Acoustic characteristics of vowels in adolescent and adult female malayalam speakers of different dialects.

[1]Welshin Wilson,[2]Satish Kumaraswamy

ABSTRACT : A language's dialects is the variation in speaking pattern that result from the geographic and racial diversity of its speakers.Each dialect uses a different set of tongue, lips, jaw, palate, and teeth articulation patterns to produce speech.In the present study,acoustic characteristics of different dialects in malayalam focussing on female adult and adolescent speakers were considered.About 30 participants each from adults and adolescents with three different dialects have been considered in the study.Analysis were done by recording the vowels /a/,i/ and, /u/ in Isolation,multiple word,single word and sentence with the help of PRAAT software(Version 6.2.14) to find the variation in all three different dialect.The present study inferred that variation in dialect has been well defined in each region of kerala.Thus,vowels have an effect in perceptual judgement of speech,differences found in three different malayalam dialect have the potential to affect listeners,perceptual identification of vowels which may impact speech intelligibility.

INTRODUCTION

Voice refers to a medium through which we do most of the communication in life.voice plays an important role in daily life. It is where we produce sound to communicate meaning,ideas,opinions,thoughts etc.In the narrow sense,voice refers to the vibration of vocal folds to produce sounds.even though vocal folds are simple in structure,the different sounds they produce seems to be remarkable.vocal sounds,typically having complex temporal patterns,vary in frequency,intensity and spectral features.The vocal fold vibration is not considered as an on-off twitching of muscles, whereas it is caused due to the passage of air from the lungs to the vocal folds.

The human voice tends to be extremely variable.Every individual sounds different depending on whether the person is laughing,speaking, shouting or whispering. The human voice offers a variety of indications to person identity.The variation in voice of a speaker can be recognised them as familiar from just a brief recording of a voice(Kreiman & Sidtis, 2011).Different investigators have found that human ear has the ability to identify an individual's gender on the basis of voice quality.There are considerable physiological differences between the vocal folds of adult males and females. Murray and Singh (2015), however, contend that listeners can determine a speaker's gender based on acoustic cues including stress and pitch levels, as well as the nasality or hoarseness of a speaker's voice in a male or female voice, respectively.Differences in pronunciation, accent and other idiosyncratically marked features of a person's vocal inventory result from variations in each person's vocal apparatus' anatomy including variations in the thickness of the vocal folds, variations in a person's palate shape, and differences in the dynamic use of the vocal tract(Scott & McGettigan, 2015).

Dialects are the regional or social diversity of languages characterised by pronunciation, grammar, and / or vocabulary.On the basis of geographical variation,speakers from different geographical regions have different dialects.Every place on this planet has its own characteristics, culture and customs. In addition, different places have their own languages, often their own dialects. Languages and dialects retain the unique cultural elements of a particular place.Different cultures have different words or different pronunciation for the same thing.different culture has its own unique identity.Culture loses its identity if all languages are standardised with the same words and pronunciations.One of the best example of dialect is the regional dialect where distinctive form of language is spoken in certain geographical areas.We can also speak of a social dialect: the distinct form of a language spoken by members of a specific socioeconomic class, such as the working-class dialects in England," (Akmajian, 2001).

Accents have to be eminent from dialects. Accents are a characteristic pronunciation of a person.Accents are an important part of recognition.It gives an idea of who we are and which community we belong to acts as significance in getting knowledge on new languages.Accents relate to the localised speech of different speech sounds and languages. They are part of the culture of the language and can be difficult to understand, but they add to their richness and variety..they have a way to connect with the community.

Acoustic analysis of vowels provides a detailed knowledge of variation in different dialects in malayalam. Multiple characteristics of vowel production have been found to be closely related to both healthy and disturbed speech's overall intelligibility. Measures of vowel duration, acoustic vowel space, fundamental frequency range, and second formant frequency range have all been demonstrated to have an impact on the overall intelligibility of speech. (Bond & Moore, 1994; Bradlow, Torretta & Pisoni, 1996; Hazan & Markam, 2004;Bond & Moore, 1994; Bradlow, Torretta & Pisoni, 1996; Hazan & Markam, 2004)

Studies have revealed that, for the same language, the phone lengths for various vowels varied across various regional accents. Two well-known regional accents of British English were represented by the formants F1, F2, and F3, which considerably varied in some vowels (Adank,Van Hout and Velde, 2007;Zheng,Dyke,Berryman and Morgan, 2012)

Studies show that Vowels can appear on their own in Kannada, although dead consonants, which only appear at the end of words, cannot. In contrast to consonants, vowels are frequently seen to carry dialectal differences in Kannada (Zhenhao, 2015; Arslan and Hansen, 1996; Nagesha and Nagabhushana, 2007).

REVIEW OF LITERATURE

Dialect is a variation of a language used to indicate origin.Although the idea is typically viewed in terms of geography (regional dialect), it might also have some relevance in terms of a person's socioeconomic background or line of work (occupational dialect).Grammar (more particularly, morphology and syntax) and vocabulary are the main aspects of linguistic structure that set a dialect from from other dialects of the same language.Dialectology is the study of dialects as a result of the aforementioned regional

variations.Language subregions are mapped using dialectology.A language's dialects is the variation in speaking pattern that result from the geographic and racial diversity of its speakers.Social or geographical difference are one form of categorisation that are accepted.Despite certain Societal distinctions,geographical differences in Kerala are the main source of dialect variance.When variations within a language allow that language to be mutually intelligible, the languages are said to be dialects of the particular language(Chambers & Trudgill, 1980).Dialects are one of the main causes of speech variabilities and are to blame for the decline in automated speech recognition (ASR) performance(Hughes, 2014).

It is predominant that a slang which is used by specific group of people should not be mystified with dialectal variation.On the basis of certain parameters including regional,community, occupation, social class etc,variation in intonation patterns and distribution of grammatical and phonetic elements can be seen.on the basis of social lines,dialects vary with respect to caste and region.few studies have shown variation in the dialect with respect to region,caste and tribe.The result of these studies illustrate linguistic variation in the state.A study summarises on the distinction between the two by claiming that social dialects reveal who we are while regional dialects reveal where we come from(Romaine, 2002).

Prosody is a vital component of spoken language that can be divided into linguistic prosody and emotional prosody(Raithel & Fastabend, 2004).One prosody parameter that provides information on the production elements is intonation.Intonation is described as a phenomenon with a very distinct core of pitch contrast, a periphery of supporting and occasionally contradictory contrasts of different orders, and a central pattern of pitch contrast(Crystal, 1969).In other words, it superimposes the statement onto the variance in fundamental frequency (F0).An abstract series of high and low tones is what is meant when we talk about intonation patterns.there are no particular physical value for these tones.Instead, they are implemented relative to one another by adjusting the voice's fundamental frequency (F0) and pitch(Ladd, 1996).Different phonetic segments are also suggested for the characterization of dialects in addition to distinguishing characteristics.Vowel intrinsic qualities including the F1, F2, pitch, and duration feature have been studied to examine the acoustic link between linguistic dialects(Escudero, 2009; Zhenhao, 2015).

Each dialect uses a different set of tongue, lips, jaw, palate, and teeth articulation patterns to produce speech..As a result, there are differences in the formant and duration values of vowels between dialects.(Adank, 2004; Arslan & Hansen, 1996; Zheng, 2012)

Vowel is a common vocal sound, produced by the speech organs, which present little airflow blockage and create a sequence of resonators above the level of the larynx(Mosby, 2008).Vowel acoustic analysis can provide their spectra.The depiction of the amplitude of all the sound's component frequencies is called a spectrum.Vowel spectra will display different energy peaks known as formants.

The first formant (F1) is the lowest peak, followed by the second formant (F2), and so on.The vocal folds vibrate at their fundamental frequency, also known as F0.Vowel perception research employing synthetic continua demonstrates that the placement of the first two formant frequencies can influence how vowels are perceived(Carlson, Granstron & Fant, 1970).Vowels differ in their formant pattern, formant bandwidth, duration, loudness, and fundamental frequency from an acoustical perspective.Among these, formant pattern, duration, and fundamental frequency are thought to have a significant impact on vowel perception(Pickett, 1980).A study is carried out to compare the acoustics of two Portuguese dialects, the Brazilian and the European. It has shown that there are differences in two dialects' intrinsic vowel characteristics, including F1, F2, pitch, and duration(Escudero, 2009).A study on the effects of vowel acoustic features on four different dialects of Hindi is presented. Three formants, pitch, and pitch slope features were considered in this study to examine the acoustic characteristics of ten Hindi vowel sounds (Sinha, 2015).

