Influence of Stress Pattern of Native Language on Non-Native Language: A Comparative Study between Tone and Non-Tone Language Speakers

Narasimhan. S.V., M.Sc. (Speech & Hearing)
Thingom Medamni Devi, Internship (B.Sc. Speech & Hearing)
Kiran Roy, Internship (B.Sc. Speech & Hearing)

Absract

As there are only a handful of studies analyzing the effects of the stress pattern of native language on non-native language, the present study aimed to investigate the effects of the stress pattern of native Manipuri (Tone language) speakers and native Hindi (non-tone language) speakers.

20 native Manipuri speakers who could speak Hindi (10 males and 10 females) and twenty native Hindi speakers (10 males and 10 females) in the age range of 20 – 23 years were made to say 10 Manipuri and 10 Hindi sentences (having adjective and noun combination) in two conditions; first with no stress and secondly, stressing the adjective. Manipuri speakers were asked to say the sentences which were in Manipuri and Hindi and the native Hindi speakers were asked to say the sentences only in Hindi. Recorded sentences were subjected to acoustical analysis. Tone Duration, Tone Height and Peak Amplitude were measured and S-ratios for these parameters were calculated.

The results indicated that tone language speakers', produce stress by increasing the duration of the word or syllable and this pattern of stress in their native language influences the pattern of stress in their second language also. This suggests that, the stress patterns of native language have a major effect on the stress pattern of the other languages they speak. The obtained data will foster our understanding of the behavior of stress in bilingual speakers of native tone language and non tone language.

Language in India www.languageinindia.com **ISSN 1930-2940 13:8 August 2013**
Thingom Medamni Devi, Internship (B.Sc. Speech & Hearing), Kiran Roy, Internship (B.Sc. Speech & Hearing) and Narasimhan. S.V., M.Sc. (Speech & Hearing)
Influence of Stress Pattern of Native Language on Non-Native Language: A Comparative Study between Tone and Non Tone Language Speakers   239

Introduction

A tone language is one having a lexically significant, contrastive but relative pitch on each syllable (Beach, 1924). Tone language has four basic characteristics; lexically significant pitch (pitch distinguishes the meanings of words), Contrastive pitch (pitch that can be differing within a functional system), relative pitch (relative height of the toneme), significant pitch unit (most frequently there is one to one correlation between the number of syllables and the number of tonemes specific utterance, however a syllable may have more than one toneme).

Tone Languages in the World

The languages of South Eastern Asia, (China, and Indo-China) and West and South Africa (Sudanic, Bantu, Bushman and the Hottentot group) are largely tone (Tuker, 1940). In North America, various tone languages are found in South Western (Mexico, Mazateco, Otomi, Tlapaneco, Trique and Zapoteco) regions. There are very few studies on tone languages spoken in North- Eastern part of India (Manipuri, Mizo and Naga languages), which belong to Kuki-chin group of the Tibeto Chinese subfamily.

Efforts have been made to investigate the production and perception of tone in past. Researchers have tried to investigate the type of tones, its perception and cues used by the native and nonnative speakers for the perception, identification and discrimination of tones. Most of these studies are on Cantonese, Thai and Mandarian-Chinese languages.

Study of Tone Languages of India

Early studies of Indian languages spoken in the Himalayan region and in the North-Eastern region of India (Assam, Nagaland, Manipur, Arunachal, etc.) have attempted to detail aspects of tones in the Tibeto-Burman family of languages. There are a good number of studies on the tone languages of India in recent decades. Central Institute of Indian Languages in Mysore, Karnataka, have come up with various phonetic readers of several Tibeto-Burman languages, such Manipuri, Thadou, Ao Naga, Angami Naga, etc., including

Thingom Medamni Devi, Internship (B.Sc. Speech & Hearing), Kiran Roy, Internship (B.Sc. Speech & Hearing) and Narasimhan. S.V., M.Sc. (Speech & Hearing)
Influence of Stress Pattern of Native Language on Non-Native Language: A Comparative Study between Tone and Non Tone Language Speakers 240

several languages spoken in the Ladakh region as well as other Himalayan regions. Researchers at the Department of Linguistics, University of Delhi have also focused on the study of the languages of the North-Eastern India, which has many tone languages. A few researchers (Radhakrishnan, 2005; Rohini, 2007) have studied the types of tone in Mizo and Manipuri language and the perception of these tones by native and non-native speakers.

