types I arrived at (the numbers per type are given between brackets) were:

- five types of pitch level, i.e. high (49), midhigh (26), mid (161), midlow (81), low (28) (henceforth: H, MH, M, ML, L) with a pitch range of ten semitones (ST) between high and low, and
- three types of pitch movement, i.e. mid-falling (14), low-falling (5), falling-rising (42) (henceforth MF, LF, FR) with an excursion size of 5 ST in each movement.

The question was, whether the eight phonetic types are phonemic: five level, three contour tones. Such a complicated tonal system was unlikely to exist: the interval between two nearest pitch levels seemed very small (ca. 2 ST) for tonal contrasts. Moreover, realizations with *both* level types H and MH, or MH and M in the *same* word occurred. The same holds true for level types M and ML, ML and L, and for movements MF and LF. Therefore, in the stimuli for the experiment I reduced the five types of pitch level to three (H, M, L), changing type MH into H and/or M and type ML into M and/or L with an interval between two levels of ca. 5 ST. Furthermore, the question was whether types MF and LF are two or just one phonemic tone, or whether they are contextual variants of pitch level MH/M/ML and ML/L, respectively, the movements being ascribed to the interaction of (inherent features of) syllable-final consonants/vowels with tone or intonation. In the stimuli for the experiment I changed types MF into M, L and LF, LF into M, L and MF. Finally, the question was whether type FR is phonemic and realized with two pitch movements within one syllable. Summarizing, questions were:

1) How many types of pitch level are phonemic?
2) Are types MF, LF one or two contour or one or two level tones?
3) Is type FR a complex contour tone?

The experiment was carried out during fieldwork in February '95.

THE EXPERIMENT

The experiment consisted of a *perception* and a *production* task with 146 stimuli: 51 mono-, di- and trisyllabic words in the *original* realization and 95 *manipulated* versions (103 manipulated syllables) of these words. The 51 *original* stimuli were selected from the 231 words dicussed above, pronounced by one of the male speakers: a literate, thirty years old son of a Kebar mother and an Amberbaken father. In order to avoid confusion if more speakers with different pitch ranges were used, and to avoid introducing dialectal variants, the selection of one, in my opinion very consistent, speaker seemed justified. His phonetic specifications (mean values for each type), according to which manipulations were made, are: H 190 hz; MH 170 hz; M 145 hz; ML 125 hz; L 100 hz; MF 140-100 hz; LF 120-90 hz; FR 145-100-145 hz.

Stimuli for the first two questions are:

- eight monosyllabic tokens in six minimal pairs and two minimal triplets, with two or four manipulations: 18 original, 42 manipulated = 60 stimuli;
- seven disyllabic tokens in minimal pairs with one manipulation: 14 original, 14 manipulated = 28 stimuli;
- seven di- and two trisyllabic words (*not* occurring in minimal pairs) with one manipulation: 9 original, 9 manipulated = 18 stimuli.

Stimuli for the third question:

- one mono- and nine disyllabic words (*not* occurring in minimal pairs) with three manipulations: 10 original, 30 manipulated = 40 stimuli. For numbers and types of manipulations see the results. All stimuli were shuffled and randomly recorded on tape in a *resynthesized* version. Practice stimuli preceded the tasks described below.

The *perception* task listeners had to perform was to listen to the *Mpur* words recorded on tape, to give a translation into Indonesian of only correctly pronounced words which was written down by me, and to give no translation if a word was pronounced incorrectly or was unrecognizable.

The *production* task was performed a few days later and consisted of a translation into *Mpur* of the Indonesian words (as they were given last year for the *original* recordings, i.e. *not* the translation by listeners in this experiment), read aloud and recorded on tape.

I suggested, that if the translation into Indonesian of the original and the manipulated versions of one word was the same, the original word had been recognized consistently and the manipulation had been executed correctly. If a different or no Indonesian translation was given, the realization of pitch level or pitch movement in the *production* task must also differ. This could be verified by measuring and comparing the original and the new realization of the stimulus. I expected that ultimately three pitch levels (types H, M, L) and two pitch movements (types LF, FR) would be found to exist; my manipulations would be correct then.

Two trained native listeners, one male (the speaker of the stimuli, see above) and one female (forty years old) performed the tasks. Other listeners invited were all non-trained, and the tasks proved to be too difficult. But, as we will see, the present two listeners were consistent in their judgements.

