

Consonants /s/ /t/ /l/ and the Syllables in Malay Language

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Abstract: Language is a medium for communication between humans. Language used code which is a combination of phonemes that form words and sentences. Each word has one or more syllables, while the combination of vowel and consonants will produce syllables. Articulation process involves the function of several human systems such as respiratory system, throat, voice cord and vellum working together in combinations ensuring perfect production of sound and speech. Each alphabet produces pattern on the tongue and hard palate contact as they were pronounced. This paper presents a pilot study on the production of /s/, /t/ and /l/, and the syllables by an adult speaker using an Electropalography (EPG). The participant, who speaks Malay as her first language recorded the production of /s/, /t/ and /l/ and the syllables. The Reading EPG palate used in this study has 62 electrodes which matched the tongue-palate contact. Data was analyzed using Articulate Assist 1.18. The purpose of this study is to observe the differences of tongue-palate contact between the consonants /s/, /t/ and /l/. Results indicate significant differences between production of /s/, /t/ and /l/ with the syllables.

Key words: Electropalatograph, syllables, Malay language.

1. Introduction

Electropalatograph (EPG) is a device used to monitor contacts between the tongue and hard palate, particularly during articulation and speech. EPG has many advantages which include the ability to provide real-time visual feedback of tongue-palate contacts [1]. EPG helps to overcome speech problem that may arise from defective palate development such those observed in cleft palate subjects [2]-[6]. EPG is also suitable as a method for language analyses [7], [8]. EPG provides a safe and convenient technique for recording the timing and location of tongue contact with the hard palate during a continuous speech [1]. Although EPG has shown potentials as a tool for speech therapy, this technique is not very common and popular in Malaysia. Hence, most of the studies involved English speaker and very few from other languages including Japanese, Cantonese and Hindi [5], [9], [10]. In this study, EPG is used to analyse articulation in Malay syllable.

Language uses code which is a combination of phonemes that form words and sentences that produces meaning [11], [12]. A language is a form of communication between humans to represent objects, actions, ideas and situations. Identifying the main differences between human languages is difficult [13].

Interestingly, EPG can be used for analyzing syllables in the Malay language. Each word has one or more syllables. The combination of vowel and consonants will produce syllables. Additionally, each consonant and vowel have their unique production. This production comes from the contact between tongue and palate.

During the process of articulation, several human systems play a role in the course of this articulation. The systems involve in articulation include the respiratory system, throat, voice box and vellum [14]. Each alphabet produced a pattern upon contact between palate and tongue [7].

In this study, three consonant were selected which are /s/, /l/ and /t/. Vowel /a/, /i/ and /u/ were also used with the consonants to produce syllables. The patterns of the syllables on the EPG palate were analysed using the Articulate Assistant™ Version 1.18.

2. Materials and Methods

2.1. Subject

In this pilot study, a 32 year old female native Malay speaker has been selected as the test subject. She does not have any history of speech, language or hearing difficulties, and is medically fit. She speaks Malay as her first language and was well trained to use the EPG palate and system. This study has been approved by the Internal Review Board of Universiti Sains Malaysia Human Ethics Committee. The subject was required to wear a customized Reading palate during the procedure.

2.2. Materials

In this study, the Reading Palate is used to monitor the tongue-palate contacts. The Reading Palate was originally built at the University of Reading in the mid-1980s [1]. The connector board will be plugged into the board reader called a multiplexer. The software, Articulate Assist 1.18 was used to analyse the data. The Reading palate consists of 62 silver contacts embedded in an acrylic resin that covers the palatal surface [1], [15]. Stainless steel Adams clasps clip were embedded around the first permanent molar teeth to retain the palate in place [15].

