LI Influence of Initial Stop Consonants in Malaysian English

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1.Introduction

With the long history of British colonisation in Malaysia for over 90 years, the influence of English in the multi-ethnic and multilingual society has remained significant in the social, education and government domains. Malaysian English (henceforth MalE) has thus emerged as a non-native English encompassed with rich local features and identities (Hashim and Leitner 2011, Hashim and Tan 2012, Schneider 2003a, 2003b). While there have been studies looking into the status of World Englishes from a sociolinguistic perspective, a gap is observed in the phonological aspect of non-native varieties of English (Bautista and Gonzalez 2006; Cho et al. 2019). The existing acoustic and instrumental studies on the pronunciation features of MalE is also limited due to the complex linguistic settings. Hence, the present study would like to investigate the phonetic variation of English initial stop consonants produced by MalE bilingual speakers across the three major ethnic groups, Malay, Chinese and Indian, as well as the extent of first language (L1) influence in their initial stop production. Voice onset time (VOT) and closure duration are adopted as the primary acoustic cues in this study due to their inverse relationship resulted from temporal adjustment. The effects of place of articulation on the acoustic cues are also examined.

Table 1 shows the phonetic realisations of plosives in respective languages studied. The voiceless stop consonants in Malay are usually unaspirated as in many standard varieties of Malay (Clynes and Deterding 2011, Sodeberg and Oslon 2008). As seen in the table, voicing discrimination is not present in Mandarin language (Deterding and Nolan 2007, Duanmu 2007, Lee and Zee 2003, Phoon 2010). As the phonemes in parentheses are non-native origins, voicing contrast is also usually less evident in the Dravidian language, including Tamil, with a single symbol used at each place of articulation (Keane 2004). The voiceless stop consonants in Tamil are also inconsistently aspirated slightly (Keane 2004). The present study is anticipated to contribute to the phonological systems of MalE.

Language	Plosives							
	Bilabial	Labio-dental	Dental	Alveolar	Retroflex	Palatal	Velar	Glottal
Malay	p b		t̪	d			k g	(ʔ)
Mandarin	p p^h		t	t^h			k k^h	
Tamil	p (b)		t̪ (d̪)		ʈ (ɖ)		k (g)	
English	p b			t d			k g	ʔ

Table 1: Plosive realisations in Malay, Mandarin, Tamil and English.

2.Methods

2.1.Speech Materials

Four sets of word list in English, Malay, Mandarin and Tamil were designed to collect the VOT and closure duration measurements in a carrier phrase of respective languages. The phrases and the translation for Malay, Mandarin and Tamil are shown as below.

(1) English: Please say ____________ again.
(2) Malay: Sila ulangi ___________ lagi.
    'Please repeat __________ again.'

(3) Mandarin: 请 再 说 __________ 一遍。
Qǐng zài shuō _________ yī biàn
'Please again say ________ once.'

(4) Tamil: Thayavu seithu ____________ nu m:ndum sollunggā.
'Please _______________ postposition again say.'

The word lists were composed of initial voiced and voiceless stop consonants across all places of articulation, /b/, /d/, /g/ and /p/, /t/, /k/, with three target stimuli in each category whereas Mandarin stimuli were made up of voiceless unaspirated and voiceless aspirated stop consonants, /p/, /t/, /k/ and /pʰ/, /tʰ/, /kʰ/. The target stimuli were attempted to be in /CVCV/ arrangement due to the commonality. The initial stop consonants were also followed by the cardinal vowels whenever possible to allow more room for analysis. Six distract words were also included in each word list and shown to the participants in a randomised order. Table 2 shows the word lists.

