

RHYTHMIC GROUPS AND STRESS GROUPS IN THAI

Presented at the International Conference

on Thai Studies

22-24 August 1984

Bangkok

by

THE APHAN L. THONGKUL

LRU, CHULALONGKORN UNIVERSITY

1. Introduction

Rhythm is regarded as one of the most fundamental characteristics of the pronunciation of a language. Rhythm is among the earliest things learnt by the infant; and it is the most difficult thing for an adult speaker to acquire when he wants to learn to communicate in a foreign language. Abercrombie (1968:36) says that the rhythm at high speed determines the slurring of syllables, and that it also guides the phonetic changes every language undergoes.¹

Almost every person has a sense of rhythm, but the origin and source of this sense is a matter of uncertainty and dispute. Baum(1923:14) says that rhythm exists in three fields of sensation: touch, vision and audition, and that the sense of rhythm differs remarkably in different individuals, just as does the sense of touch, of smell, of hearing, and so forth. In the psychological sense, Woodrow (1951:1232) defines rhythm as "the perception of a series of stimuli as a series of group of stimuli. The successive groups are ordinarily of similar pattern and experienced as repetitive. Each group is perceived as a whole and therefore has a length lying within the psychological pattern."

Speech timing and speech rhythm are two different things : timing is an objective instrumental measurement, whereas rhythm is a subjective measurement of the human mind which involves many complex elements. In analysing speech rhythm, we must take into account the following components: speech timing, the psychology of time, and the phonology of the language in question. Allan(1968:79) says:

Rhythm is by definition the structure of , or the structure imposed upon, the timing, and ...we can perceive a rhythm independently of the exact timing.

Allan (1968:74) defines the timing of speech as "the exact neuro-motor program of articulation which is performed when we speak", and the rhythm of language as "the time dependent sequential character of the code we use to communicate". He discusses rhythm as "a constraint on Linguistic performance" and also relates rhythm to "linguistic competence".

(p.76) As far as the perception of rhythm is concerned, he states:

...we perceive language as being rhythmic because it is fairly regular in its sequential characteristics often enough that we can impose on it simple rhythmic structures. This argument holds for any language because all languages are produced in basically the same manner, by organized movements of the respiratory and articulatory muscles.Some of the structural characteristics of English speech rhythm are related to our human perceptual abilities; this argument should hold for other languages as well, since all languages have accents around which rhythmic groups can perform. (Allan, 1968:74)

2. Concept of isochrony

The most controversial point of the theory of rhythm is the concept of isochrony. Some scholars are for and some are against it. The latter have argued that rhythmic feet are not isochronous and have tried to prove their argument by showing the results obtained from instrumental measurements. To re-examine the problem of isochrony of rhythmic feet in English speech and to investigate the relationship between rhythmic and syntactic units of speech production and perception, Lehiste (1973) conducted a set of experiments. The results obtained show that there is some evidence for isochrony in production as well as in perception.

Lehiste states her findings as follows:

If the listeners cannot focus on the differences in the duration of spoken rhythmic units, it seems reasonable to assume that they hear these rhythmic units as being in some sense of equal duration. It is likely that there is a connection here between production and perception. In production, the durations of metric feet will differ somewhat depending on the phonetic structure of the lexical items comprising the metric feet. It stands to reason that differences of a similar type are not heard as differences: the listener makes allowances for them. The same latitude that is observed in the production of metric feet of the same type may be expected to obtain in the perception of

the duration of metric feet of the same type. With non-speech materials, listeners do not make the same allowances; hence they achieve significantly better results in estimating the duration of filled intervals. (pp. 1233-4)

Objectively, rhythmic feet are not isochronous, but subjectively, they are. Perceived duration is not identical with physical duration. The different physical durations of time intervals can be said to be approximately equal² when they do not exceed or fall much below certain time limits (Bolton, 1894:157). The physical measurements of time intervals must be transposed, first, to the psychological plane. Höring, as early as 1864 found that among intervals ranging from .3 to 1.4 seconds, the shortest were overestimated and the longest underestimated. This discovery led to the concept of an indifferent point or indifferent zone (Fraisse, 1964:118). The indifferent zone was determined by Woodrow to be between .59 and .62 second; and interval of .3 second was found to be overestimated by up to 6.2 percent; the underestimation of an interval of 1.2 seconds was 2.1 percent (Fraisse, 1964:119).