2.3. Procedures

Table 1. Collocation between Vowels and Consonants

Alphabet	s	l	t
a	as	al	at
i	Is	il	It
u	us	ul	ut

A full plaster of Paris (gypsum) study model was first fabricated from the subject's upper palate impression imprint and teeth using conventional dental impression taking and pouring procedures. The upper arch impression must be accurate and free of bubbles. After that, the acrylic plate was casted on the study model. The acrylic plate must be as thin as possible to ensure no or minimal interference with normal speech production [1]. The subject is required to wear the artificial plate for at least 30 minutes to one hour before the first recording for acclimatization to the plate. This is to allow the subject to become accustomed to the sensation of an unfamiliar object in the mouth [1]. The subject was required to record their sound of voice samples in a sound-proof room with a microphone at a distance of 15cm from her mouth [1]. The subject was asked not to look at the EPG display on the computer screen while recording to obtain natural speech production. During speech production, the artificial palate will transmit the tongue-palate contact information to the computer. Table 1 shows the collocation between vowels and consonants. These three

vowels were chosen to collocate with a consonant in Malay speaker. By using these three vowels, differences among the syllables will be magnified.

3. Result and Discussion

3.1. Consonant /t/ /s/ /l/

Fig. 1 shows the pattern of consonant /t/ in different syllables. These syllables start with vowel /a/, /i/, /u/ and end with consonant /t/. From this figure, it can be observed that there are slight differences between /t/ and the syllables. In the production of /t/, /at/ and /ut/ there are seven electrode contacts between the palate and tongue at the alveolar zone. However, there are six contacts between palate and tongue in the production of /it/. This shows that only one different contact point exist at the alveolar zone. At post-alveolar zone, there are seven electrode contacts in the production of /t/, /at/ and /ut/ and six electrode contacts in the production of /it/. There are five electrode contacts in the production of /t/ and /it/ at the palatal zone. Two electrode contacts in the production of /at/ and one electrode contact in the production of /ut/. While at the velar zone, there are three electrode contacts in the production of /t/ and /it/, two electrode contacts in the production of /at/ and one electrode contact in the production of /ut/. The total electrode contact in the production of /t/, /at/, /it/ and /ut/ are 22 electrodes, 18 electrodes, 20 electrodes and 16 electrodes, respectively. There are minimal differences observed between the production of /t/ with /it/ and marked differences between the production of /t/ with /at/ and /ut/.

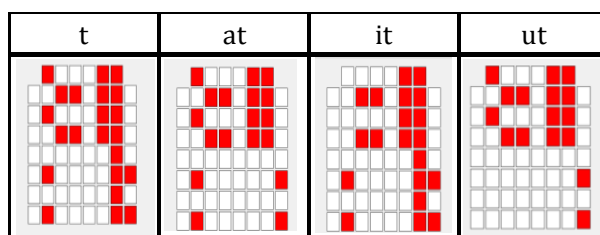


Fig. 1. Pattern of consonants /t/ in different syllables.

Fig. 2 shows the pattern of consonant /s/ in different syllables. In the production of /s/ there are nine electrode contacts between the tongue and palate in the alveolar zone and there are five contacts in the production of /as/, four contacts in the production of /is/ and three contacts in the production of /us/. In post-alveolar zone, there are nine electrode contacts in the production of /s/, five contacts in the production of /as/, four electrodes in the production of /is/ and three electrodes in the production of /us/. In the palatal zone, two electrodes were in contact in the production of /s/, /is/ and /us/ whereas one contact in the production of /as/. While in the velar zone, two electrode contacts were observed during the production of /is/ and /us/, one in the production of /as/ and no electrode contact in the production of /s/. The total electrode contact in the production of /s/, /as/, /is/ and /us/ are 20 electrodes, 12 electrodes, 12 electrodes and 10 electrodes, respectively.

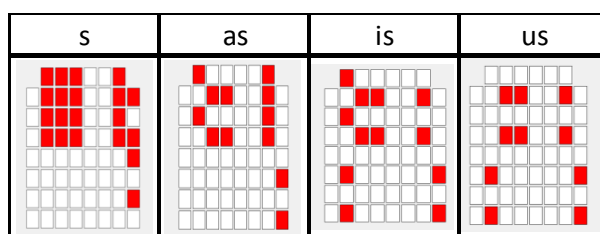


Fig. 2. Pattern of consonants /s/ in different syllables.