Phoneme	English	Malay	Glossary	Mandarin	Glossary	Tamil	Glossary
/b/	bitter	bida	bid	鼻涕 bí tì	mucus	பி ம்ப ம் bimbam	image
	Buddha	buku	book	簿子 bù zi	book	பு த ன் buthan	Wednesday
	barber	batu	stone	爸爸 bà ba	father	பா வ ம் ba:vam	expression
/d/	decay	didik	educate	弟弟 dì di	brother	தீ ப ம் đi:bam	light
	doodle	duka	grief	肚皮 dù pí	belly	து க்க ம் đukkam	sorrow
	darker	daki	climb	大地 dà dì	earth	தா ச ன் đa:san	follower
/g/	girdle	getah	rubber	哥哥 gē ge	brother	கெ ட்து geṭthu	proud
	guru	gula	sugar	顾客 gù kè	customer	குரு guru	teacher
	gala	gadis	girl	高度 gāo dù	height	கா ன ம் ga:nam	music
/p/	pity	pipi	cheek	琵琶 pí pá	lute	பிரி piri	separate
	poodle	putar	turn	瀑布 pù bù	waterfall	புதர் putar	bush
	party	pati	essence	爬梯 pá tī	access ladder	பா ட்டி pa:ṭṭi	grandmother
/t/	titter	titi	wooden bridge	梯子 tī zi	ladder	தி ட்டி ti:ṭṭu	sharpen

	tutu	tugu	statue	图库 tú kù	gallery	து க்கு tu:kku	lift
	tardy	tadi	just now	踏步 tà bù	steps	தாடி ta:ṭi	beard
/k/	curtain	ketua	leader	课题 kè tí	issues	கெ ட்டி keṭṭi	hard
	cookie	kuda	horse	枯骨 kū gǔ	bones	கு டை kudai	umbrella
	khaki	kaki	leg	卡车 kǎ chē	truck	க ங்கு kanggu	ridge

Table 2: Word lists of English, Malay, Mandarin and Tamil.

2.2.Participants and Procedures

Ten participants aged between 19 to 28 were recruited from each ethnic group as this group of young generation born in the 1990s are the batch of students who were exposed to the teaching and learning of science and mathematics in English in an education policy. They are all fluent bilingual speakers of their L1s and English who were born and raised in the state of Selangor, including the capital Kuala Lumpur. Two Indian participants are from Penang and Kedah states respectively with no marked regional variation reported. On the other hand, nine British monolinguals of the same age group from London and South East Regions were also gathered as a reference group for comparison. British English is used as a reference in this study due to its historical ties and adoption in the official education system. Only three participants are originated from North East, North West and Yorkshire respectively, but did not produce any informed distinctive variations in their initial stop production auditorily and acoustically.

In the audio recording sessions, the bilingual participants were to iterate the L1 word lists three times before they continue to read English stimuli in the same manner with a short break in between. The monolingual participants only read the English word list in the same setting. The recording was carried out using Sony ICD-UX560F Digital Voice Recorder and Takstar SGC-578 Microphone.

2.3.Measurements and Data Analysis

Following the speech data collection, VOT and closure duration measurements were obtained using Praat. The data was downsampled from 44100 Hz to 22050 Hz, high-pass filtered at 50 Hz and low-pass filtered at 11025 Hz. The VOT values were measured from the vertical spike in periodic pattern indicating the release of the stop consonant to the voicing onset indicated by oscillating pattern of the vocal folds' vibration in the vowel (Ladefoged and Johnson 2011, Sundara et al. 2006). At the nearest zero-crossing, the presence of voicing before the release of stop consonants were labelled as negative VOT and known as voicing lead whereas the VOT measured after the release of stop consonants were stated positive numbers and called voicing lag (Ladefoged and Johnson 2011; Lisker and Abramson 1964). The mispronounced words were not discarded from the analysis. As for closure duration, it was measured from the voicing offset of the preceding vowel to the periodic pattern indicating the release of stop consonants. Any duration more than 200 ms was considered as hesitation pauses and eliminated from the analysis (Bilá and Džambová 2011, Campione and Véronis 2002, Schertz et al. 2015). Table 3 shows the total number of tokens extracted for the analyses.

Speaker	VOT		Closure Duration	
	L1	MalE	L1	MalE

Malay	538/540	540/540	524/540	519/540
Chinese	539/540	534/540	520/540	467/540
Indian	539/540	531/540	311/540	407/540
British	485/486		482/486	

Table 3: The total number of tokens extracted for analyses of VOT and closure duration.

