E-ISBN: 978-967-2122-11-1

Intervocalic /r/ and Pre-consonantal /r/ in Penang Malay Dialect: An Instrumental Analysis

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ABSTRACT

This paper makes an instrumental analysis of intervocalic /r/ and pre-consonantal /r/ in Penang Malay Dialect produced by two Malaysian Malay undergraduate speakers. The focus is on the vowel quality of intervocalic /r/ and pre-consonantal /r/ which includes three levels of analysis: perception analysis, acoustic analysis, and phonological rules. The formant frequency model (following Watt and Tillotson 2001) was used to analyze the vowels on PRAAT version 6.0.29 (Boersma, Paul, Weenink, & David, 2017). The results indicate that, the speakers had produced the intervocalic /r/ as /ʁ/ in Penang Malay Dialect. However, for pre-consonantal /r/, the production of the sound was dynamic because the speakers had produced it differently. The acoustic analysis shows a significant difference in the formant values (F_1 and F_2) between intervocalic /r/ and pre-consonantal /r/.

Keywords*: formant frequency model, vowel quality, intervocalic /r/, pre-consonantal /r/*

INTRODUCTION

Asmah Omar (1993) has divided Northern Malay Dialects into a few subregions namely Perlis, part of Pulau Langkawi, part of Lembah Kedah-Seberang Perai, and part of Penang Island. Hence, the people residing in Penang or colloquially known as Penangites use one of Kedahan subdialects which is known as Penang subdialect to communicate (Asmah Omar, 1993). Apart from its existing term, Penang Malay Dialect, this particular term is also referred to as Bahasa Tanjong; a dialect spoken by Malays in Georgetown area of Penang. Bahasa Tanjong is often used in the present discussion of dialectology following the origin of the dialect itself, i.e. Georgetown in Penang (Hajar Abdul Rahim, 2015).

Research Objectives

1. To investigate how intervocalic /r/ is produced in Penang Malay Dialect.
2. To investigate how pre-consonantal /r/ is produced in Penang Malay Dialect.

Research Questions

1. How is intervocalic /r/ produced in Penang Malay Dialect?
2. How is pre-consonantal /r/ produced in Penang Malay Dialect?

Significance of the Study

Many researchers have studied the Northern Malay Dialects because of the linguistic uniqueness (Ida Ahmad, 1969; Collins, 1989; Asmah Omar, 1993). One of the main reasons why the researcher had decided to study the production of intervocalic /r/ and pre-consonantal /r/ was to examine the vowel quality of both intervocalic /r/ and pre-consonantal /r/, and if there was any significant difference in the formant values (F_1 and F_2).

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METHODOLOGY

The data were collected from (two) Malaysian Malay undergraduate students from University of Selangor (UNISEL). The first speaker is from Georgetown, Penang. The second speaker was born in Kedah; however, she has been living in Seberang Perai all her life. Both of the speakers are 21 years old and had Malay as L1.

Since the purpose of this study was to investigate the quality of vowels preceding the /r/ sound in intervocalic and pre-consonantal, the researcher decided to make the selection of speakers homogenous. The reason why male voices were not analyzed in this particular research was because of the pitch differences among male and female voices. Even though the researcher only had two speakers, they were requested to repeat each phrase three times in order to increase the reliability and validity of the data.

Two sets of random pictures representing intervocalic /r/ and pre-consonantal /r/ were presented to them. Each speaker had to tell the researcher what they saw, constructed a simple phrase, and repeated it for three times. Please refer to *Table 1* for the full sets of pictures.