RESULTS AND CONCLUSION

In the *perception* task of the experiment, the *original* versions of 49 stimuli out of 51 were translated according to the original translation. The two exceptions were stimuli */ip/* (wind) and */wot/* (to see) realized with type MH, which in the manipulated version were accepted as type M, but rejected as type H, because of a tonal contrast in the same pair of type H vs. M. In the *production* task, the translation from Indonesian into *Mpur*, the same 49 stimuli were realized with the same type as in the original recording; the two exceptions were now realized with type M. I verified the phonetic similarity of each stimulus pair, i.e. the original and the new realization, by measuring and comparing pitch in both versions, using speech analysis system "Cecil" version 2.0, developed by Jaars Inc. USA (it had to be done in the field). No dissimilarities were found to exist, which was confirmed by the listeners. After the official experiment they compared the two versions presented in pairs via Cecil and accepted them as perceptually equivalent.

For the 95 *manipulated* versions (103 manipulated syllables) the results are presented below. The column "nr." indicates the number of manipulated syllables, the columns "yes" and "no" whether a given manipulated type was accepted or not. The results are not differentiated per listener, since they agreed in their judgements, except for two manipulations. I decided for the accepted version. Note, that the *monosyllabic* stimuli were manipulated into *two* or *four* types *each*.

Monosyllabic stimuli in minimal pairs and triplets:

type	nr.	yes	no
8 MH → H	8	5	3
M	8	5	3
6 ML → M	6	3	3
L	6	5	1
2 MF → M	2		2
L	2		2
MF	2	2	
LF	2	2	
1 LF → M	1		1
L	1		1
MF	1		1
LF	1	1	
1 FR → MF	1		1
LR	1		1
total	42	23	19

Type MF → MF and LF → LF are stylizations. Types H and M for MH, and types M and L for ML were two times *both* accepted; there was no tonal contrast in the same pair or triplets of types H vs. M, or M vs. L.

Disyllabic stimuli in minimal pairs:

type	nr.	yes
MH → H	1	1
MH → M	2	2
ML → M	6	6
ML → L	9	9
MF → M	1	1
LF → L	1	1
total	20	20

Di-, trisyllabic stimuli not in pairs:

type	nr.	yes	no
MH → H	3	2	1
ML → M	2	2	
ML → L	6	4	2
total	11	8	3

The three rejected manipulations occurred in one word; according to the listeners, type H was too high; type M would be acceptable.

Stimuli of type FR:

type	nr.	yes	no
M-FR →			
M-MF	9	2	7
MF-LR	9	1	8
L-LR	9		9
FR → MF	1		1
→ LR	2		2
total	30	3	27

In the *production* task of words with type FR, the two words for which type M-MF and one word for which MF-LR was accepted, were realized with type M-FR. I have no explanation for accepting the types here.

The three questions, formulated above, can now be answered.

1) *Number and types of pitch level.* The results show, that types MH and ML are not phonemic: if in a given word string an opposition exists of type H vs. M, type MH is a contextual variant of either type H or type M; if in a given word string there is no opposition of type H vs. M, the type can be realized as H, MH or M. The same holds true for type ML. For example, type MH in */muk/* (tail) was accepted with types H and M, type ML in */muk/* (name) only with type L; type ML in */pa/* (already) was accepted with types M and L, type MH in */pa/* (rain) only with type H.

2) *Types MF and LF.* There are only three examples of these types, since in a lot of stimuli falling movements were stylized into level tones and accepted (see above). Type LF in */bak/* (axe) is the only acceptable realization, and for type MF in */ip/* (boil) and */džan/* (not) both MF and LF were accepted; for all three stimuli level types were rejected. Afterwards, listening to type MF and LF stimuli again, the native speakers were persistent in their judgement and came up with more examples of type LF. For the time being, I accept contour tone LF, since manipulations of type MF into LF were acceptable.

3) *Type FR.* The results show that this type is only accepted in its original realization. Other realizations are incorrect or a dialectal variant (type LR): both listeners confirmed my earlier observation, that in the given words type LR is regular in the Ajiw dialect.

Finally, tone contrasts are presented below. They are marked with +, but tone contrasts only occurring in final syllables of polysyllabic words are marked with x. Note, that types LF and FR were not observed in initial or central syllables of polysyllabic words.

Tone contrasts:

	H	M	L	LF	FR
H		+	+	+	
M	+		+	+	+
L	+	+		+	+
LF	+	+	+		x
FR		+	+	x	

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REFERENCES

[1] Voorhoeve, C.L. (1994), *Comparative Linguistics and the West Papuan Phylum*, Maluku & Irian Jaya, E.K.M. Masinambow ed., LIPI Jakarta, pp. 65-90.

[2] Kalmbacher, J.G. (1990), *Mpur phonology*, Cenderawasih University & SIL, unpublished ms., Jayapura 1990.

[3] Hart, J. 't, Collier, R., Cohen, A. (1990), *A perceptual study of intonation: An experimental phonetic approach to speech melody*, Cambridge.

[4] Hermes, D.J. (1988), "Measurements of pitch by subharmonic summation", *J.Acoust.Soc.Am.*