Suprasegmentals

The term "suprasegmental" refers to those properties of an utterance which do not belong to any single segment. The supra segmental properties are stress, tone, intonation, length and organization of segments into syllables. Sweet (1878) was the first one to talk about stress. He said that stress is a comparative force and called it as extra physical effort. Bolinger (1958) implies the possibility of more and less prominent pitch accent by referring to stress as "the most prominent one in the utterances". The acoustic correlate of stress varies depending on the language under the study.

Stress is cued by acoustic parameters such as increased fundamental frequency (F0), increased amplitude (A0), prolonged duration. The importance of these parameters indicating stress is language dependant. Stress is the relative force with which a given sound, syllable or word is pronounced. Stress is assigned to that syllable of a word which stands out more conspicuously. It is conveyed by variation of frequency, intonation, duration and pause (Hargrove and McGarr, 1994). While in languages such as English (Bolinger, 1958; Morton & Jassem, 1965), and French (Rigault, 1962), Fo is the primary acoustic correlate of stress whereas duration is found to be major correlate in Swedish (Westin, Buddenhagen & Obrecht, 1966), Estonian (Lehiste, 1968a), Italian (Bertinetto, 1980), Tamil (Balasubramanyam, 1981), and Kannada (Savithri, 1987; Raju Pratap, 1991; Savithri 1999).

Very few studies on stress have been done in Indian languages. Some of the works done in Indian languages are summarized in Table 1.

Language	Author	Year	Cue for stress

Language in India www.languageinindia.com **ISSN 1930-2940 13:8 August 2013**
Thingom Medamni Devi, Internship (B.Sc. Speech & Hearing), Kiran Roy, Internship (B.Sc. Speech & Hearing) and Narasimhan. S.V., M.Sc. (Speech & Hearing)
Influence of Stress Pattern of Native Language on Non-Native Language: A Comparative Study between Tone and Non Tone Language Speakers   241

Kannada	Ratna, et al.	1981	Do, Ao
Kannada	Savithri	1987	Do
Kannada	Raju Prathap	1991	Do
Kannada	Savithri	1999	Do
Hindi	Ruchi, et. al.	2007	Do, Fo
Mizo	Narasimhan, et. al.	2010	Do

Table 1: Cues for stress in different languages (Indian studies)

Importance of Pitch and Stress in Tone Languages

Tone languages use pitch and stress to signal a difference in meaning between words (Avery 1977), these pitch variations are an important part of the language. In these languages, word meanings or grammatical categories such as tense are dependent on stress. Stress is assigned to that syllable of a word which stands out more conspicuously. Hence among the bilingual tone and non-tone language speakers, the acoustic factors which contribute to this stress patterns in tone languages may differ from the stress patterns in non-tone language. So, the present study will help in understanding the effect of stress patterns of a tone language on the stress patterns of non-tone language.

Need for the Study

India is a country with a variety of languages including tonal and non tonal languages. In past, several studies on perceptual and acoustic correlates of stress have been carried out in Indian languages. There are no studies analyzing influence of stress patterns of tone language on the stress patterns of non tone language of India, hence, the present study was planned.

Aim of the Study

Thingom Medamni Devi, Internship (B.Sc. Speech & Hearing), Kiran Roy, Internship (B.Sc. Speech & Hearing) and Narasimhan. S.V., M.Sc. (Speech & Hearing)
Influence of Stress Pattern of Native Language on Non-Native Language: A Comparative Study between Tone and Non Tone Language Speakers   242

The presents study aimed at comparing the stress patterns of native Manipuri speakers (tone language) speaking Hindi and English (non-tone languages) with native Hindi speakers speaking Hindi and English.