Variations in tempo cause variations in rhythmic foot duration. This is the major reason why rhythmic feet are not absolutely isochronous but approximately so. Catford (1977:86-7) states:

Halliday (1967) refers to a sample of loud reading of English in which 'the ratio of the average durations of one-, two-, three-syllable feet was shown instrumentally to be about 5:6:7'. Although this shows that isochronism is not absolute, it is powerful evidence for a tendency in that direction. If foot duration depended merely on the number of syllables within the foot, we should expect the average to be in the ratio 5:10:15. The very striking deviation from this predicted ratio can hardly be explained otherwise than as indicating an attempt to maintain isochronism. It may be more exact to say that feet are isodynamic, each foot involving about the same initiator-power output. This would undoubtedly lead to feet being approximately, but not exactly, isochronous.

One may discard the concept of isochrony when one talks about speech timing, i.e. the physical measurements of time, but one must regard isochronism when one discusses speech rhythm. The former belongs to instrumental phonetics but the latter, more abstract, belongs to linguistic phonetics and the phonology of a language.³ One must look for a rhythmic structure instead of the exact timing of feet or syllables. A tendency toward equality of interstress intervals causes both the stressed and unstressed syllables to get shorter when the number of unstressed syllables

in the interval increases. For example, in Standard Thai, 5-syllable feet are very rare. This is because it is difficult to keep time. Both the salient (or stressed) and weak (or unstressed) elements within a polysyllabic foot can be shortened to a minimum.

3. Measurements of rhythmic groups and stress groups

According to Halliday (1967), the hierarchical organization of the phonology of a language is composed of four units in descending order: tone group, foot, syllable and phoneme. The domain of a foot extends from a salient syllable, audible or inaudible⁴, up to but not including the next salience. Thus, the first syllable of a rhythmic foot or the salient element (| S |) is identical with stressed syllable; the unstressed syllables in a foot (if there are any), are the weak element (| w |). Using vertical lines to indicate boundaries, the following Thai sentence can be said to contain four feet:

| phǎi | kàp | nǒn | paj dɔ̀ɔn | lɛ̀n | kan jùu naj | sǎn |
 1 2 3 4

"The older and younger siblings are walking in the garden."

Foot is not a grammatical unit. Hence, it has nothing to do with the morphemes or words of a language. As Chatman (1965:117) says:

Feet have nothing to do with language: they thare non-grammatical and non-lexical, and so do not bear any relation to word-integrity, phonological juncture, or any other real linguistic feature. Foot boundaries may split words, and two words separated by even the strongest juncture (say the one represented by a period) may occur within the same foot. Feet, in short, are purely "notational".

Should rhythmic feet in every language be scanned the same way, or one way for languages that thave non-fixed or free word stress, such as English, and another way for languages that have fixed word stress, such as Thai, where stress aiways falls on the last syllable of a ward? Some Thai phoneticians, such as Santirojprapai (1981-1982: 221-225) who did her thesis under Gsell, feel that the salience should be the last syllables of rhythmic feet instead of the first. Thus, the above sentence contains four rhythmic feet, namely:

| phǎi | kàp | nǒn | paj dɔ̀ɔn | lɛ̀n | kan jùu naj | sǎn |
 1 2 3 4

This means that in Thai weak elements always precede salient elements.

In order to justify the two techniques of breaking Thai speech into rhythmic groups, the oscillographic measurements of syllable durations occurring in "The Story of a Myna Bird" were studied again. (See Luangthongkum 1977) For convenience sake, phonological pauses or "silent stress" have been ignored in the present study; only | S |, | Sw |, | Swww | and | Swwww | have been considered. The number of the occurrences of each type of rhythmic foot, the range of foot durations and the mean durations (in cs) may be summarized in the following table:

Table 1 : Measurements of the durations of rhythmic groups
(1st technique)

Type	Number	Range	Mean	Standard deviation
S	63	23-48	33	5.98
Sw	23	33-55	50	5.87
Sww	10	46-62	54	5.49
Swww	3	53-59	56	3.05
Swwww	1	60	-	-

The same data was used again with a different technique of scanning. This time the interstress intervals were located and measured another way: | S |, | wS |, | wwS |, | wwwS | and | wwwwS |. The results of the measurements of stress groups is as follows:

Table 2 : Measurements of the durations of stress groups
(2nd technique)

Type	Number	Range	Mean	Standard deviation
S	46	19-44	30	5.72
wS	28	32-65	46	9.09
wwS	19	45-83	59	10.59
wwwS	6	61-74	67	6.56
wwwwS	1	87	-	-

When the results obtained from the two ways of measuring are compared, it is interesting to note that the first technique, or the Abercrombie technique⁵, seems to more reflect the concept of isochrony of interstress intervals than does the second technique. When the second technique is applied, it is noticeable that the last stress group of an utterance is always much longer than that which precedes it because stressed syllables

never get shorter in order to keep time. This fact seems to violate the tendency towards equality of interstress intervals. Dauer (1983) compares the durations of interstress intervals occurring in continuous texts in many stress-timed and syllable-timed languages; she then concludes: "A tendency of stresses to recur regularly appears to be a language universal property".