A speaker's production of the same vowel might vary greatly depending on their age, gender, and sociolinguistic background.Men and women have different supralaryngeal vocal tract and vocal cord lengths, which contribute to differences in acoustic signals that indicate speaker sex. These differences can cause the same vowel produced by different speakers to have different resonant frequencies, most notably the first and second formant frequencies (F1 and F2).Studies have shown that /e/ sound has a significant difference in F2 formant for female speakers(Kibria, 2020)

Malayalam is one of the preponderant languages spoken in kerala in southwestern part of India.More than 20 million population in the southern part of kerala consider malayalam as their mother tongue.Malayalam,closely related to tamil,belongs to the southern group of dravidian languages.This is one of the 22 languages planned in India, spoken by 2.88% of Indians.Malayalam is also spoken by the linguistic minorities of neighbouring countries. There are numerous speakers in the Nirgilis and Kanyakumari districts of Tamil Nadu and the Kodagu and Dakshina kannada districts of Karnataka.there are huge number of malayali expatriates located in persian gulf where malayalam is spoken widely in gulf countries.There is no gender category and it does not distinguish between people and numbers in the finite (individual) form of the verb.Sanskritized Manipravalam and the Tamilized Misra-bhasa were the two dialects found in the early classical malayalam.kerala is a state with 14 districts in which there are different dialects with the increase number of districts.the major regional dialects are broadly classified into three:south,north and central.

In the 16th century, the difference between the two dialects disappeared. A unified literary language has developed in Ezuttacchan's work.The modern spoken Malayalam, which includes 12 regional dialects and numerous caste dialects, is different from the literary language.Majority of the verbs and nouns from sanskrit has been borrowed by the language,malayalam.Like the common Dravidian, Malayalam has a set of retroflex consonants (/ ɖ /, / ɳ /, and / ʈ /) created by turning the tip of the tongue back toward the palate.

Variations in a language, whether phonological, morphological, lexical or syntax is approached in sociology.Categorically different dialect variation can be seen internally in different levels which include phonological,morphological and syntactic.the viewpoint regarding the categorisation of variation are in diverse.(Holmes, 2001).It is challenging to theoretically develop a clear categorization between the dialects(Wardhaugh, 2006).

A survey identifies twelve dialect areas; South Travancore, Central Travancore, West Vempanad, North Travancore, Cochin, South Malabar, South Eastern Palghar, North Western Phalgat, Central Malabar, Wayanad, North Malabar and Kasaragod.this study came up with result of identifying these areas through the analysis of malayalam spoken by ezhavas and thiyyas(Subramoniam, 1974).When compared to the other dialects in the state, the Mappila dialect (spoken by the Mappila Muslim population in Kerala,

primarily in the Malabar region) differs greatly from literary Malayalam.The central Kerala dialect, which is spoken in the Kottayam area, has the strongest resemblance to the written Malayalam.

According to Tegegne (2015), student receives effective and successful learning with the help of their own native dialect.Solano-Flores & Li, 2006 observed that students performed better when they were administered tests in the local dialect than the standard dialect of the language Haitian-Creole (Tegegne, 2015).

According to the consonantal context, vowel formant frequencies have been shown to change.(Lindblom, 1963; Steven & House, 1963)and whether the formant frequencies are measured in monosyllables or in continuous speech (Shearme & Holmes, 1961).

Jensen & Menon (1972) measured the formant frequencies of the five long and short vowels of Malayalam. These vowels were produced by six speakers (male) of Malayalam in the age range of 26 to 41 years. The F1 frequency of /i/ -/iː/ and F2 frequency of /e/-/eː/ did not differ from each other. The F1 frequency of /e/ versus /eː/, /o/ versus /oː/ and /u/ versus /uː/ differed by less than 20Hz and the F2 frequency of /o/ versus /oː/ differed by 31Hz.However, the F1 frequency of /a/ versus /aː/ showed a difference of 52Hz and the F2 frequency of /a/ - /aː/ and /u/ - /uː/ showed differences of 84Hz and 73 Hz Respectively.

The temporal features of Malayalam vowels were examined by Sasidharan in 1995. The dialect studied was the Peak dialect (so named because it is spoken in the northern part of the Cannanore district). The vowels were examined in initial, medial, and final positions in VCV and CVCV contexts.These words were embedded in carrier sentences.the result conjectured that the long vowels were found to be shortest in word medial position (185ms) and longest in word initial position (217ms).The average ratio of the duration of short to the long vowels is 1:1.89 in Malayalam.

Understanding the generation and perception of speech sounds in Indian languages requires analysis of their acoustic properties(Savithri, 1989).A study carried out in Malayalam, to study the durational aspects of Malayalam vowels in isolation as well as in a variety of phonetic contexts. The results revealed that the short and long vowels tend to keep their ratio in the range of 1:2(Velayudhan, 1975).

Vowel acoustic properties might vary depending on dialect or area.Study of acoustic measures (duration, first and second formant frequencies) from six regional varieties of American English,revealed a constant regional difference, especially in the production of low vowels and high back vowels. Vowel system of American English is better characterised by the region of origin than in terms of single set (Clopper, Pisoni & de Jong, 2005)

Krishna & Rajashekhar (2013) inferred that there is a significant association between age and region with respect to vowel duration.There was significant decrease in vowel duration with increase in age.The data suggests that individual variations have a greater impact on vowel duration than they do on the consonants that come before it.It was also found that Vowel duration is influenced by region. Compared to speakers of the Coastal or Telangana languages, Rayalaseema speakers have longer vowel durations.

Clopper & Bradlow (2008) inferred from a study that listeners can explicitly categorise unfamiliar talkers by regional dialect with above chance performance under ideal listening conditions.however,the extent to which the important source of variation affects speech processing is largely unknown.In a series of four experiments effects of dialects variation on speech intelligibility in noise and the effects of noise on perceptual dialect classification were examined.result revealed that on one hand ,dialect specific differences in speech intelligibility were pronounced at harder signal to noise ratio,but were attenuated under more favourable listening condition.listener dialect did not interact with talker dialect,for all listeners at a range of noise levels,the general american talkers were the most intelligible and the mid-atlantic talkers were the least intelligible.dialect classification performance,on the other hand was poor even with only moderate amount of noise.

Jacewicz (2009) also acknowledged the effect of regional dialect on acoustic characteristics of vowels by reporting significant differences between measures of vowel duration and trajectory length for the vowels / ɪ, ɛ, e, æ, aɪ/. While the aforementioned literature reported on the effects of dialect on adult speakers. Jacewicz, Fox & Salmons (2011) also acknowledged that the effects of dialect on vowels is significant in children as well as adults. These results suggest that regional dialect has an effect on multiple acoustic parameters of vowels though supporting literature is limited.

Hillenbrand (1995) compared Southern Louisiana data to data reported by himself of differences between the mean F1 and F2 values. More specifically, Southern Louisiana speakers had increased mean F2 values for mid vowels, decreased F1 values for high vowels, and increased F2 values for high vowels. Also, Southern Louisiana speakers had lower mean F1 and F2 values for the central vowel /ʌ/. There was no pattern identified between mean F1 and F2 values comparing these two dialects for front or back vowels.

In recognition of the potential dialectical variability within the region selected, an analysis of the languages spoken in the region was performed. After recording, participants were also asked to fill out a survey regarding their proficiency in speaking French or Cajun French as well as their family history of language use (Dubois & Melancon, 1997)

METHODOLOGY

AIM

The Aim of the study was to compare the acoustic characteristics of vowel in female adolescents and adult who speaks malayalam in different dialect with following objective;

1. To compare the F0,F1,F2.F3 and HNR in /a/,/i/ and /u/ of female adults and adolescents across different dialects.
2. To compare voice characteristics for different dialects across regions(Kottayam,Trivandrum,Kasargod)

PARTICIPANTS

A total of 30 female individuals in the age range of 15 to 25 which is further divided into 15 to 19.11 and 20 to 24.11 participated in the present study.

AGE RANGE	TRIVANDRUM	KASARGOD	KOTTAYAM

15-19.11	10	10	10
20-24.11	10	10	10

All these 30 adults and adolescents participating in the study were from pure malayalam background.

INCLUSION CRITERIA

Malayalam is considered as the first language yo be taken among the age range between 15-25years,females.All these adults and adolescents were born and are living in these selected towns for more than 10 years.

EXCLUSION CRITERIA

- Subjects with significant history of speech,language and neurological disorder or hearing abnormality
- Non Native malayalam speakers

PROCEDURE

The study includes a task of asking participants to produce three vowels /a/,/i/ and /u/ in isolation,words and sentence.The recording was carried out in quiet condition using standard laptop with PRAAT software(Version 6.2.14).

ANALYSIS

Vowels recorded are in Isolation, Words and Sentences which are used to analyse the speakers regional background in first three formant frequencies,fundamental frequency and HNR.ANOVA was carried out for each of the three vowels per speech community served as the independent variable.Bonferroni test was used to analyse the mean,standard deviation across the cities.