Methodology

Subjects – 22 native Manipuri speakers who knew Hindi (10 males and 10 females) and 20 native Hindi speakers (10 males and 10 females) in the age range of 20-23years served as the subjects for the study. All subjects were pursuing their graduation in LLB at Mysore University. They were screened for any speech, language, hearing, cognitive and neurological deficits.

Material – 10 Manipuri and 10 Hindi sentences (which had noun + adjective combination) served as the stimuli. Geminate clusters and aspirated syllables were avoided during the selection of stimuli and a constant syllable length was maintained in the sentences. Table 2 below shows the stimuli used for the study.

Sl no	Sentences in Manipuri	Sentences in Hindi
1	Adagi achouba yum sae fajiya.	Wo bada ghar acha hein.
2	Adagi se asangaba tablene.	Wo ek lamba table hein.
3	Sagol amuba ani chalae.	Do kaala gode daud rahe hein.
4	Asidagi phajaba phirol sae eiginae.	Wo khubsursath vasthre mera hein.
5	Kayada nungsiraba yumno!	Kithna sundar ghar hein!
6	Eigi anonba gari ama liarae.	Meine ek nayi gaadi khareedi.
7	Angang sindigi apikpa behong palli.	Bachon ke charan chotte hein.
8	Adagi apakpa lambel church ki manung chalae.	Wo chowdi sadak church tak jaathi hein.
9	Eigi emanaba di apikpa mamit palli.	Meri dosth ki aankhein chotti hein.
10	Eidi magi anguowba phijol do pamme.	Mujhe uski safed vasthre pasand aaya.

Table 2: Sentences used for the study

Language in India www.languageinindia.com **ISSN 1930-2940 13:8 August 2013**
Thingom Medamni Devi, Internship (B.Sc. Speech & Hearing), Kiran Roy, Internship (B.Sc. Speech & Hearing) and Narasimhan. S.V., M.Sc. (Speech & Hearing)
Influence of Stress Pattern of Native Language on Non-Native Language: A Comparative Study between Tone and Non Tone Language Speakers   243

Procedure – The subjects were asked to say each sentence in two conditions; first, with no stress i.e., speaking as naturally as possible and secondly, stressing the second word i.e., the adjective. The stimuli were recorded using sandisk m200 digital recorder. It was digitized at a sampling frequency of 16 KHz using a 12 bit A/D converter. Subjects were seated comfortably in noise-free environment and the microphone was placed at a distance of 8-10 cm from the mouth. Native Manipuri speakers read the sentences given in Manipuri and Hindi language and the native Hindi speakers read only the sentences given in Hindi. Two Manipuri native speakers and two Hindi native speakers listened to the recorded samples of the subjects and were asked whether the two conditions (stressed and unstressed) were produced correctly or not. Further, all the sentences were subjected to acoustic analyses using PRAAT software (version 4.5.06; Paul and David 2006; University of Amsterdam) and the following parameters were extracted:

a) Tone Height (TH) was measured as the difference between the starting (A) and ending point (B) of F0 contour. TH = A – B (in Hz).

b) Tone duration (TD) was measured as the time difference between the starting and ending point of the F0 contour (in ms).

c) Peak Intensity/ Amplitude (PA) was measured as the maximum intensity in the utterance (in dB).

S-Ratio i.e., difference between stressed and unstressed words for males and females were found and tabulated.

Statistical analysis – MANOVA at 0.05 level of significance was done as a part of the inferential statistics to compare the three acoustic correlates of stress (TH, TD, and PA) for stressed and unstressed production across the 3 speaking conditions, i.e., Manipuris speaking Manipuri (M-M), Manipuris speaking Hindi (M-H) and Hindi speaking Hindi (H-H). Further, to examine the significant effects of the three speaking conditions on TD, TH and PA, Scheffe's Post Hoc test (multiple comparisons) was also carried out. SPSS software (13th version) was used for the analysis.