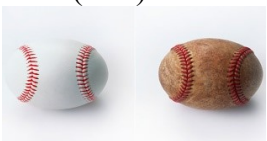
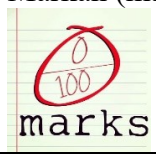
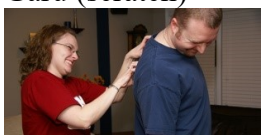
Intervocalic /r/	Pre-consonantal /r/
Baru (new) 	Garpu (fork) 
Baring (lie down) 	Darjah (class) 
Garam (salt) 	Markah (marks) 
Garu (scratch) 	Harga (price) 
Barat (west) 	Warna (color)

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Table 1 shows two sets of pictures for intervocalic /r/ and pre-consonantal /r/

PRAAT is an open-software tool of analysis to analyze speeches in phonetics. PRAAT version 6.0.29 was used to listen to the sound files, view the spectrograms and waveforms. PRAAT was also used to make an orthographic transcription and to measure vowel formant frequencies. The researcher had made two tiers to isolate between the words.

The formant frequency model was used to analyze the vowels. According to Watt and Tillotson (2001), the current practice in instrumental phonetics, is to reduce individual vowel sounds to a pair of figures representing the frequencies in Hertz of the two lowest formants, which are conventionally labelled F1 and F2. They said, formants can be defined as narrow bands within the acoustic spectrum in which energy is concentrated during the production of speech sounds; the frequency of each formant is determined by the volumes and resonances of various vocal tract cavities (pharyngeal, oral, nasal). Formants contain most energy during sonorant sounds such as vowels, and the frequencies of F_1 and F_2 relative to one another are thought to provide the human speech perception system with the cues necessary for the recognition of individual vowel qualities. F_1 and F_2 frequencies are, moreover, said to correlate closely with tongue position, such that an increase in F_1 frequency corresponds to tongue lowering and jaw opening, while an increase in F_2 frequency results from fronting of the tongue body.

Hence, in this research, the data were instrumentally analyzed based on three levels of analysis: the perception analysis, acoustic analysis and phonological rules. The first level of analysis was the perception analysis where the researcher transcribed phonetically the sounds from the recordings.

Whereas on the second level of analysis, the researcher had analyzed the recordings instrumentally. By using PRAAT, each recording went through a similar process. Firstly, the recording was opened as a long sound file, then pause detector was inserted to determine the pauses found in each recording. Next, the researcher inserted a text script containing the word list. Lastly, the instrumental analysis was divided into two tiers; the first tier is meant for the orthographic transcription whereas the second tier is meant for the isolation of vowels. Then, the researcher calculated the F_1 and F_2 values in Microsoft Excel to get the F_1 (Bark) and F_2 (Bark) values, average and standard deviation, and lastly transformed the values in the form of a scatter plot.

Lastly, on the third level of analysis, the researcher made some phonological rules for intervocalic /r/ and pre-consonantal /r/ based on the acoustic analyses conducted.

ANALYSIS

Intervocalic /r/ in Penang Malay Dialect

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Based on the acoustic analysis, the researcher had performed a perception analysis to determine the phonetic symbol that represents the intervocalic /r/ in Penang Malay Dialect. Please refer to *Table 2* for the phonetic transcription.

Wordlist	Speaker 1	Speaker 2
Baru	[baʁu]	[baʁu]
Baring	[baʁɪŋ]	[baʁɪŋ]
Garam	[gaʁam]	[gaʁam]
Garu	[gaʁu]	[gaʁu]
Barat	[baʁat]	[baʁat]

Table 2 shows the phonetic transcription of the intervocalic words.

Based on the perception analysis, the researcher found out that both speakers had produced the intervocalic /r/ as /ʁ/ in Penang Malay Dialect. Phonetically, /ʁ/ is a voiced uvular fricative, this means that the production of /ʁ/ requires the root of the tongue to be retracted to narrow the air passage between the tongue and the uvular. When air rushes out through this passage, there is friction. In the process, the vocal folds vibrate. Please refer to *Figure 1* for the production of /ʁ/.