RESULT AND DISCUSSION

Table 4.1

Showing the acoustic characteristics of fundamental frequency for the production of vowel /a/

PARAMETER				MEAN	STANDARD DEVIATION	P-VALUE	SIG
/a/	KOTTAYAM	ISOLATION	Adults	223.90	34.15	0.948	NS
			Adolescents	223.10	17.48		
		MULTIPLE WORD	Adults	217.70	34.38	0.194	NS
			Adolescents	234.95	21.34		
		SINGLE WORD	Adults	224.20	34.79	0.143	NS
			Adolescents	243.80	20.67		
		SENTANCE	Adults	210.50	37.78	0.392	NS
			Adolescents	222.58	21.66		
	TRIVANDRUM	ISOLATION	Adults	215.20	43.28	0.681	NS
			Adolescents	209.10	16.00		
		MULTIPLE WORD	Adults	212.30	33.20	0.927	NS
			Adolescents	213.30	7.44		
		SINGLE WORD	Adults	226.50	32.29	0.685	NS
			Adolescents	222.00	12.05		
		SENTANCE	Adults	206.90	28.57	0.324	NS
			Adolescents	196.60	14.71		
	KASARGOD	ISOLATION	Adults	184.20	12.66	0.000	Sig
			Adolescents	217.40	14.47		
		MULTIPLE WORD	Adults	218.80	12.88	0.662	NS
			Adolescents	216.20	13.26		
		SINGLE WORD	Adults	228.00	15.24	0.032	Sig
			Adolescents	211.50	16.57		
		SENTANCE	Adults	211.50	12.15	0.025	Sig
			Adolescents	228.20	17.91		

Table 4.1 shows that there is no significant difference in the production of vowel /a/ for all the different sets in kottayam and Trivandrum(P value >0.000).but there has been significant difference (P value <0.000) found in the production of vowel /a/ in Isolation,Single Word and Sentence in Kasargod.

Table 4.2

Showing the acoustic characteristics of fundamental frequency for the production of vowel /i/

PARAMETER				MEAN	STANDARD DEVIATION	P-VALUE	SIG
/i/	KOTTAYAM	ISOLATION	Adults	231.00	41.51	0.660	NS
			Adolescents	223.90	28.21		
		MULTIPLE WORD	Adults	227.60	41.24	0.180	NS
			Adolescents	247.50	18.38		

		SINGLE WORD	Adults	242.90	42.77	0.364	NS
			Adolescents	257.20	22.89		
		SENTANCE	Adults	221.30	39.22	0.194	NS
			Adolescents	240.00	19.67		
	TRIVANDRUM	ISOLATION	Adults	223.20	34.78	0.666	NS
			Adolescents	218.00	14.08		
		MULTIPLE WORD	Adults	232.00	34.25	0.119	NS
			Adolescents	213.60	9.32		
		SINGLE WORD	Adults	231.50	54.93	0.913	NS
			Adolescents	229.50	15.80		
		SENTANCE	Adults	218.70	29.06	0.792	NS
			Adolescents	215.20	29.30		
	KASARGOD	ISOLATION	Adults	199.20	10.12	0.000	Sig
			Adolescents	225.30	15.04		
		MULTIPLE WORD	Adults	226.40	24.49	0.765	NS
			Adolescents	228.90	8.86		
		SINGLE WORD	Adults	238.90	32.50	0.881	NS
			Adolescents	237.20	14.00		
		SENTANCE	Adults	216.40	12.89	0.037	Sig
			Adolescents	230.00	14.12		

Table 4.2 shows no significant difference for the production of vowel /i/ in kottayam and trivandrum(P value >0.000) in all different sets whereas there is significant difference (P value <0.000)for the production of vowel /i/ in isolation and sentence in kasargod.

Table 4.3

Showing the acoustic characteristics of fundamental frequency for the production of vowel /u/

PARAMETER				MEAN	STANDARD DEVIATION	P VALUE	SIG
/u/	KOTTAYAM	ISOLATION	Adults	237.50	57.57	0.880	NS
			Adolescents	234.60	17.21		
		MULTIPLE WORD	Adults	240.40	37.46	0.477	NS
			Adolescents	250.30	21.29		
		SINGLE WORD	Adults	246.30	40.57	0.514	NS
			Adolescents	256.60	27.24		
		SENTANCE	Adults	236.10	33.68	0.356	NS
			Adolescents	248.30	22.89		
	TRIVANDRUM	ISOLATION	Adults	231.50	36.47	0.340	NS
			Adolescents	219.70	10.85		
		MULTIPLE WORD	Adults	241.40	42.57	0.179	NS
			Adolescents	222.00	10.45		
		SINGLE WORD	Adults	242.40	55.37	0.685	NS
			Adolescents	234.80	18.55		
		SENTANCE	Adults	227.00	30.39	0.091	NS
			Adolescents	208.10	14.07		
	KASARGOD	ISOLATION	Adults	204.30	23.83	0.031	Sig
			Adolescents	230.40	25.94		
			Adults	237.70	13.79	0.031	Sig

		MULTIPLE WORD	Adolescents	218.70	21.72		
		SINGLE WORD	Adults	246.30	15.03	0.831	NS
			Adolescents	243.40	39.63		
		SENTENCE	Adults	236.60	17.16	0.186	NS
			Adolescents	227.50	11.94		

Table 4.3 shows no Significant difference(P value >0.000) in the production of vowel /u/ in all different sets in kottayam and trivandrum.it was found that there is significant difference(P value <0.000) present in isolation and multiple word for the production of vowel /u/ in kasargod.

Table 4.4

Showing the acoustic characteristics of Formant Frequency[F1] for the production of vowel /a/

Parameter				Mean		P value	SIG
F1	/a/			Adults	Adolescents		
		ISOLATION	KOTTAYAM	838.9	875.1	0.516	NS
			TRIVANDRUM	783.7	904.0	0.120	NS
			KASARGOD	883.1	775.9	0.064	NS
		MULTIPLE WORD	KOTTAYAM	922.7	1002.0	0.375	NS
			TRIVANDRUM	878.9	777.2	0.346	NS
			KASARGOD	1149.3	800.9	0.000	Sig
		SINGLE WORD	KOTTAYAM	954.1	966.8	0.851	NS
			TRIVANDRUM	869.7	974.9	0.439	NS
			KASARGOD	1194.8	775.4	0.000	Sig
		SENTENCE	KOTTAYAM	817.3	773.1	0.675	NS
			TRIVANDRUM	943.8	957.8	0.923	NS
			KASARGOD	867.3	1325.2	0.002	Sig

Table 4.4 shows no Significant difference(P value >0.000) in the production of vowel /a/ in all different sets in kottayam and trivandrum.It was found that there is significant difference(P value <0.000) present in Multiple word,Single word and sentence for the production of vowel /a/ in kasargod.

Table 4.5

Showing the acoustic characteristics of Formant Frequency[F1] for the production of vowel /i/

	Parameter			Mean		P value	SIG
F1	/i/			Adults	Adolescents		
		ISOLATION	KOTTAYAM	549.0	561.9	0.74	NS
			TRIVANDRUM	546.0	664.6	0.043	Sig
			KASARGOD	751.1	521.4	0.001	Sig
		MULTIPLE WORD	KOTTAYAM	665.3	606.4	0.470	NS
			TRIVANDRUM	743.5	973.8	0.101	NS
			KASARGOD	900.9	718.7	0.074	NS
		SINGLE WORD	KOTTAYAM	804.0	671.8	0.267	NS
			TRIVANDRUM	607.8	936.1	0.011	Sig
			KASARGOD	959.2	670.5	0.005	Sig
		SENTENCE	KOTTAYAM	757.6	661.8	0.275	NS
			TRIVANDRUM	727.7	596.6	0.139	NS
			KASARGOD	917.0	563.9	0.005	Sig

Table 4.5 shows no Significant difference(P value >0.000) in the production of vowel /i/ in all different sets in kottayam whereas significant difference(P value <0.000) were present in isolation and single word in trivandrum as well as Isolation,Single word and sentence in Kasargod.

Table 4.6

Showing the acoustic characteristics of Formant Frequency[F1] for the production of vowel /u/,

	Parameter			Mean		P value	SIG
F1	/u/			Adults	Adolescents		
		ISOLATION	KOTTAYAM	575.6	546.4	0.531	NS
			TRIVANDRUM	570.6	652.7	0.369	NS
			KASARGOD	556.6	503.4	0.203	NS
		MULTIPLE WORD	KOTTAYAM	745.6	664.9	0.480	NS
			TRIVANDRUM	737.9	786.2	0.625	NS
			KASARGOD	1010.7	676.8	0.007	Sig
		SINGLE WORD	KOTTAYAM	879.5	674.1	0.069	NS
			TRIVANDRUM	645.1	949.1	0.010	Sig
			KASARGOD	843.6	788.5	0.685	NS
		SENTENCE	KOTTAYAM	841.8	681.8	0.172	NS
			TRIVANDRUM	760.7	724.0	0.796	NS
			KASARGOD	931.1	906.4	0.793	NS

Table 4.6 shows no Significant difference(P value >0.000) in the production of vowel /u/ in all different sets in kottayam whereas significant difference(P value <0.000) were present in isolation in trivandrum as well as Multiple word in Kasargod.

Table 4.7

Showing the acoustic characteristics of Formant Frequency[F2] for the production of vowel /a/.