Results & Discussion

Language in India www.languageinindia.com **ISSN 1930-2940 13:8 August 2013**
Thingom Medamni Devi, Internship (B.Sc. Speech & Hearing), Kiran Roy, Internship (B.Sc. Speech & Hearing) and Narasimhan. S.V., M.Sc. (Speech & Hearing)
Influence of Stress Pattern of Native Language on Non-Native Language: A Comparative Study between Tone and Non Tone Language Speakers   244

The present study aimed at analyzing the influence of stress patterns in Manipuris speaking Manipuri and Hindi and the native Hindi speakers. MANOVA was done to compare the three acoustical correlates of stress (Tone Height, Tone Duration and Peak Amplitude) for two conditions (stressed and unstressed). The result of MANOVA for stressed and unstressed condition across M-M, M-H and H-H are displayed in Table 3.

Source	Variable	F-Value	Significance
Speaking Condition	TD	137.847	.000
	TH	196.961	.000
	PA	21.073	.000
Gender	TD	221.045	.000
	TH	161.767	.000
	PA	96.440	.000
Stress	TD	416.533	.000
	TH	127.625	.000
	PA	51.716	.000
Speaking condition VS Gender	TD	22.707	.000
	TH	13.661	.000
	PA	20.377	.000
Speaking condition VS Strtess	TD	12.688	.000
	TH	22.342	.000
	PA	1.118	.327
Gender VS Stress	TD	8.455	.004
	TH	11.114	.001
	PA	.464	.496
Speaking condition VS Gender VS Stress	TD	1.527	.218
	TH	3.340	.036
	PA	.289	.749

Table 3: Results of MANOVA.

As it can be seen from Table 3, the result of MANOVA, it was evident that TD, TH and PA were significantly different between both the stressed and unstressed conditions. It was seen that there was a significant effect of speaking conditions (i.e., M-M, M-H and H-H) on all the three acoustic correlate of stress. Significant gender effect was also noted across the TD, TH and PA. The combined effects of the speaking conditions and gender were also noted across all the three acoustic parameters analysed.

As there was significant effects of the three speaking conditions on TD, TH and PA, Scheffe's Post Hoc test (multiple comparison) was carried out. From the result of Scheffe's Post Hoc test it was noted that there was a significant difference between all the three speaking conditions across the TH. M-M showed highest with the mean value of 510.9 msec that was significantly higher than that of M-H (432.6msec). H-H showed the least TD with a mean of 413.8 msec. It was also noted that H- H (37.8 Hz) showed highest TH whereas M-H and M-M showed no significant difference on TH i.e., 18.5Hz and 19.5 Hz respectively. PA of H-H (71.0dB) showed the least from all the three speaking conditions. However M-M and M-H speaking conditions there was no significant difference i.e., 73.2 dB and 74.4 dB respectively.

The results of acoustic analysis indicated that tone duration (TD) was the major cue for stress in Manipuri language as well as the Hindi spoken by native Manipuri speakers. However, tone height (TH) along with tone duration (TD) served as major cues for stress in Hindi spoken by native Hindi speakers. Thus the results indicated that tone language speakers give stress by increasing the duration of the word or the syllable and they also perceive the stress with increased duration of the word or the syllable. The results are in consonance with the studies done on Estonian (Lehiste, 1968) and Mizo (Narasimhan et al., 2010) where the results suggested that the TD was major acoustic correlate of stress in tone languages. The results also indicated that the speakers of tone language generalize the stress patterns of their native language to the second language they speak in spite of the second language being non tone language. Hence from the results of the present study it can be inferred that in native tone language speakers, there is a major influence of stress patterns of tone language on a non tone language.

Thingom Medamni Devi, Internship (B.Sc. Speech & Hearing), Kiran Roy, Internship (B.Sc. Speech & Hearing) and Narasimhan. S.V., M.Sc. (Speech & Hearing)
Influence of Stress Pattern of Native Language on Non-Native Language: A Comparative Study between Tone and Non Tone Language Speakers

The acoustic correlates of stress in Hindi were found to be TD as well as TH. Hence the results obtained in the present study are in agreement with the study done by Ruchi et al, (2007) which reported that the major acoustic correlates of stress in Hindi are the TD and TH. This can be further evidenced by the higher S-ratio obtained for TD and TH by the Hindi speakers. Therefore it can be noted that the native Hindi speakers give stress by increasing the syllable duration as well as changing the relative pitch of the syllable.