A linear mixed effects analysis was run using lme4 package in RStudio to test the correlation and statistical significance across the ethnic groups and voicing categories (Bates et al. 2015). Adopting VOT as the dependent variable, the fixed effects were voicing, language group and place of articulation in three-way interactions. The fixed effects were all treatment coded. By-subject and by-item intercepts were set as random effects. The same procedure was repeated by changing the dependent variable to closure duration. The effects of place of articulation were also examined by running likelihood ratio test using ANOVA function in R.

3.Results

3.1.VOT

Figures 1, 2 and 3 show the VOT distribution of Malay-English, Mandarin-English and Tamil-English bilinguals visualised in boxplots using R. Overall, the VOT distribution of bilingual groups lies in an intermediate position between their L1s and British English. Besides, the VOT of the bilingual and monolingual groups is generally governed by the place of articulation despite some variation in the alveolar voiceless stop consonants. Place of articulation shows significance in the VOT distribution of all language groups ($p < .01$ for voiceless or voiceless aspirated stop consonants in Chinese-influenced English and Mandarin and $p < .001$ for the remaining groups) except for voiced stop consonants in Tamil due to its wider range of distribution ($X^2(2) = 3.65$, $p = .16$).

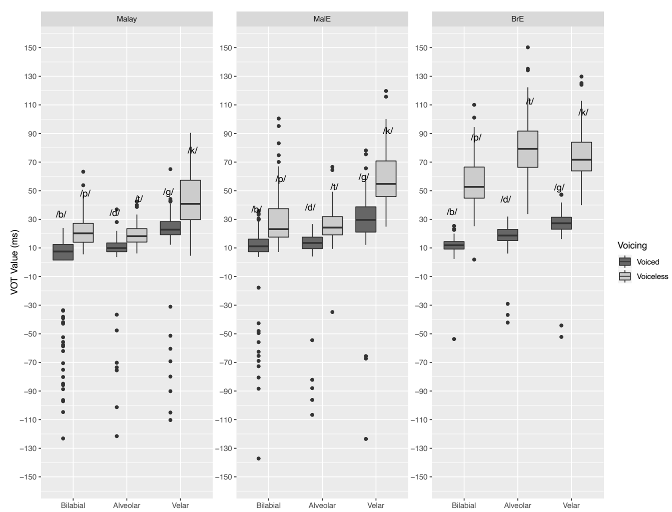

Figure 1: VOT distribution of Malay, Malay-influenced English and British English across place of articulation.

From Figure 1, a high frequency of voicing lead can be seen in the voiced stop consonants of Malay-influenced English within the range of -30 ms to -100 ms, resembling Malay. There is also one occurrence of voicing lead in /t/ in Malay-influenced English. The lack of voicing contrast between voiced and voiceless stop consonants in the English stop consonants produced by Malay-

English bilinguals also echoes the phonetic realisation of Malay initial stop consonants. The statistical results show that the VOT difference between voiced and voiceless alveolar stop consonants in Malay-influenced English is only slightly higher than Malay by 2.68 ms ± 7.82 (standard errors) with a *t*-value of - .34 but much lower than British English by 46.35 ms ± 3.88 (standard errors) with a *t*-value of 11.94. The low *t*-value suggests Malay-influenced English has no significant statistical difference from Malay but a rather significant difference from British English.

According to Figure 2, Mandarin-English bilinguals produce voicing lead in their English voiced stop consonants even though Mandarin stop consonants are not discriminated by voicing. The wider distribution of the Mandarin-English bilinguals indicate greater individual variability. The voicing contrast of Mandarin-influenced English is also weaker compared to Mandarin and British English. The VOT difference between voiced and voiceless alveolar stop consonants in Chinese-influenced English is lower than Mandarin by 27.82 ms ± 10.58 (standard errors), $t = 2.63$ and British English by 9.27 ms ± 4.22 (standard errors), $t = 2.20$. The statistical results show that the VOT distribution of Mandarin-influenced English is relatively more assimilated to British English.