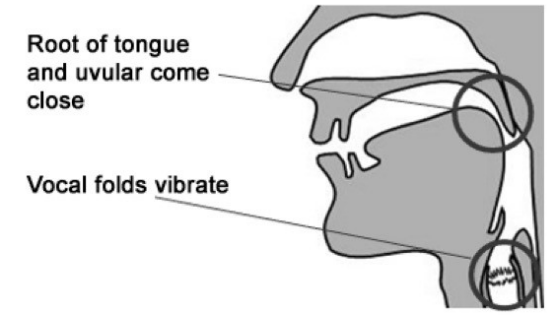

Figure 1 shows the production of /ʁ/

On the second level of analysis, the researcher had analyzed the recordings instrumentally. Please refer to *Figure 2* for a sample of recording.

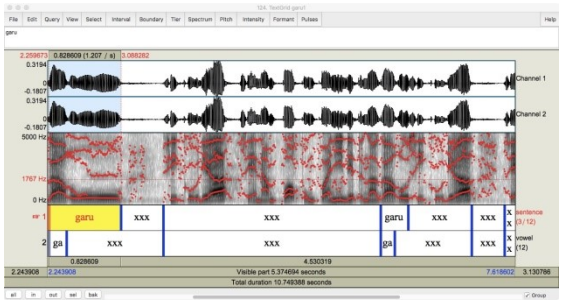

Figure 2 shows the spectrogram of the word ‘garu’

Based on Figure 2, the red splatters are the formant that the researcher was also interested in finding out the values of F_1 and F_2. Please refer to *Table 3* for the F_1 and F_2 values, average of F_1 and F_2, and the standard deviation (SD) of F_1 and F_2 for the intervocalic sounds.

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a	F1 (Hz)	F2 (Hz)	Ave F1	Ave F2	SD F1	SD F2
barat1	1026	1674	860	1588	139	136
barat1	1041	1717				
barat1	1017	1682				
barat2	822	1764				
barat2	848	1810				
barat2	862	1594				
baring1	1046	1756				
baring1	1056	1744				
baring1	1060	1659				
baring2	805	1676				
baring2	769	1671				
baring2	653	1352				
baru1	1022	1550				
baru1	930	1528				
baru1	1022	1605				
baru2	781	1480				
baru2	717	1490				
baru2	667	1275				
garam1	919	1618				
garam1	904	1559				
garam1	907	1611				
garam2	746	1581				
garam2	837	1614				
garam2	719	1557				
garu1	892	1662				
garu1	851	1572				
garu1	890	1584				
garu2	745	1520				
garu2	681	1532				
garu2	550	1192				

Table 3 shows the F_1 and F_2 values, average of F_1 and F_2, and the standard deviation (SD) of F_1 and F_2 for the intervocalic sounds.

Even though both of the speakers are very familiar with Penang Malay Dialect; however, Speaker 1 and Speaker 2 had rather different F_1 and F_2 values. These findings will be further elaborated in the discussion section.

On the last level of analysis, the researcher came up with several phonological rules following the acoustic analysis that they had performed. Based on the acoustic analysis, it is agreed that for intervocalic /r/, the /r/ sound changes to /ʁ/ (voiced uvular fricative) in Penang Malay Dialect as opposed to the regular /r/ sound in Standard Malay.

Pre-consonantal /r/ in Penang Malay Dialect

E-ISBN: 978-967-2122-11-1

Based on the acoustic analysis, the researcher had performed a perception analysis to determine the phonetic symbol that represents the pre-consonantal /r/ in Penang Malay Dialect. Please refer to *Table 4* for the phonetic transcription.

Wordlist	Speaker 1	Speaker 2
Warna	[wana]	[waɪna]
Harga	[harga]	[harga]
Markah	[markah]	[maɪkah]
Darjah	[dadʒah]	[gaɪpu]
Garpu	[garpu]	[daɪdʒah]

Table 4 shows the phonetic transcription of the pre-consonantal words.