Fig. 3 shows the pattern of consonant /l/ in different syllables, the syllables ends with the consonant /l/ and begins with vowel /a/, /i/, /u/. In the production of /l/ and /al/, there are seven electrode contacts between tongue and palate at the alveolar zone. However, there are six contacts between palate and tongue in the production of /il/ and /ul/. In post-alveolar zone, there are seven electrode contacts between tongue and palate. However, there are six contacts in the production of /il/ and /ul/. There are no electrode contacts in the production of /l/, /al/ and /ul/ in the palatal zone, whereas three electrode contacts in the production of /il/. There are three contacts in the production of /il/ and no electrode contact in the production of /l/, /al/ and /ul/ in velar zone. Total electrode contacts in production of /l/, /al/, /il/ and /ul/ are 14 electrodes, 14 electrodes, 18 electrodes and 12 electrodes, respectively.

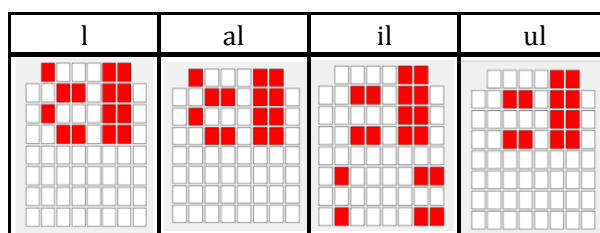


Fig. 3. Pattern of consonants /l/ in different syllables.

Table 2 summarizes the percentage of contact between the tongue and palate against consonant /t/, /s/, /l/ and the syllables. From the table, the production of /t/, /at/, /it/ and /ut/ have the highest contact in the alveolar zone, followed by post-alveolar, velar and palatal. The percentage is 50% at the production of /t/, /at/ and /ut/ and 43% at the production of /it/. At post-alveolar zone, the percentage is 44% for the production of /t/, /at/ and /ut/ and 38% at the production of /it/. Meanwhile at the palatal zone, the percentage for the production of /t/ and /it/ is 38%, the production of /at/ is 25% and the production of /ut/ is 13%. Palatal zone shows the lowest contact compared to other zones. At the production of /t/ and /it/ the percentage is 21%, /at/ is 8% and /ut/ is 4%. Velar zone shows the lowest contact compared to other zones. At the production of /t/ and /it/ the percentage is 38%, /at/ is 25% and /ut/ is 13%.

Table 2. Percentage Contact of Consonant /t/ and Syllables

Zone	t	at	it	ut	s	as	is	us	l	al	il	ul
Alveolar	50	50	43	50	64	36	29	21	50	50	43	43
Post-alveolar	44	44	38	44	56	31	25	19	44	44	38	38
Palatal	21	8	21	4	8	4	8	8	0	0	13	0
Velar	38	25	38	13	0	13	25	25	0	0	38	0

Similarly, the highest percentage of contact for the production of /s/ with variation of syllables is at alveolar zone followed by post alveolar, velar and palatal. The percentage of contact for production of /l/ and its syllables at alveolar and post-alveolar are similar to consonant /t/. However, palatal and velar zone have the lowest contact compared to others production.

3.2. Differences between /t//s//l/ and Syllables and Palate Zone

Fig. 4 shows the percentage of contact against the palate zone. The production of /s/, /t/ and /l/ shows the highest contact at the alveolar zone followed by post-alveolar. The /s/ and /l/ have similar pattern of contact for the four different palate zones. However, the production of /t/ is slightly different compared to /s/ and /l/ particularly at the velar zone. All three consonants have low palate contact at the palatal and

velar zones.

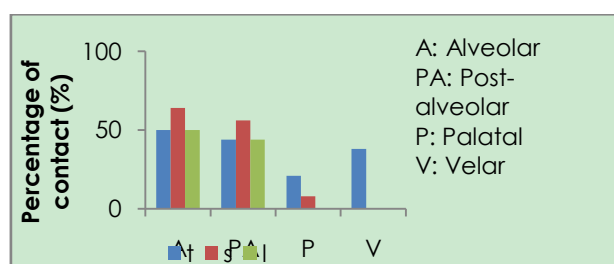


Fig. 4. Percentage of contact against palate zone.