	Parameter			Mean		P value	SIG
F2	/a/			Adults	Adolescents		
		ISOLATION	KOTTAYAM	1407.6	1314.2	0.241	NS
			TRIVANDRUM	1363.5	1465.4	0.393	NS
			KASARGOD	1359.7	1241.2	0.185	NS
		MULTIPLE WORD	KOTTAYAM	1757.8	1433.7	0.032	Sig
			TRIVANDRUM	1365.4	1506.4	0.318	Ns
			KASARGOD	1687.8	1394.8	0.024	Sig
		SINGLE WORD	KOTTAYAM	1655.3	1480.3	0.248	NS
			TRIVANDRUM	1591.7	1664.7	0.732	NS
			KASARGOD	1666.2	1885.8	0.137	NS
		SENTENCE	KOTTAYAM	1588.0	1403.0	0.250	NS
			TRIVANDRUM	1773.7	1726.7	0.815	NS
			KASARGOD	1464.9	1928.6	0.017	Sig

Table 4.7 shows no Significant difference(P value >0.000) in the production of vowel /a/ in all different sets in Trivandrum whereas significant difference(P value <0.000) were present in Multiple word in Kottayam as well as Multiple word and sentence in Kasargod.

Table 4.8

Showing the acoustic characteristics of Formant Frequency[F2] for the production of vowel /i/

	Parameter			Mean		P value	SIG
F2	/i/			Adults	Adolescents		
		ISOLATION	KOTTAYAM	1618.3	1646.6	0.929	NS
			TRIVANDRU	1848.1	1478.3	0.131	NS

			M				
			KASARGOD	1791.0	1553.7	0.340	NS
		MULTIPLE WORD	KOTTAYAM	1603.3	2076.3	0.053	NS
			TRIVANDRUM	2034.7	2338.8	0.155	NS
			KASARGOD	1545.3	2328.3	0.000	Sig
		SINGLE WORD	KOTTAYAM	1883.3	2239.3	0.129	NS
			TRIVANDRUM	1716.6	1871.1	0.588	NS
			KASARGOD	1737.1	2085.1	0.027	Sig
		SENTENCE	KOTTAYAM	1851.3	1774.0	0.767	NS
			TRIVANDRUM	1637.9	1948.5	0.355	NS
			KASARGOD	1803.9	1906.0	0.598	Sig

Table 4.8 shows no Significant difference(P value >0.000) in the production of vowel /i/ in all different sets in Kottayam and Trivandrum whereas significant difference(P value <0.000) were present in Multiple word,Single Word and sentence in Kasargod.

Table 4.9

Showing the acoustic characteristics of Formant Frequency[F2] for the production of vowel /u/.

	Parameter			Mean		P Value	SIG
F2	/u/			Adults	Adolescents		
		ISOLATION	KOTTAYAM	1027.8	1016.3	0.864	NS
			TRIVANDRUM	1166.6	1129.3	0.855	NS
			KASARGOD	1156.5	996.6	0.203	NS
		MULTIPLE WORD	KOTTAYAM	1583.2	1452.1	0.619	NS
			TRIVANDRUM	1381.1	1588.8	0.393	NS
			KASARGOD	1391.5	1934.1	0.015	Sig
		SINGLE WORD	KOTTAYAM	1662.3	1569.3	0.708	NS
			TRIVANDRUM	1550.7	1741.4	0.406	NS
			KASARGOD	1508.6	1821.3	0.130	NS
		SENTENCE	KOTTAYAM	1606.1	1227.1	0.027	Sig
			TRIVANDRUM	1695.5	1554.6	0.570	NS
			KASARGOD	1808.3	1466.6	0.177	NS

Table 4.9 shows no Significant difference(P value >0.000) in the production of vowel /u/ in all different sets in Trivandrum whereas significant differences(P value <0.000) were present in Multiple word in Kasargod besides the significant differences in sentences in kottayam.

Table 4.10

Showing the acoustic characteristics of Formant Frequency[F3] for the production of vowel /a/.

	Parameter			Mean		P value	SIG
F3	/a/			Adults	Adolescents		
		ISOLATION	KOTTAYAM	2419.5	2607.9	0.425	NS
			TRIVANDRUM	2676.5	2982.6	0.131	NS
			KASARGOD	2839.3	2120.7	0.000	Sig
		MULTIPLE WORD	KOTTAYAM	2786.7	2547.5	0.249	NS
			TRIVANDRUM	2676.4	2769.7	0.649	NS
			KASARGOD	2775.1	2777.6	0.985	NS
		SINGLE WORD	KOTTAYAM	2778.8	2654.8	0.587	NS
			TRIVANDRUM	2865.9	2756.6	0.622	NS
			KASARGOD	2695.1	2761.6	0.710	NS
		SENTENCE	KOTTAYAM	2739.7	2455.3	0.178	NS

				TRIVANDRUM	2767.9	3055.5	0.158	NS
				KASARGOD	2449.7	2766.9	0.108	NS

Table 4.10 shows no Significant difference(P value >0.000) in the production of vowel /u/ in all different sets in kottayam and Trivandrum whereas significant differences(P value <0.000) were present in kasargod for the production in Isolation.

Table 4.11

Showing the acoustic characteristics of Formant Frequency[F3] for the production of vowel /i/.

	Parameter			Mean		P Value	SIG
F3	/i/			Adults	Adolescents		
		ISOLATION	KOTTAYAM	2899.2	2929.9	0.744	NS
			TRIVANDRUM	2960.4	2877.6	0.497	NS
			KASARGOD	2823.3	3043.4	0.239	NS
		MULTIPLE WORD	KOTTAYAM	2876.3	2984.5	0.201	NS
			TRIVANDRUM	2922.4	3214.8	0.144	NS
			KASARGOD	2636.6	2970.7	0.057	NS
		SINGLE WORD	KOTTAYAM	2898.5	3023.1	0.335	NS
			TRIVANDRUM	2811.5	2964.3	0.366	NS
			KASARGOD	2772.4	2973.9	0.338	NS
		SENTENCE	KOTTAYAM	2786.3	2831.1	0.809	NS
			TRIVANDRUM	2911.6	2916.2	0.979	NS
			KASARGOD	2853.5	2952.4	0.537	Ns

Table 4.11 shows no Significant difference(P value >0.000) in the production of vowel /u/ in all different sets in kottayam,Trivandrum and kasargod.

Table 4.12

Showing the acoustic characteristics of Formant Frequency[F3] for the production of vowel /u/.

	Parameter			Mean		P Value	SIG
F3	/u/			Adults	Adolescents		
		ISOLATION	KOTTAYAM	2487.1	2711.1	0.452	NS
			TRIVANDRUM	2723.0	2933.7	0.216	NS
			KASARGOD	2521.1	2647.7	0.236	NS
		MULTIPLE WORD	KOTTAYAM	2850.7	2797.3	0.764	NS
			TRIVANDRUM	2845.8	2960.2	0.660	NS
			KASARGOD	2568.8	2985.0	0.051	NS
		SINGLE WORD	KOTTAYAM	2846.0	2717.3	0.476	NS
			TRIVANDRUM	2732.6	3019.5	0.283	NS
			KASARGOD	2683.9	2921.8	0.173	NS
		SENTENCE	KOTTAYAM	2775.9	2461.1	0.039	Sig
			TRIVANDRUM	2857.3	3078.0	0.305	NS
			KASARGOD	2939.4	3101.0	0.371	NS

Table 4.12 shows no Significant difference(P value >0.000) in the production of vowel /u/ in all different sets in kottayam,Trivandrum whereas significant differences (P value <0.000)were seen in kasargod for the production of /u/ in sentence.

Table 4.13

Showing the acoustic characteristics of HNR for the production of vowel /a/.

PARAMETER				N	MEAN	STANDARD DEVIATION	P Value	
/a/	KOTTAYAM	ISOLATION	Adults	10	12.89	2.39	0.078	NS
			Adolescents	10	14.96	2.57		
			Adults	10	10.56	2.83	0.244	NS

		MULTIPLE WORD	Adolescents	10	11.74	1.25		
		SINGLE WORD	Adults	10	10.77	3.25	0.028	Sig
			Adolescents	10	13.39	1.18		
		SENTENCE	Adults	10	10.91	1.64	0.712	NS
			Adolescents	10	11.19	1.69		
	TRIVANDRUM	ISOLATION	Adults	10	14.86	4.35	0.638	NS
			Adolescents	10	14.01	3.56		
		MULTIPLE WORD	Adults	10	10.31	2.08	0.099	NS
			Adolescents	10	11.63	1.19		
		SINGLE WORD	Adults	10	11.29	3.07	0.052	NS
			Adolescents	10	13.67	1.91		
		SENTENCE	Adults	10	9.86	1.74	0.002	Sig
			Adolescents	10	12.39	1.33		
	KASARGOD	ISOLATION	Adults	10	14.29	1.63	0.177	NS
			Adolescents	10	15.60	2.46		
		MULTIPLE WORD	Adults	10	10.33	2.43	0.042	Sig
			Adolescents	10	12.12	0.88		
		SINGLE WORD	Adults	10	11.73	1.85	0.630	NS
			Adolescents	10	12.09	1.40		
		SENTENCE	Adults	10	9.63	2.54	0.013	Sig
			Adolescents	10	12.02	1.05		

Table 4.13 shows no Significant difference(P value >0.000) in the production of vowel /a/ in Isolation,Multiple Word and Sentence in Kottayam whereas Significant differences(P value <0.000)were present in Single Word.In the case of Trivandrum,no Significant differences(P value >0.000)were found in Isolation, Multiple Word and Single Word but were present in Sentence.furthermore,there was no Significant differences(P value >0.000)seen in Isolation and Single Word in Kasargod,although Multiple Word and Sentence shows Significant differences(P value <0.000).