Thus, this data supports the notion that acoustic cues of stress differs across languages. Also native tonal language speakers use the stress patterns of their native language while speaking their second language (non tonal). The relative pitch (i.e.TH) is lexically significant in a tone language, i.e., change in TH changes the meaning of the word. Intensity cannot be a major cue for stress due to various factors such as intrinsic properties of the speech sounds, interaction between F0 & formant data, transition factor, and recording variables. Thus TD can cue stress in tone languages which in turn influences the stress patterns of other languages they speak. But the relative pitch (i.e.TH) is not lexically significant in a non tone language, i.e., change in TH does not change the meaning of the word. Hence it can be told that the non tone language speakers make use of the change in relative pitch of the syllable as well as the TD to cue stress in non tone language and which also in turn influences the stress patterns of other languages they speak.

Conclusion

In this study we analyzed the acoustic correlates of stress in native Manipuris speaking Manipuri, Hindi and English languages; Hindi native speakers speaking Hindi and English languages. It was found that tone duration was the major cue for stress in native Manipuris irrespective of the language they spoke while tone duration and tone height were the major acoustic correlates of stress in the native Hindi language speakers. During the course of the study it was also found that the acoustic correlates of native language (tonal or non tonal) could influence the stress correlates of their second language. Further studies on this aspect could throw light on understanding the nature of stress in bilinguals. The obtained data will foster our understanding of the behavior of stress in tone and non tone languages. It also provides a thrust to the long felt need for research in the field of prosody in bilingual

Thingom Medamni Devi, Internship (B.Sc. Speech & Hearing), Kiran Roy, Internship (B.Sc. Speech & Hearing) and Narasimhan. S.V., M.Sc. (Speech & Hearing)
Influence of Stress Pattern of Native Language on Non-Native Language: A Comparative Study between Tone and Non Tone Language Speakers   247

native tonal language speakers and also on the tone languages of India. Further, stress analysis should be done on speech and language disorders in tone language to better understand prosodic deficits in them. It will also be a useful input in text to speech synthesis and can also be used in forensic sciences in the speech identification.

===

References

Abercrombie (1976). 'Stress and some other terms'. Department of Linguistics, University of Edenburgh 9:551-3.

Abramson, A. S. (1962). The Vowels of Tones of Standard Thai: Acoustical Measurements and Experiments. *International Journal of American Linguistics*. 28/2, Part II.

Avery (1977). A quantitative language. In E.Blancquaert and W.Pee (eds.), pp.276-280.

Balasubramanian, T (1981): Emphasis in Tamil. *Journal of Phonetics*, 9, 139-150.

Bauer, R. S., & Benedict, P. K. (1997). *Modern Cantonese Phonology*. Berlin: Mouton de Gruyter.

Beach, D. M. (1924). *The Science of Tonetics & its Application to Bantu Languages*, in Bantu studies, 2nd series, II, 84, 102.

Bertinetto (1980). 'Observations on Sentential Stress'. Language 48: 304-28.

Bolinger, D. L.: Theory of Pitch Accent in English. *Word*, 14:109-149(1958).

Crystal, D. (1982). *Prosodic systems and intonation in English*. Oxford Cambridge University Press.

Fant (1958). Experiments in the perception of stress. Language and Speech 1:126-52.

Language in India www.languageinindia.com **ISSN 1930-2940 13:8 August 2013**
Thingom Medamni Devi, Internship (B.Sc. Speech & Hearing), Kiran Roy, Internship (B.Sc. Speech & Hearing) and Narasimhan. S.V., M.Sc. (Speech & Hearing)
Influence of Stress Pattern of Native Language on Non-Native Language: A Comparative Study between Tone and Non Tone Language Speakers   248

Fry, D. B. (1955). Duration and intensity as physical correlates of linguistic stress. *Journal of Acoustical Society of America*, 27, pp 765-769.