Based on the perception analysis, the researcher found out that the pre-consonantal /r/ was produced differently by the speakers. The first speaker had elided the /r/ in [wana] and [dadʒah]. However, she had pronounced the other three words with /r/, which, phonetically, is known as voiced alveolar trill. The second speaker, on the other hand, had pronounced all the pre-consonantal words with /ɪ/. Phonetically, /ɪ/ is known as voiced alveolar approximant. This sound is commonly found in Standard Malay.

Please refer to *Figure 3* and *Figure 4* for the production of /r/ and /ɪ/.

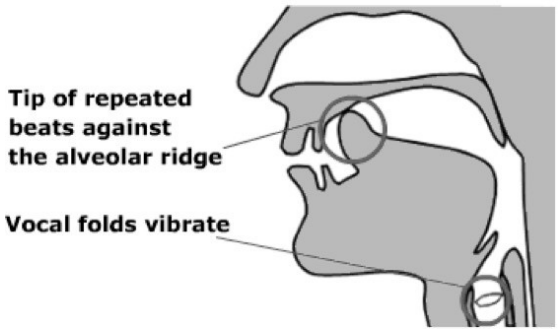

Figure 3 shows the production of /r/

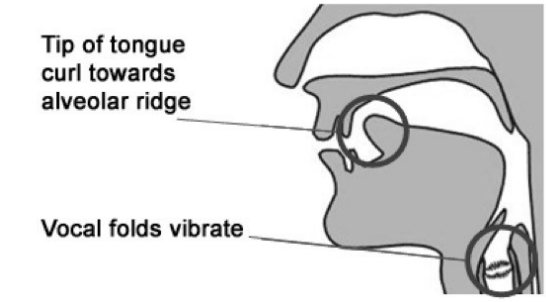

Figure 4 shows the production of /ɪ/

On the second level of analysis, the researcher had analyzed the recordings instrumentally. Please refer to *Figure 5* for a sample of recording.

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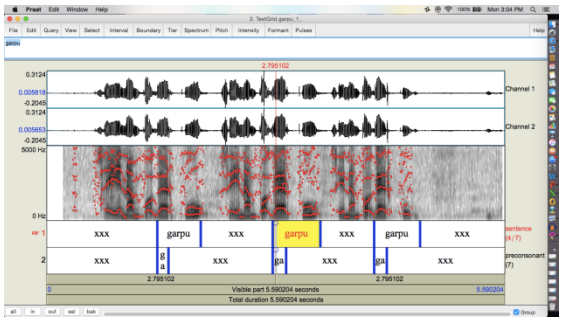

Figure 5 shows the spectrogram of the word 'garpu'

Please refer to *Table 5* for the F_1 and F_2 values, average of F_1 and F_2, and the standard deviation (SD) of F_1 and F_2 for the pre-consonantal sounds.

a	F1 (Hz)	F2 (Hz)	Ave F1	Ave F2	SD F1	SD F2
darjah1	704	2169	754	1747	127	288
darjah1	667	2130				
darjah1	664	2172				
garpu1	822	2140				
garpu1	826	2188				
garpu1	781	2263				
harga1	890	1910				
harga1	882	1877				
harga1	880	1755				
markah1	844	1476				
markah1	1106	1701				
markah1	872	1324				
warna1	723	1650				
warna1	697	1441				
warna1	725	1449				
darjah2	693	2020				
darjah2	683	1938				
darjah2	653	1928				
garpu2	812	1694				
garpu2	813	1613				
garpu2	791	1670				
harga2	838	1794				
harga2	598	1772				
harga2	483	1754				
markah2	882	1368				
markah2	829	1416				
markah2	585	1459				
warna2	622	1450				
warna2	606	1369				
warna2	638	1518				

Table 5 shows the F_1 and F_2 values, average of F_1 and F_2, and the standard deviation (SD) of F_1 and F_2 for the pre-consonantal sounds.

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On the last level of analysis, the result was inconclusive because the speakers had produced the pre-consonantal sounds differently.