4. Conclusion

No one denies that English is a stress-timed or stress-based language. How about what were previously called syllable-timed languages, such as Thai, Spanish, Portuguese, Tamil, etc.? Phoneticians who have given attention to this phonetic aspect, such as Luangthongkum (1977), Pointon (1980), Balasubramanian (1980), Major (1981), Dauer (1983), etc., seem to doubt whether those languages really have syllable-timed rhythm, as defined by Pike and Abercrombie. Why have some languages been perceived as being more syllable-timed than others? Dauer (1983) comments that "the differences between stress-timed and syllable-timed languages has to do with differences in syllable structure, vowel reduction, and the phonetic realization of stress and its influence on the linguistic system."

If it works the way suggested by Dauer, how can one feel and/or hear rhythmical movements in exotic languages when one knows nothing about their syllable structure, vowel reduction, phonetic correlates of stress and so forth? Even children can imitate the rhythm of a language they cannot speak by saying "dada....da...."

I am inclined to think that speech rhythm cannot be studied efficiently without joint efforts between experimental psychologists⁶ and phoneticians. Phoneticians alone can handle well only timing or objective measurements of the durations of segments, syllables, stress groups and so on. This is because rhythm is a subjective measurement of the human mind which involves many complex elements. At present, perhaps it is wiser to talk only of "stress grouping", which is more concrete. Meanwhile, let us forget about "isochronous rhythmic grouping", since none of us know for certain how our mind works. Moreover, in analyzing stress groups, the other linguistic components, syntax and semantics, can be taken into account because the boundaries of stress groups cannot be assigned without knowledge of the grammar of a language.

Notes

1. For example, rhythm is a cause of segmental (consonant and vowel) and tone changes in Thai. When a rhythmic foot contains many syllables, in order to keep time, those syllables have to be jammed together. The whole process causes many type of changes, both segmental and suprasegmental. Segmental length is affected the most; for example, in unstressed positions, vowels lose their long-short distinctions. (A detailed discussion and the instrumental evidence are to found in Hiranburana, 1971 and Luangthongkum, 1977)

2. Psychologists make a distinction between equivalence and identity categorization. The perception of equal intervals is an equivalence (as the same kind of thing) rather than an identity (exactly the same) categorization. Chatman states, "Indeed, absolutely identical rhythmical repetitions rarely occur in nature; the perception of rhythm is almost always based upon the mental approximations of slightly divergent recurrences. What is important is the impression of proportion or equivalence itself." (Chatman, 1965:115)

3. A good example can be drawn from Thai. Rhythm in Thai is linguistically significant. Two or more utterances containing the same lexical items, the same consonants, vowels and tones, can have different meanings when different rhythmic patterns and syllable quantities are assigned. (See details in Luangthongkum, 1977:210-220)

4. Inaudible salient syllable is the same thing as silent stress or phonological pause. When transcribing, it is represented by a caret (^).

5. This can be traced back to Steele (1775). Joshua Steele is regarded as the founder of a school of modern prosody which has been known as the school of "temporal tradition". He pointed out that the studies of music and speech should be joined together to afford mutual support. He states that verse is essentially a matter of musical rhythm, and that not only verse, but also prose, and even every sentence possesses some kind of rhythm. Steele's concept of melody and rhythmus has been passed on. Melody is now called intonation and rhythmus is rhythm, in the technical language of phoneticians.

6. Phoneticians have recently given attention to timing in speech, but many psychologists, e.g. Bolton (1894), Triplett (1901), Squire (1901), Stetson (1905), Wallin (1901, 1912), Adams (1915), Dunlap (1916), Isaacs (1920), etc., had studied and conducted experiments on various aspects of speech rhythm decades earlier.