Table 4.14

Showing the acoustic characteristics of HNR for the production of vowel /i/.

PARAMETER				N	MEAN	STANDARD DEVIATION	P Value	SIG
/i/	KOTTAYAM	ISOLATION	Adults	10	12.63	3.52	0.236	NS
			Adolescents	10	14.52	3.38		
		MULTIPLE WORD	Adults	10	10.08	2.76	0.799	NS
			Adolescents	10	10.35	1.82		
		SINGLE WORD	Adults	10	9.61	3.24	0.508	NS
			Adolescents	10	10.43	2.07		
		SENTENCE	Adults	10	8.96	2.62	0.145	NS
			Adolescents	10	10.37	1.30		
	TRIVANDRUM	ISOLATION	Adults	10	15.25	4.33	0.976	NS
			Adolescents	10	15.30	2.76		
		MULTIPLE WORD	Adults	10	10.35	1.96	0.032	Sig
			Adolescents	10	12.53	2.22		
		SINGLE WORD	Adults	10	9.46	2.75	0.019	Sig
			Adolescents	10	12.56	2.64		
		SENTENCE	Adults	10	8.86	2.45	0.003	Sig
			Adolescents	10	11.86	1.41		
	KASARGOD	ISOLATION	Adults	10	11.59	2.24	0.005	Sig
			Adolescents	10	15.34	2.93		

		MULTIPLE WORD	Adults	10	9.74	2.43	0.077	NS
			Adolescents	10	11.57	1.90		
		SINGLE WORD	Adults	10	11.88	3.55	0.594	NS
			Adolescents	10	11.17	2.13		
		SENTENCE	Adults	10	7.73	1.08	0.000	Sig
			Adolescents	10	11.37	0.67		

Table 4.14 shows no Significant difference(P value >0.000) in the production of vowel /i/ in all different sets in Kottayam whereas significant differences(P value <0.000)were present in Multiple Word, Single Word and Sentence in Trivandrum as well as for Isolation and Sentence in Kasargod.

Table 4.15

Showing the acoustic characteristics of HNR for the production of vowel /u/.

PARAMETER				N	MEAN	STANDARD DEVIATION	P Value	SIG
/u/	KOTTAYAM	ISOLATION	Adults	10	18.19	4.30	0.995	NS
			Adolescents	10	18.18	2.89		
		MULTIPLE WORD	Adults	10	10.44	3.05	0.362	NS
			Adolescents	10	11.55	2.20		
		SINGLE WORD	Adults	10	11.90	3.66	0.846	NS
			Adolescents	10	11.61	2.85		
		SENTENCE	Adults	10	10.37	2.76	0.211	NS
			Adolescents	10	11.71	1.75		
	TRIVANDRUM	ISOLATION	Adults	10	17.57	3.83	0.904	NS
			Adolescents	10	17.34	4.52		
		MULTIPLE WORD	Adults	10	10.60	1.85	0.187	NS
			Adolescents	10	11.59	1.34		
		SINGLE WORD	Adults	10	11.62	2.78	0.767	NS
			Adolescents	10	11.97	2.40		
		SENTENCE	Adults	10	10.48	1.87	0.551	NS
			Adolescents	10	10.88	0.91		
	KASARGOD	ISOLATION	Adults	10	12.98	4.61	0.000	Sig
			Adolescents	10	21.15	2.91		
		MULTIPLE WORD	Adults	10	9.78	2.11	0.198	NS
			Adolescents	10	10.72	0.71		
		SINGLE WORD	Adults	10	9.97	2.14	0.692	NS
			Adolescents	10	9.62	1.73		
		SENTENCE	Adults	10	7.93	1.32	0.000	Sig
			Adolescents	10	11.75	1.07		

able 4.15 shows no Significant difference(P value >0.000) in the production of vowel /u/ in all different sets in Kottayam and Trivandrum whereas significant differences(P value <0.000)were present in Isolation and Sentence in Kasargod.

Table 4.16

Showing the acoustic characteristics of Formant frequency[F1] for the production of vowel /a/ across the cities.

Parameter	Mean		SIG	KOTTAYAM VS	KOTTAYAM VS	

					p value		TRIVANDRUM	KASARGOD	TRIVANDRUM VS KASARGOD
/a/	ISOLATION	Adults	KOTTAYAM	838.90	0.017	Sig	0.294	0.544	0.014
			TRIVANDRUM	783.70					
			KASARGOD	883.10					
		Adolescents	KOTTAYAM	875.10	0.269	NS	1.000	0.692	0.375
			TRIVANDRUM	904.00					
			KASARGOD	775.90					
	MULTIPLE WORD	Adults	KOTTAYAM	922.70	0.012	Sig	1.000	0.054	0.017
			TRIVANDRUM	878.90					
			KASARGOD	1149.30					
		Adolescents	KOTTAYAM	1002.00	0.038	Sig	0.039	0.106	1.000
			TRIVANDRUM	777.20					
			KASARGOD	800.90					
	SINGLE WORD	Adults	KOTTAYAM	954.10	0.005	Sig	1.000	0.045	0.005
			TRIVANDRUM	869.70					
			KASARGOD	1194.80					
		Adolescents	KOTTAYAM	966.80	0.089	NS	1.000	0.185	0.157
			TRIVANDRUM	974.90					
			KASARGOD	775.40					
	SENTENCE	Adults	KOTTAYAM	817.30	0.605	NS	0.973	1.000	1.000
			TRIVANDRUM	943.80					
			KASARGOD	867.30					
		Adolescents	KOTTAYAM	773.10	0.001	Sig	0.474	0.001	0.023
			TRIVANDRUM	957.80					
			KASARGOD	1325.20					

Table 4.16 shows that there was significant difference across the cities for the production of vowel /a/ for isolation,multiple word and single word in adult and there was no significant differences for sentence in adult.however,Significant differences was also present in adolescents for multiple word and sentence but there was no significant differences in Isolation and Single word.

Table 4.17

Showing the acoustic characteristics of Formant frequency[F1] for the production of vowel /i/ across the cities

	PARAMETER			MEAN	P Value	SIG	KOTTAYAM VS TRIVANDRUM	KOTTAYAM VS KASARGOD	TRIVANDRUM VS KASARGOD
/i/	ISOLATION	Adults	KOTTAYAM	549.00	0.003	Sig	1.000	0.008	0.007
			TRIVANDRUM	546.00					
			KASARGOD	751.10					
		Adolescents	KOTTAYAM	561.90	0.004	Sig	0.052	0.978	0.004
			TRIVANDRUM	664.60					
			KASARGOD	521.40					

	MULTIPLE WORD	Adults	KOTTAYAM	665.30	0.071	NS	1.000	0.075	0.373
			TRIVANDRUM	743.50					
			KASARGOD	900.90					
		Adolescents	KOTTAYAM	606.40	0.008	Sig	0.008	0.965	0.090
			TRIVANDRUM	973.80					
			KASARGOD	718.70					
	SINGLE WORD	Adults	KOTTAYAM	804.00	0.010	Sig	0.228	0.467	0.008
			TRIVANDRUM	607.80					
			KASARGOD	959.20					
		Adolescents	KOTTAYAM	671.80	0.032	Sig	0.037	1.000	0.065
			TRIVANDRUM	936.10					
			KASARGOD	670.50					
	SENTENCE	Adults	KOTTAYAM	757.60	0.234	NS	1.000	0.545	0.345
			TRIVANDRUM	727.70					
			KASARGOD	917.00					
		Adolescents	KOTTAYAM	661.80	0.304	NS	0.934	0.399	1.000
			TRIVANDRUM	596.60					
			KASARGOD	563.90					

Table 4.17 shows Significant difference present in adults across the cities for production of vowel /i/ in isolation,Single Word and there was no significant difference in Multiple Word and Sentence.Moreover,Significant differences was also present in adolescents for Isolation,Multiple Word and Single Word whereas no significant differences was seen in Sentence.