Similar to Malay-influenced English, there is frequent occurrence of voicing lead in the English stop consonants produced by Tamil-English bilinguals as seen in Figure 3. The weaker voicing contrast in Tamil-influenced English also resembles the lack of voicing contrast in Tamil. The statistical findings reflect that Indian-influenced English has no significant difference from Tamil but from British English. The VOT difference between voiced and voiceless alveolar stop consonants in Indian-influenced English is higher than Tamil by 8.25 ms ± 10.29 (standard errors), $t = -.80$ and lower than British English by 17.99 ms ± 5.23 (standard errors), $t = 3.44$, indicating a greater L1 influence on the VOT production of Tamil-English bilinguals.

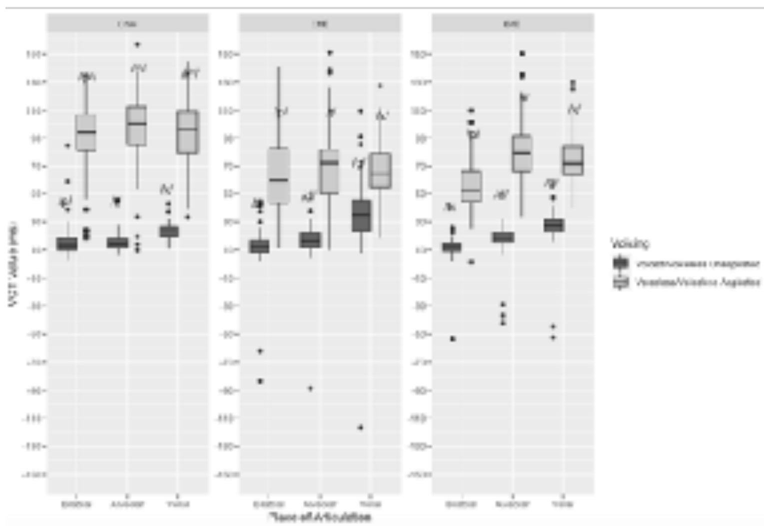

Figure 2: VOT distribution of Mandarin, Chinese-influenced English and British English across place of articulation.

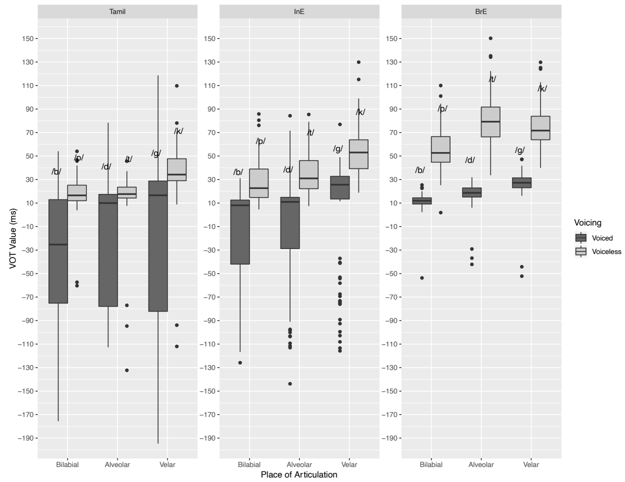

Figure 3: VOT distribution of Tamil, Indian-influenced English and British English across place of articulation.

3.2.Closure Duration

Figures 4, 5 and 6 display the closure duration distribution of Malay-English, Mandarin-English and Tamil-English bilinguals. The overall distribution is, to a certain extent, governed by the place of articulation where the more posterior the stop consonants, the shorter the closure duration. The likelihood ratio test shows that place of articulation affects closure duration of all language groups except for voiced stop consonants in Malay voiced stop consonants (X2(2) = 2.08, *p* = .35), voiced stop consonants in Chinese-influenced English (X2(2) = 1.85, *p* = .40), voiced stop consonants in Tamil (X2(2) = 2.33, *p* = .31) and Indian-influenced English (X2(2) = 2.45, *p* = .29).