Fig. 5a, 5b and 5c show the percentages of the contact against palate zone for the production of vowel /a/, /i/ and /u/. From the figure, the highest contacts were obtained at the alveolar zone whereas the lowest contact was observed at the palatal zone. Combining each of the consonant with a specific vowel produced a similar contact pattern throughout the different palate zones. This indicates the uniqueness of the vowel which forms the basis of the syllables.

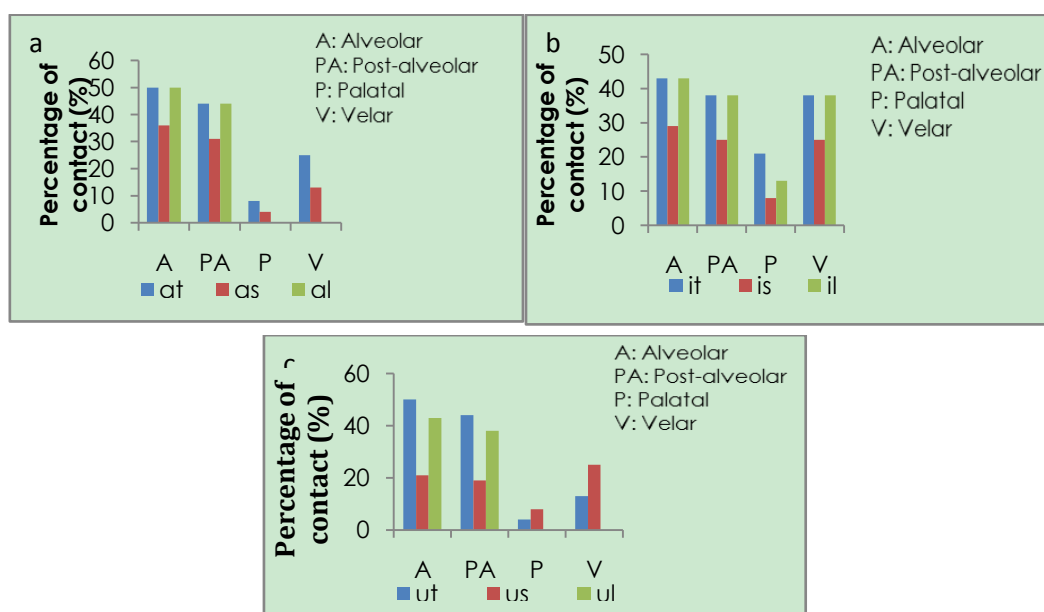


Fig. 5. (a) Percentage of contact against palate zone for vowel /a/. (b) Percentage of contact against palate zone for vowel /i/. (c) Percentage of contact against palate zone for vowel /u/.

The tongue adhered and created strong contact with the alveolar and also with the post-alveolar during the production of /s/, /t/ and /l/ and the syllables. However, a less strong contact which is weak was observed when the tongue is in contact with the palatal zone during the production for each consonant and the syllables [10]. This study indicates that the characteristic of a vowel will affect the contact pattern.

4. Conclusion

The productions of vowel depend on the condition of the oral cavity. Tongue plays a role in this activity because it will move up and down, and at the same time controlling the size of the mouth with the facial muscles. The production of vowel occurs without any restrictions on the flow of air which exist throughout the system and its production are also different from one language to other languages. These findings showed that the vowel /a/, /i/ and /u/ can change the pattern contact between the tongue and the palate.

Hence, each vowel has its characteristics which help to change the pattern. However, this study needs to improve in the future. Researchers should use three or more subjects for comparison, and therefore ensuring more accurate readings can be obtained. Subject needs to wear the training palate at least 4 hours before he or she records the readings. Longer time may be needed for subject to adjust himself/herself and feel comfortable with the Reading Palate.

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