Table 4.18

Showing the acoustic characteristics of Formant frequency[F1] for the production of vowel /u/ across the cities

Parameter				Mean	p value	SIG	KOTTAYAM VS TRIVANDRUM	KOTTAYAM VS KASARGOD	TRIVANDRUM VS KASARGOD
/u/	ISOLATION	Adults	KOTTAYAM	575.55	0.929	NS	1.000	1.000	1.000
			TRIVANDRUM	570.60					
			KASARGOD	556.60					
		Adolescents	KOTTAYAM	546.40	0.119	NS	0.448	1.000	0.140
			TRIVANDRUM	652.70					
			KASARGOD	503.40					
	MULTIPLE WORD	Adults	KOTTAYAM	745.60	0.022	Sig	1.000	0.041	0.043
			TRIVANDRUM	737.90					
			KASARGOD	1010.70					
		Adolescents	KOTTAYAM	664.90	0.475	NS	0.815	1.000	0.961
			TRIVANDRUM	786.20					
			KASARGOD	676.80					

	SINGLE WORD	Adults	KOTTAYAM	879.50	0.073	NS	0.103	1.000	0.209
			TRIVANDRUM	645.10					
			KASARGOD	843.60					
		Adolescents	KOTTAYAM	674.10	0.110	NS	0.115	1.000	0.642
			TRIVANDRUM	949.10					
			KASARGOD	788.50					
	SENTENCE	Adults	KOTTAYAM	841.80	0.489	NS	1.000	1.000	0.708
			TRIVANDRUM	760.70					
			KASARGOD	931.10					
		Adolescents	KOTTAYAM	681.80	0.035	Sig	1.000	0.045	0.134
			TRIVANDRUM	724.00					
			KASARGOD	906.40					

Table 4.18 shows that there were Significant differences in multiple words in adults for the production of vowel /u/across the cities whereas all other different sets had no Significant differences.Significant differences were also present in adolescents for sentence but the rest of the different set had no significant differences.

Table 4.19

Showing the acoustic characteristics of Formant frequency[F2] for the production of vowel /a/ across the cities.

Parameter				Mean	P Value	SIG	KOTTAYAM VS TRIVANDRUM	KOTTAYAM VS KASARGOD	TRIVANDRUM VS KASARGOD
/a/	ISOLATION	Adults	KOTTAYAM	1407.60	0.752	NS	1.000	1.000	1.000
			TRIVANDRUM	1363.50					
			KASARGOD	1359.70					
		Adolescents	KOTTAYAM	1314.20	0.153	NS	0.588	1.000	0.179
			TRIVANDRUM	1465.40					
			KASARGOD	1241.20					
	MULTIPLE WORD	Adults	KOTTAYAM	1757.80	0.028	Sig	0.037	1.000	0.110
			TRIVANDRUM	1365.40					
			KASARGOD	1687.80					
		Adolescents	KOTTAYAM	1433.70	0.626	NS	1.000	1.000	1.000
			TRIVANDRUM	1506.40					
			KASARGOD	1394.80					
	SINGLE WORD	Adults	KOTTAYAM	1655.30	0.893	NS	1.000	1.000	1.000
			TRIVANDRUM	1591.70					
			KASARGOD	1666.20					
		Adolescents	KOTTAYAM	1480.30	0.072	NS	0.849	0.069	0.600
			TRIVANDRUM	1664.70					
			KASARGOD	1885.80					

	SENTENCE	Adults	KOTTAYAM	1588.00	0.337	NS	1.000	1.000	0.440
			TRIVANDRUM	1773.70					
			KASARGOD	1464.90					
		Adolescents	KOTTAYAM	1403.00	0.004	Sig	0.096	0.003	0.509
			TRIVANDRUM	1726.70					
			KASARGOD	1928.60					

Table 4.19 shows that there were Significant differences in multiple words in adults for the production of vowel /a/across the cities whereas all other different sets had no Significant differences.Significant differences were also present in adolescents for sentence but the rest of the different set had no Significant differences.

Table 4.20

Showing the acoustic characteristics of Formant frequency[F2] for the production of vowel /i/ across the cities.

	PARAMETER			MEAN	P Value	SIG	KOTTAYAM VS TRIVANDRUM	KOTTAYAM VS KASARGOD	TRIVANDRUM VS KASARGOD
/i/	ISOLATION	Adults	KOTTAYAM	1618.30	0.646	NS	1.000	1.000	1.000
			TRIVANDRUM	1848.10					
			KASARGOD	1791.00					
		Adolescents	KOTTAYAM	1646.60	0.833	NS	1.000	1.000	1.000
			TRIVANDRUM	1478.30					
			KASARGOD	1553.70					
	MULTIPLE WORD	Adults	KOTTAYAM	1603.30	0.020	sig	0.067	1.000	0.031
			TRIVANDRUM	2034.70					
			KASARGOD	1545.30					
		Adolescents	KOTTAYAM	2076.30	0.364	NS	0.635	0.689	1.000
			TRIVANDRUM	2338.80					
			KASARGOD	2328.30					
	SINGLE WORD	Adults	KOTTAYAM	1883.30	0.721	NS	1.000	1.000	1.000
			TRIVANDRUM	1716.60					
			KASARGOD	1737.10					
		Adolescents	KOTTAYAM	2239.30	0.271	NS	0.332	1.000	1.000
			TRIVANDRUM	1871.10					
			KASARGOD	2085.10					
	SENTENCE	Adults	KOTTAYAM	1851.30	0.572	NS	0.955	1.000	1.000
			TRIVANDRUM	1637.90					

			KASARGOD	1803.90					
		Adolescents	KOTTAYAM	1774.00	0.842	NS	1.000	1.000	1.000
			TRIVANDRUM	1948.50					
			KASARGOD	1906.00					

Table 4.20 shows that there were Significant differences in multiple words in adults for the production of vowel /i/ across the cities whereas all other different sets had no Significant differences.There was no Significant differences seen in adolescents for all different sets across the cities.

Table 4.21

Showing the acoustic characteristics of Formant frequency[F2] for the production of vowel /u/ across the cities.

PARAMETER				MEAN	P Value	SIG	KOTTAYAM VS TRIVANDRUM	KOTTAYAM VS KASARGOD	TRIVANDRUM VS KASARGOD
/u/	ISOLATION	Adults	KOTTAYAM	1027.80	0.559	NS	1.000	1.000	1.000
			TRIVANDRUM	1166.60					
			KASARGOD	1156.50					
		Adolescents	KOTTAYAM	1016.30	0.596	NS	1.000	1.000	1.000
			TRIVANDRUM	1129.30					
			KASARGOD	996.60					
	MULTIPLE WORD	Adults	KOTTAYAM	1583.20	0.574	NS	1.000	1.000	1.000
			TRIVANDRUM	1381.10					
			KASARGOD	1391.50					
		Adolescents	KOTTAYAM	1452.10	0.163	NS	1.000	0.200	0.547
			TRIVANDRUM	1588.80					
			KASARGOD	1934.10					
	SINGLE WORD	Adults	KOTTAYAM	1662.30	0.779	NS	1.000	1.000	1.000
			TRIVANDRUM	1550.70					
			KASARGOD	1508.60					
		Adolescents	KOTTAYAM	1569.30	0.518	NS	1.000	0.798	1.000
			TRIVANDRUM	1741.40					
			KASARGOD	1821.30					
	SENTENCE	Adults	KOTTAYAM	1606.10	0.700	NS	1.000	1.000	1.000
			TRIVANDRUM	1695.50					
			KASARGOD	1808.30					
		Adolescents	KOTTAYAM	1227.10	0.243	NS	0.320	0.699	1.000

			TRIVANDRUM	1554.60					
			KASARGOD	1466.60					

Table 4.21 shows no Significant difference(P value >0.000) in the production of vowel /u/ in all different sets across the cities for both adults and adolescents.

Table 4.22

Showing the acoustic characteristics of Formant frequency[F3] for the production of vowel /a/ across the cities.

Parameter				Mean	p value	SIG	KOTTAYAM VS TRIVANDRUM	KOTTAYAM VS KASARGOD	TRIVANDRUM VS KASARGOD
/a/	ISOLATION	Adults	KOTTAYAM	2419.50	0.077	NS	0.482	0.078	1.000
			TRIVANDRUM	2676.50					
			KASARGOD	2839.30					
		Adolescents	KOTTAYAM	2607.90	0.002	Sig	0.286	0.099	0.001
			TRIVANDRUM	2982.60					
			KASARGOD	2120.70					
	MULTIPLE WORD	Adults	KOTTAYAM	2786.70	0.810	NS	1.000	1.000	1.000
			TRIVANDRUM	2676.40					
			KASARGOD	2775.10					
		Adolescents	KOTTAYAM	2547.50	0.340	NS	0.640	0.593	1.000
			TRIVANDRUM	2769.70					
			KASARGOD	2777.60					
	SINGLE WORD	Adults	KOTTAYAM	2778.80	0.647	NS	1.000	1.000	1.000
			TRIVANDRUM	2865.90					
			KASARGOD	2695.10					
		Adolescents	KOTTAYAM	2654.80	0.872	NS	1.000	1.000	1.000
			TRIVANDRUM	2756.60					
			KASARGOD	2761.60					
	SENTENCE	Adults	KOTTAYAM	2739.70	0.256	NS	1.000	0.525	0.414
			TRIVANDRUM	2767.90					
			KASARGOD	2449.70					
		Adolescents	KOTTAYAM	2455.30	0.010	Sig	0.008	0.293	0.371
			TRIVANDRUM	3055.50					
			KASARGOD	2766.90					

Table 4.22 shows no Significant difference(P value >0.000) in the production of vowel /a/ in all different sets across the cities for adults as well as in Multiple Word and Single Word for adolescents whereas Significant differences(P value <0.000)were present in Isolation and Sentence in adolescents across the cities.