Based on Figure 4, the distribution between Malay-influenced English and Malay is more similar with longer closure duration reflected in the voiceless stop consonants than the voiced stop consonants unlike the opposite case in British English. The statistical analysis shows no significant statistical difference between Malay-influenced English and Malay as their difference between voiced and voiceless alveolar stop consonants in Malay-influenced English is only higher than Malay by 3.41 ms ± 7.77 (standard errors), *t* = .44 but much higher than British English by 68.50 ms ± 5.58 (standard errors) with a *t*-value of -12.27. Unlike Mandarin, the English voiceless stop consonants produced by Mandarin-English bilinguals have longer closure duration than the voiced stop consonants (see Figure 5). The closure duration for the voiced velar stop consonant /g/ is particularly longer despite its longer VOT, overlapping the distribution of /k/. Nevertheless, the closure duration contrast is evident. The statistical findings show the closure duration difference between voiced and voiceless alveolar stop consonants in Chinese-influenced English is higher than Mandarin by 69.49 ms ± 11.08 (standard errors), *t* = -6.27 and British English by 42.16 ms ± 6.27 (standard errors), *t* = -6.73. Referring to Figure 6, the closure duration distribution between Indian-influenced English and Tamil shares greater resemblance as compared to British English. As statistical findings confirm, the closure duration difference between voiced and voiceless alveolar stop consonants in Indian-influenced English is higher than Tamil by 19.77 ms ± 9.97 (standard errors), *t* = -1.98 and British English by 47.12 ms ± 6.05 (standard errors), *t* = -7.79.

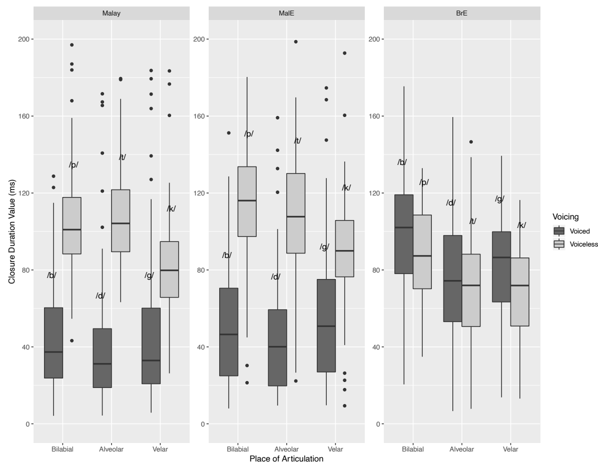

Figure 4: Closure duration distribution of Malay, Malay-influenced English and British English across place of articulation.

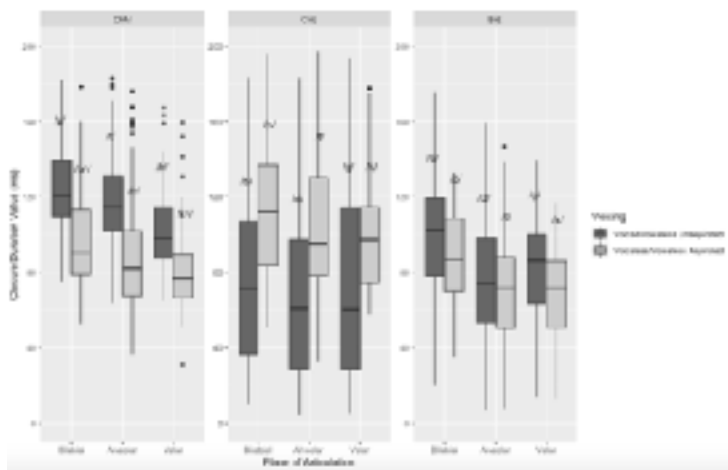

Figure 5: Closure duration distribution of Mandarin, Chinese-influenced English and British English across place of articulation.