References

- Abercrombie, D. Elements of General Phonetics. Chicago: Aldine Publishing Company, 1968.
- _____. "Conversation and Spoken Prose," in Studies in Phonetics and Linguistics. London: Oxford University Press, 1971.
- _____. "Syllable Quantity and Enclitics in English," in
S Studies in Phonetics and Linguistics. London: Oxford University Press, 1971.
- _____. "Steele, Monboddo and Garrick," in Studies in Phonetics and Linguistics. London: Oxford University Press., 1971.
- _____. "Some Functions of Silent Stress," in Edinburgh Studies in English and Scots. ed., A. J. Aitken et al. London, 1971.
- _____. "'Stress' and Some Other Terms," in Work in Progress, No. 9, Department of Linguistics, University of Edinburgh, 1976.
- Adams, H. F. "A note on the Effect of Rhythm on Meaning," in Psychological Review, Vol. 22, 1915.
- Allan, G.D. "On Testing for Certain Stress-Timing Effects," in Working Papers in Phonetics, No. 10, University of California, Los Angeles, November, 1968.
- _____. "Experiments on the Rhythm of English Speech," in Working Papers in Phonetics, No. 10, University of California, Los Angeles, November, 1968.
- _____. "The Place of Rhythm in a Theory of Language," in Working Papers in Phonetics, No. 10, University of California, Los Angeles, November, 1968.
- Balasubramanian, T. "Timing in Tamil," in Journal of Phonetics 8:449-467, 1980.

- Baum, P.F. The Principles of English Versification. Cambridge:Harvard University Press, Mass., U.S.A. 1923.
- Brosnahan, L.F. and B. Malmberg. Introduction to Phonetics. Cambridge: W. Heffer Sons Ltd., 1970.
- Chatmen, S. A Theory of Metre. Mouton, The Hague, 1965.
- Dauer, R.M. "Stress-timing and Syllable-timing Reanalyzed, " in Journal of Phonetics 11:51-62, 1983.
- Dunlap, K. "Time and Rhythm," in Psychological Bulletin, Vol.13, 1916.
- Fraisse, P. The Psychology of Time, (translated by Jennifer Leith). London: Eyre Spottiswoode, 1964.
- Halliday, M.A. K. Intonation and Grammar in British English. Mouton, The Hague, 1967.
- Hiranburana, S. The Role of Accent in Thai Grammar. Unpublished Ph.D. thesis, University of London, 1971.
- Isaacs, E. "The Nature of Rhythm Experience, " in Psychological Review, Vol. 27, 1920.
- Ladefoged, P. Three Areas of Experimental Phonetics. London:Oxford University Press, 1969.
- Lehiste, I. "Rhythmic Units and Syntactic Units in Production and Perception," in JASA, Vol. 54, No. 5, 1973
- Luangthongkum, T. Rhythm in Standard Thai, Unpublished Ph.D. thesis, University of Edinburgh, 1977.
- Major, R. C. "Stress-timing in Brazilian Portuguese, " in Journal of Phonetics 9: 343-351, 1981.
- Pike, K. L. The Intonation of American English. Ann Arbor: University of Michigan Press, 1946.
- _____. Language in Relation to a Unified Theory of the Structure of Human Behavior. Paris: Mouton, The Hague, 1971.
- Pointon, G. E. "Is Spanish really syllable-timed?" in Journal of Phonetics 8: 293-304, 1980.
- Santiropjapapai, V. Etude contrastive : groupe accentual en Français et en Thai Standard. Thèse pour le Doctorat de 3ème Cycle Présenté à l'Université de la Sorbonne Nouvelle, Paris III.

- Stetson, R. H. "A Motor Theory of Rhythm and Discrete Succession," in Psychological Review, Vol. 12, 1905.
- _____. Motor Phonetics : A Study of Speech Movements in Action.
la Haye Martinus Nishoff, 1928.
- Squire, C.R. "A Genetic Study of Rhythm," American Journal of Psychology, Vol. 12, 1901.
- Steele, J. An Essay towards Establishing the Melody and Measure of Speech.
London, 1775.
- Stone, M. "Evidence for a rhythm pattern in speech production : observations of jaw movement," in Journal of Phonetics 9: 109-120, 1981.
- Sumera, M. "The Concept of Isochrony : Some Problems of Analysis," in Work in Progress, No. 7, Department of Linguistics, University of Edinburgh, 1974.
- Triplett, N. and E. C. Sanford. "Studies of Rhythm and Meter," in American Journal of Psychology, Vol. 12, 1901.
- Wallin, J. E. W. "Researches on the Rhythm of Speech," In Studies from the Yale Psychological Laboratory, ed., E. W. Scripture, 1901.
- _____. "Experimental Studies of Rhythm and Time," in Psychological Review, Vol. 19, 1912.
- Woodrow, H. "Time Perception," in Handbook of Experimental Psychology.
., S. S. Stevens, New York: Wiley, 1951