Table 4.23

Showing the acoustic characteristics of Formant frequency[F3] for the production of vowel /i/ across the cities.

	PARAMETER			MEAN	P Value	SIG	KOTTAYAM VS TRIVANDRUM	KOTTAYAM VS KASARGOD	TRIVANDRUM VS KASARGOD
/i/	ISOLATION	Adults	KOTTAYAM	2899.20	0.472	NS	1.000	1.000	0.677
			TRIVANDRUM	2960.40					
			KASARGOD	2823.30					
		Adolescents	KOTTAYAM	2929.90	0.566	NS	1.000	1.000	0.903
			TRIVANDRUM	2877.60					
			KASARGOD	3043.40					
	MULTIPLE WORD	Adults	KOTTAYAM	2876.30	0.104	NS	1.000	0.283	0.145
			TRIVANDRUM	2922.40					
			KASARGOD	2636.60					
		Adolescents	KOTTAYAM	2984.50	0.275	NS	0.535	1.000	0.463
			TRIVANDRUM	3214.80					
			KASARGOD	2970.70					
	SINGLE WORD	Adults	KOTTAYAM	2898.50	0.764	NS	1.000	1.000	1.000
			TRIVANDRUM	2811.50					
			KASARGOD	2772.40					
		Adolescents	KOTTAYAM	3023.10	0.926	NS	1.000	1.000	1.000
			TRIVANDRUM	2964.30					
			KASARGOD	2973.90					
	SENTENCE	Adults	KOTTAYAM	2786.30	0.725	NS	1.000	1.000	1.000
			TRIVANDRUM	2911.60					
			KASARGOD	2853.50					
		Adolescents	KOTTAYAM	2831.10	0.803	NS	1.000	1.000	1.000
			TRIVANDRUM	2916.20					
			KASARGOD	2952.40					

The table above shows no Significant difference(P value >0.000) in the production of vowel /i/ in all different sets across the cities for both adolescents and adults.

Table 4.24

Showing the acoustic characteristics of Formant frequency[F3] for the production of vowel /u/ across the cities.

Parameter	Mean					

					p value		KOTTAYAM VS TRIVANDRUM	KOTTAYAM VS KASARGOD	TRIVANDRUM VS KASARGOD
/u/	ISOLATION	Adults	KOTTAYAM	2487.10	0.620	NS	1.000	1.000	1.000
			TRIVANDRUM	2723.00					
			KASARGOD	2521.10					
		Adolescents	KOTTAYAM	2711.10	0.066	NS	0.239	1.000	0.081
			TRIVANDRUM	2933.70					
			KASARGOD	2647.70					
	MULTIPLE WORD	Adults	KOTTAYAM	2850.70	0.202	NS	1.000	0.357	0.376
			TRIVANDRUM	2845.80					
			KASARGOD	2568.80					
		Adolescents	KOTTAYAM	2797.30	0.710	NS	1.000	1.000	1.000
			TRIVANDRUM	2960.20					
			KASARGOD	2985.00					
	SINGLE WORD	Adults	KOTTAYAM	2846.00	0.706	NS	1.000	1.000	1.000
			TRIVANDRUM	2732.60					
			KASARGOD	2683.90					
		Adolescents	KOTTAYAM	2717.30	0.363	NS	0.500	1.000	1.000
			TRIVANDRUM	3019.50					
			KASARGOD	2921.80					
	SENTENCE	Adults	KOTTAYAM	2775.90	0.688	NS	1.000	1.000	1.000
			TRIVANDRUM	2857.30					
			KASARGOD	2939.40					
		Adolescents	KOTTAYAM	2461.10	0.001	Sig	0.003	0.002	1.000
			TRIVANDRUM	3078.00					
			KASARGOD	3101.00					

Table 4.24 shows no Significant difference(P value >0.000) in the production of vowel /u/ in all different sets across the cities for adults and Isolation,Multiple word,Single word in adolescents but there was Significant difference present in Sentence for adolescents

DISCUSSION

The result were analysed using PRAAT Software Version(Version 6.2.14) which explains variation of dialect within the cities and across the cities The result reveals that regional dialect are predominantly present within the cities and across the cities in kerala and the comparison were done between adult and adolescent female speakers showing Significant differences.As said by Romaine (2002), summarises the distinction between the two by saying that whereas social dialects reveal who we are, regional dialects reveal where we come from.Vaheed & Subba Rao (2011) compared the acoustic characteristics of vowels in adult Malayalam speaking individuals with different dialects. The result indicated that the regional varieties are of most importance in the study of

vowels. Differences were seen between as well as within speech communities.The current study result also shows that there were Significant differences in vowel production across the cities and between ages. The Significant differences were also visible when comparing the acoustic characteristics between adolescents and adult female Speakers.Voice characteristics which were analysed in both adults and adolescents, when compared in different dialects showed Significant difference.Significant differences in vowels were highly visible in kasargod when comparing between adult and adolescent female speakers.As said by Hillenbrand & colleagues (1995), Patterns of discrepancies between these dialects, particularly in terms of F1 and F2 values, suggest that the speaker's dialect may have an impact on where the vowel is produced in an articulating manner. Current study shows high Significant differences in F1-F2 within the region and across the region for Isolation ,Multiple Word and Sentence.

A considerable Significant differences were also present for vowels in Kottayam and Trivandrum when compared between Adult and Adolescent female speakers.Overall the Study explains dialectal variation of vowels in different dialects in malayalam.this study was helpful in gaining information on voice characteristic as well as variation in different dialects when compared between adults and adolescents in female speakers.These research have given the study of speech perception new knowledge from fields like sociolinguistics, which focuses on linguistic change and variation. This has also highlighted the significance of long-ignored phonetic variability and introduced a fresh perspective on speech perception.

SUMMARY & CONCLUSION

The present study was to analyze and compare the acoustic characteristics of different dialects in malayalam focussing on female adult and adolescent speakers.Analysis has also helped throughout for the acknowledgement of voice characteristics in them. The parameters considered for comparing the dialects involved important role in analyzing the voice characteristics and has given a valuable result proving variation in dialects between adult and adolescents.This study has been a contemplative way of taking the research to the next level for the future in knowing in depth for Speech perception.About 30 participants each from adults and adolescents with three different dialects have been considered in the study.Analysis were done by recording the vowels /a/,i/ and, /u/ in Isolation,multiple word,single word and sentence with the help of praat software(Version 6.2.14) to find the variation in all three different dialect.

In the light of the analysis of the study ,variation in dialect has been well defined in each region of kerala.Variation in dialect were highly significant when compared between the adult and adolescent female speakers in kasargod.Significant differences were also present in kottayam as well as in trivandrum.

The present study inferred that vowels have an effect in perceptual judgement of speech,differences found in three different malayalam dialect have the potential to affect listeners,perceptual identification of vowels which may impact speech intelligibility.It is important to understand the effect of dialect variation in speech processing and for speech perception.It is predominant to consider the dialect variation for speech assessment.

REFERENCE

1. Adank, P., Van Hout, R., & Smits, R. (2004). An acoustic description of the vowels of Northern and Southern Standard Dutch. *The Journal of the Acoustical society of*
2. *America*, 116(3), 1729-1738.
3. Akmajian, A., Demers, R. A., Farmer, A. K., & Harnish, R. M. (2001). An introduction to language and communication. *In Library of Congress Cataloging-in- Publication Data*.
4. Arslan, L. M., & Hansen, J. H. (1996). Language accent classification in American English. *Speech Communication*, 18(4), 353-367.
5. Carlson, R., Granström, B., & Fant, G. (1970). Some studies concerning perception of isolated vowels. *Speech Transmission Laboratory Quarterly Progress and Status Report*, 11(2-3), 19-35.
6. Chambers, J. K., & Trudgill, P. (1998). Dialectology. Cambridge University Press.
7. Chittaragi, N. B., & Koolagudi, S. G. (2019). Acoustic-phonetic feature based Kannada dialect identification from vowel sounds. *International Journal of Speech Technology*, 22(4),1099-1113.
8. Choi, H. (2002). Acoustic cues for the Korean stop contrast-Dialectal variation.
9. *Leibniz-Zentrum Allgemeine Sprachwissenschaft (ZAS), Papers in Linguistics*, 28, 1-12.
10. Clopper, C. G. (2021). Perception of dialect variation. *The handbook of speech perception*, 333-364.
11. Clopper, C. G., & Bradlow, A. R. (2008). Perception of dialect variation in noise:
12. Intelligibility and classification. *Language and speech*, 51(3), 175-198.
13. Clopper, C. G., Pisoni, D. B., & De Jong, K. (2005). Acoustic characteristics of the vowel systems of six regional varieties of American English. *The Journal of the Acoustical Society of America*, 118(3), 1661-1676.
14. Crystal, D. (1969). Prosodic Systems and Intonation in English. *Cambridge Studies in*
15. *Linguistics 1*.
16. Dubois, S., & Melançon, M. (1997). Cajun is dead–long live Cajun: Shifting from a linguistic to a cultural community. *Journal of Sociolinguistics*, 1(1), 63-93.
17. Escudero, P., Benders, T., & Lipski, S. C. (2009). Native, non-native and L2 perceptual cue weighting for Dutch vowels: The case of Dutch, German, and Spanish listeners. *Journal of Phonetics*, 37(4), 452-465.
18. Garellek, M. (2019). The phonetics of voice 1. *In The Routledge handbook of phonetics*(pp. 75-106). Routledge.
19. George, J., Abraham, A. S., Arya, G. S., & Kumaraswami, S. (2015). Acoustic
20. characteristics of stop consonants during fast and normal speaking rate in typically developing Malayalam speaking children. *Language in India*, 15, 47.
21. Gobl, C., & Chasaide, A. N. (1992). Acoustic characteristics of voice quality. *Speech Communication*, 11(4-5), 481-490. Chicago