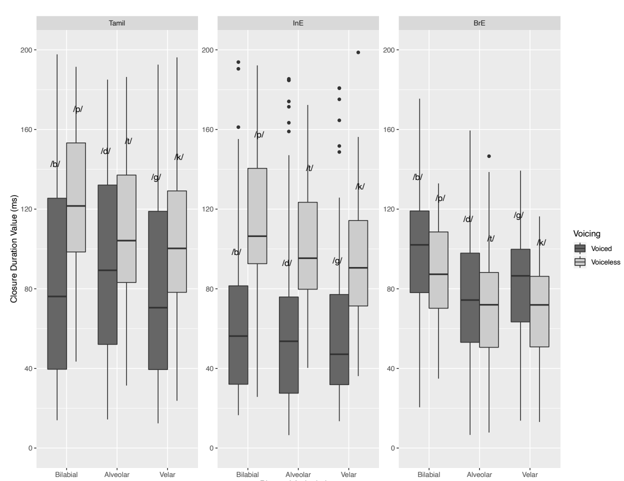

Figure 6: Closure duration distribution of Tamil, Indian-influenced English and British English across place of articulation.

4.Discussion

In short, L1 influence is observed in the initial stop production of the MalE bilingual speakers although the degree of influence may vary. Both Malay-English and Tamil-English bilinguals show greater assimilation to their L1s, but Mandarin-English bilinguals tend towards British English in their distribution. This can be explained by the variation in their L1s as Mandarin stop consonants are largely differentiated by the presence or absence of aspiration (Deterding and Nolan 2007, Duanmu 2007, Lee and Zee 2003, Phoon 2010). Hence, the voicing contrast in Chinese-influenced English is also relatively more evident than the other two groups. As Abramson and Whalen (2017) suggest, the cross-linguistic influence may take place only on the phonetic implementation level rather than phonemic level. Even though there are two voicing categories in respective L1s, the phonetic realisation of initial stop consonants produced by each ethnic group differ from one another and their underlying representation.

Regardless, the bilingual speakers' results lie in an intermediate position between their respective L1s and British English, which suggests a bidirectional cross-linguistic influence. This is a common phenomenon in second language acquisition (Flege 1995, Fowler et al. 2008, Macleod and Stoel-Gammon 2009, VanPatten et al. 2019). The initial stop production of MalE bilingual speakers also corresponds to the Speech Learning Model (SLM) theory established by Flege (1995) where the L1 and L2 phonetic systems of bilingual speakers lie in a common phonological space and mutually influence each other. While age was proposed as the factor for phonetic variation in second language acquisition in the earlier years, the focus has recently switched to social factors especially quality and quantity of input (Flege 2018). Flege and Bohn (2021) have also recently revised the SLM theory and provided more insights into how the phonetic systems of individual develop over time concerning the input received. Additionally, speech perception and production are said to coexist with no precedence in L2 learning. These new ideas set as substantial precedents for further investigation in the study of MalE.

Despite the weaker voicing contrast, closure duration contrast is still noticeable in all bilingual groups. This contradicts to the lack of contrast in the monolingual group. According to the scatterplots shown in Figure 7, the relationship between VOT and closure duration between the bilingual groups and monolingual groups seems to differ. From the scatterplots, the contrast between two voicing categories in the bilingual groups can be observed in both VOT and closure duration. However, the closure duration contrast is absent in the monolingual group as their distribution lie in a rather vertical dimension as shown in the scatterplot. The results in this study conform with the study of Flege and Port (1981), which suggests the absence of temporal contrast in closure duration in American English. Therefore, the present study hypothesises that closure duration may be a secondary acoustic cue in British English as in many languages while VOT and closure duration may play an equivalent role in the initial stop production of the bilingual speakers (Abramson and Whalen 2017). Kong et al. (2012) also suggest that VOT may not be the only acoustic cue in the voicing discrimination of non-native varieties of English since L1 influence is robust in the acquisition of English stop consonants among second language learners. Thus, it would be interesting to investigate further as to whether VOT and closure duration are an index for ethnicity in the multilingual Malaysia.