Hargrove & McGarr (1994). Structures and categories in prosodic representations. In A.Cutler and D.R.Ladd (eds.), pp.93-109.

Hashimoto, O. K. Y. (1972). Phonology of Cantonese. Studies in Yue dialects 1. Cambridge University Press.

James, A. L., & Bargery, G. P. (1923-25). A note on the pronunciation of Hausa. *BSOS*, III, 721-728.

Jassem & Gibbon (1980). Redefining English accent and stress. *Journal of the International Phonetic Association* 10: 2-16.

Laver, John (1994). Principles of Phonetics. Cambridge: University Press.

Lehiste, I (1968a). Vowel quality in word and utterances in Estonian. *Congresses secundus internationalis finno-ugristarum, Helsinki*, 1965 (Helsinki: Societas Finno-Ugrica), 293-303.

Morton, Jassem, & Steffen-Botog (1965). Acoustic correlates of stress. *Language and Speech*, 8, 159-187.

Ratna. N, Nataraja. N. P and Subrahmanyaiah. M. G. (1981). A Study on Prosodic Aspects of Kannada Language. *Journal of All India Institute of Speech and Hearing*, Vol, 12, 1981, pp1-6.

Radhakrishna, S. (2005). *Perception of Manipuri tones by native and non-native speakers*, Unpublished Master's dissertation submitted in part fulfillment of M. Sc. (Speech Language Pathology)) to the University of Mysore.

Language in India www.languageinindia.com **ISSN 1930-2940 13:8 August 2013**
Thingom Medamni Devi, Internship (B.Sc. Speech & Hearing), Kiran Roy, Internship (B.Sc. Speech & Hearing) and Narasimhan. S.V., M.Sc. (Speech & Hearing)
Influence of Stress Pattern of Native Language on Non-Native Language: A Comparative Study between Tone and Non Tone Language Speakers   249

Rajupratap, S. (1991). Production of word stress in children-3-4 years. In M. Jayaram & S. R. Savithri (Eds.). *Research at All India Institute of Speech and Hearing. Dissertation Abstracts, Vol III, pp11.*

Rigault, A., (1962): *Proceedings of the 4th International Congress of Phonetic Sciences, Helsinki*, 1961.The Hague: Mouton & Co., pp.735-748.

Rohini, C (2007). Perception *of Manipuri and Mizo tones by native and non-native speakers,* Unpublished Master's dissertation submitted in part fulfillment of M. Sc. (Speech Language Pathology) to the University of Mysore.

Ruchi (2007). Acoustic correlates of stress in Hindi. Paper presented at FRSM, Mysore.

Savithri, S.R. (1987).Some acoustic and perceptual correlates of stress in Kannada. *Proceedings of the National Symposium on Acoustics*, *Special edition*, 2009.

Sweet, H. (1878). *Handbook of phonetics.* Oxford: Clarendon Press.

Tucker, A. N. (1940). *The Eastern Sudanic Languages*. I, 57-59, London.

Westin, K., Buddenhagen, R.G., & Obrecht, D.H. (1966). An experimental analysis of relative importance of pitch quantity and intensity as cues to phonemic distinctions in southern Swedish. *Language and Speech*, 9, 114-126.

===
Thingom Medamni Devi, Internship (B.Sc. Speech & Hearing)
Kiran Roy, Internship (B.Sc. Speech & Hearing)
Narasimhan. S.V., M.Sc. (Speech & Hearing).

Corresponding Author:
Thingom Medamni Devi
Internship (B.Sc. Speech & Hearing)
J.S.S. Institute of Speech and Hearing
Ooty Road, Mysore 570025
Karnataka
India
thmedha08@gmail.com

Language in India www.languageinindia.com **ISSN 1930-2940 13:8 August 2013**
Thingom Medamni Devi, Internship (B.Sc. Speech & Hearing), Kiran Roy, Internship (B.Sc. Speech & Hearing) and Narasimhan. S.V., M.Sc. (Speech & Hearing)
Influence of Stress Pattern of Native Language on Non-Native Language: A Comparative Study between Tone and Non Tone Language Speakers   250