22. Barnes-Holmes, Y., Hayes, S. C., Barnes-Holmes, D., & Roche, B. (2001). Relational frame theory: a post-Skinnerian account of human language and cognition. *Advances in child development and behavior*, 28, 101–138. https://doi.org/10.1016/s0065-2407(02)80063-5
23. Hillenbrand, J., Getty, L. A., Clark, M. J., & Wheeler, K. (1995). Acoustic characteristics of American English vowels. *The Journal of the Acoustical Society of America*, 97(5), 3099-3111.
24. Hughes, V. (2014). The definition of the relevant population and the collection of data for likelihood ratio-based forensic voice comparison (Doctoral dissertation, University of York).
25. Ivić, P. and Crystal, . David (2014, July 22). dialect. *Encyclopaedia Britannica*.
26. Jacewicz, E., Fox, R. A., O'Neill, C., & Salmons, J. (2009). Articulation rate across dialect, age, and gender. *Language variation and change*, 21(2), 233-256.
27. Jensen, P. J., & Menon, K. M. N. (1972). Physical analysis of linguistic vowel duration. *The Journal of the Acoustical Society of America*, 52(2B), 708-710.
28. Jones, G., Van der Merwe, A., Olinger, L., Le Roux, M., & Van der Linde, J. (2020).The effect of voice disorders on lexical tone variation: Exploratory study in an African language. *International Journal of Speech-Language Pathology*, 22(1),86-87
29. Karlsson, I. (1992). Modelling voice variations in female speech synthesis. *Speech*
30. *Communication*, 11(4-5), 491-495.
31. Kirkham, S., Nance, C., Littlewood, B., Lightfoot, K., & Groarke, E. (2019). Dialect variation in formant dynamics: The acoustics of lateral and vowel sequences in Manchester and Liverpool English. *The Journal of the Acoustical Society of America*, 145(2), 784-794.
32. Kreiman, J., & Sidtis, D. (2011). Foundations of voice studies: An interdisciplinary approach to voice production and perception. *John Wiley & Sons*.
33. Kriengwatana, B., Terry, J., Chládková, K., & Escudero, P. (2016). Speaker and accent variation are handled differently: Evidence in native and non-native listeners.*Public Library of Science one*, 11(6),e0156870.
34. Ladefoged, P. (2001). Vowels and consonants. *International Journal of Phonetic Science*, 58(3), 211-212.
35. Lavan, N., Burton, A. M., Scott, S. K., & McGettigan, C. (2019). Flexible voices:Identity perception from variable vocal signals. *Psychonomic bulletin & review*,
36. 26(1), 90-102.
37. Lee, Y., Keating, P., & Kreiman, J. (2019). Acoustic voice variation within and
38. between speakers. *The Journal of the Acoustical Society of America*, 146(3),1568-1579.
39. Lindblom, B. (1963). Spectrographic study of vowel reduction. *The journal of the*
40. *Acoustical society of America*, 35(11), 1773-1781.
41. Mathew, M. M., & Bhat, J. S. (2010). Aspects of emotional prosody in Malayalam and Hindi. *The Buckingham Journal of Language and Linguistics*, 3, 25-34.
42. Namboodiripad, S., & Garellek, M. (2017). Malayalam (namboodiri dialect). *Journal of the International Phonetic Association*, 47(1), 109-118.
43. Pappachan, P. (2020). The Importance of Dialectal Variation in Kerala Curriculum
44. Framework. *Middle Eastern Journal of Research in Education and Social Sciences*, 1(2), 287-298.Perception from variable vocal signals. *Psychonomic bulletin & review*, 26(1), 90-102.
45. Pickett, J. M. (1980). The sounds of speech communication. A primer of acoustic
46. phonetics and speech perception. Austin, Texas: *ProEducation Solution*.
47. Radhakrishnan, S. (2009). *Perception of synthetic vowels by monolingual and bilingual Malayalam speakers* (Doctoral dissertation, Kent State University).
48. Raithel, V., & Hielscher-Fastabend, M. (2004). Emotional and linguistic perception of prosody. *International Journal of Phoniatrics, Speech Therapy and Communication Pathology*, 56(1), 7-13.
49. Krishna, Y., & Rajashekhar, B. (2013). Association between bandwidths of vowel formants and age, gender and consonant context in Telugu. *Language in India*, 13(3).
50. Rajashekhar, B. Vowel Duration across Age and Dialects of Telugu Language Krishna
51. Y, Ph. D. (Sp. & Hg.), CCC-A. *Strength for Today and Bright Hope for Tomorrow Volume 13: 2 February 2013, 164.*
52. Rao, K. S., Nandy, S., & Koolagudi, S. G. (2010). Identification of Hindi dialects using speech. *World Multi-conference on Systemics, Cybernetics and Informatics* -
53. *2010.*
54. Romaine, S. (2002). Signs of identity, signs of discord: Glottal goofs and the green
55. grocers glottal in debates on Hawaiian orthography. *Journal of Linguistic Anthropology, 12(2), 189-224.*
56. Scott, S. K., and McGettigan, C. (2015). *The Voice APA Handbook of Nonverbal*
57. *Communication*. Washington, DC: American Psychological Association.
58. Shankar, V., Velayudhan, K. C., & Trivedi, B. K. (1975). Diversity, dominance,
59. stability and net production in three communities of Sehima-Dicanthium cover. *International journal of paleontology 2(4), 107-110.*
60. Shearme, J. N., & Holmes, J. N. (1961). *Fourth Congress of Phonetic*
61. *Science*. Helsinki, 233, 1962.
62. Siebenhaar, B., Forst, M., & Keller, E. (2004). Prosody of Bernese and Zurich German.What the development of a dialectal speech synthesis system tells us about it. *Regional Variation in Intonation*, 219-238.

63. Sinha, S., Jain, A., & Agrawal, S. S. (2015). Fusion of multi-stream speech features for dialect classification. *The journal CSI transactions on ICT*, 2(4), 243-252.
64. Solano–Flores, G., & Li, M. (2006). The use of generalizability (G) theory in the
65. testing of linguistic minorities. Educational Measurement: Issues and Practice, 25(1), 13-22. speech. *World Multi-conference on Systemics,Cybernetics and Informatics -2010.*
66. Stevens, K. N., & House, A. S. (1963). Perturbation of vowel articulations by
67. consonantal context: An acoustical study. *Journal of speech and hearing research, 6(2), 111-128.*
68. Subramoniam, V. I. (1974). *Dialect Survey of Malayalam (Ezhava-Tiiya).* Trivandrum:Department of Linguistics, University of Kerala.
69. Sunija, A. P., Rajisha, T. M., & Riyas, K. S. (2016). Comparative study of different classifiers for Malayalam dialect recognition system. *Procedia Technology*, 24, 1080-1088.
70. Tegegne, W. (2015). The use of dialects in education and its impacts on students'
71. learning and achievements. *Education Journal*, 4(5), 263-269.*The Buckingham Journal of Language and Linguistics*, 3, 25-34.
72. Tiwari, M., & Tiwari, M. (2012). Voice - How humans communicate?. *Journal of*
73. *natural science, biology, and medicine*, 3(1), 3–11.
74. Wardhaugh, R., & Fuller, J. M. (2021). *An introduction to sociolinguistics*. John Wiley& Sons.
75. Zhang Z. (2016). Mechanics of human voice production and control. *The Journal of the Acoustical Society of America*, 140(4), 2614.
76. Zheng, D. C., Dyke, D., Berryman, F., & Morgan, C. (2012). A new approach to
77. acoustic analysis of two British regional accents—Birmingham and Liverpool accents. *International Journal of Speech Technology*, 15(2), 77-85.