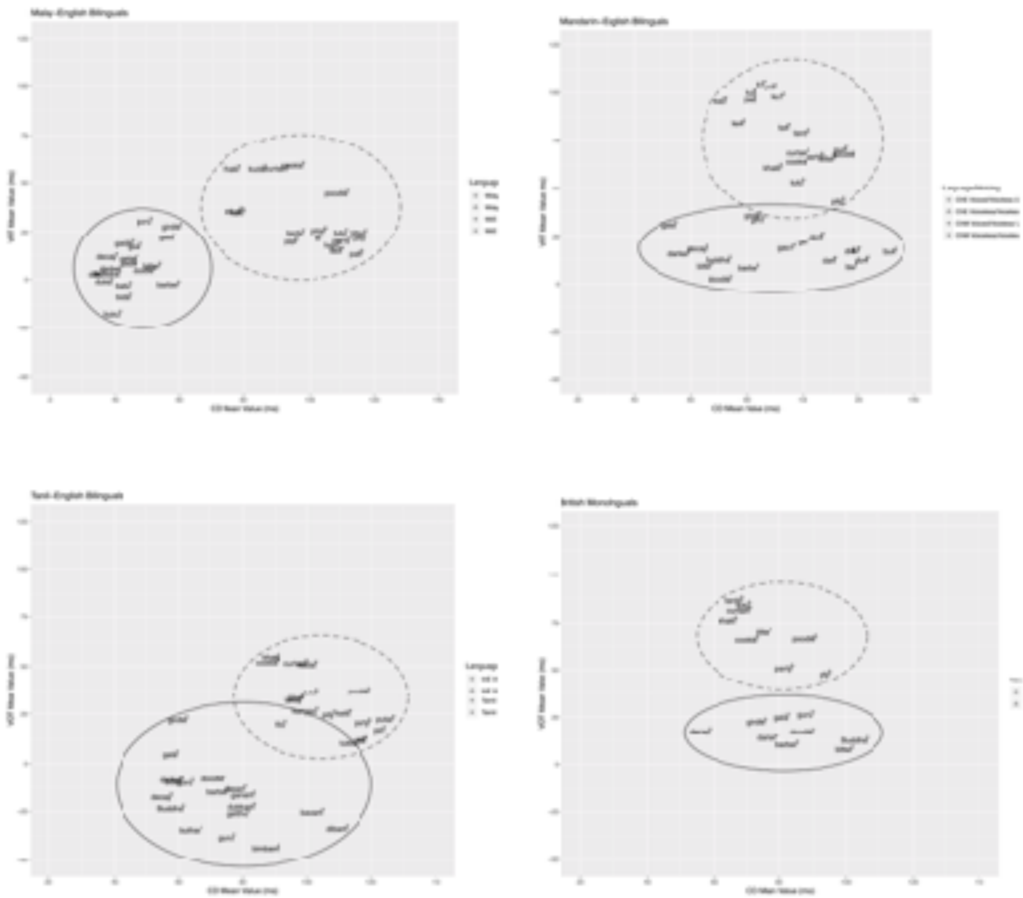

Figure 7: Mean VOT and closure duration values of initial stop consonants for Malay-English bilinguals, Mandarin-English bilinguals, Tamil-English bilinguals and British monolinguals respectively.

5.Conclusion

The present study investigates the L1 and L2 initial stop consonants produced by MalE bilingual speakers and compares the results to the British monolinguals. The VOT and closure duration produced by both bilingual and monolingual groups are generally governed by the pattern of place of articulation though it is less consistent in closure duration. Findings prove a strong L1 influence on the English initial stop production of MalE bilingual speakers, and a lack of voicing contrast. Despite this, the temporal contrast in closure duration is noticed in their English initial stop production. While both L1s and English do mutually influence the Malay-, Chinese- and Indian-influenced English cross-linguistically, the equivalent weight of VOT and closure duration as an acoustic cue in the initial stop production of MalE bilinguals may be a factor that sets MalE apart from Englishes spoken in the Inner Circle and shall be investigated further.

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