DISCUSSION

In this section, the researcher would like to place the focus more on the findings that he found. In the analysis of intervocalic /r/, the researcher has conceded earlier that the F_1 and F_2 values for the two speakers are somewhat different even though they are very familiar with Penang Malay Dialect. This could be because of the geographical differences between Speaker 1 and Speaker 2. The first speaker is from Georgetown, Penang and the second speaker is from Seberang Perai. However, even though that the formant values are different between these two speakers, based on the perception analysis, the researcher had found out that the two speakers had /ʁ/ when they pronounced words with intervocalic /r/.

In the analysis of pre-consonantal /r/, the result was inconclusive because the two speakers had produced the sounds differently. Please refer to *Figure 6* for the scatter plot of intervocalic /r/ and pre-consonantal /r/.

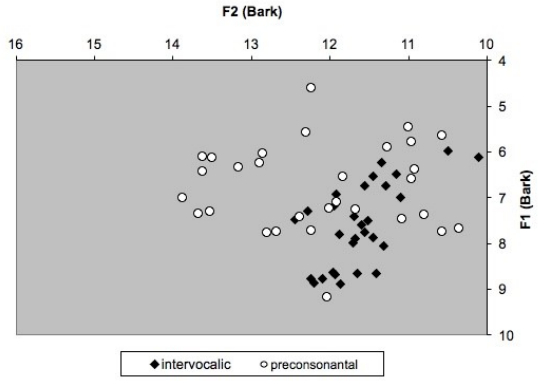

Figure 6 shows the scatter plot of intervocalic /r/ and pre-consonantal /r/

According to the scatter plot as found in *Figure 6*, the intervocalic /r/ was thought to be more stable than the pre-consonantal /r/ in terms of the distribution as the black dots (representing the intervocalic) scattered around the same region. This evidence confirms the researcher's perception analysis as it was accepted that the intervocalic /r/ in Standard Malay changes to /ʁ/ in Penang Malay Dialect. The scatter plot (see *Figure 6*) confirms the researcher's perception and instrumental analysis of the pre-consonantal /r/ as the white dots (representing the pre-consonantal) scattered and not as stable as the intervocalic /r/. Hence, the result was inconclusive for pre-consonantal /r/.

Following Watt and Tillotson's (2001) formant frequency model, it is evident that the vowel /a/ for intervocalic /r/ is higher and more front as compared to the vowel /a/ for pre-consonantal /r/. Please refer to *Table 6* for the average of F_1 and F_2 for intervocalic /r/ and pre-consonantal /r/, and Figure 7 for the vowel chart representing the vowel /a/ for both intervocalic and pre-consonantal.

	F1 (Hz)	F2 (Hz)	F1 (Bark)	F2 (Bark)

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intervocalic	860	1588	7.572	11.582
pre-consonantal	754	1747	6.800	12.218

Table 6 shows the average of F_1 and F_2 for intervocalic /r/ and pre-consonantal /r/

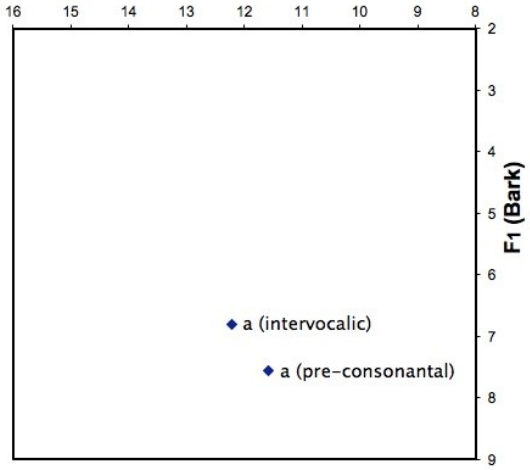

Figure 7 shows the vowel chart for intervocalic and pre-consonantal

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E-ISBN: 978-967-2122-11-1