

## Production And Perception Of English Word Final Stops By Malay Speakers

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### Abstract

A few influential speech studies have been carried out using established speech learning models, which confirmed that the analysis of first language (L1) and second language (L2) at a phonemic level provides only a partial view of deeper relationships between languages in contact. Therefore, studies focusing on cross-language *phonetic* differences as a causative factor in L2 learner difficulties have been proposed to understand second language learners' (L2) speech production and how listeners respond perceptually to the phonetic properties of L2. This paper presents a study of the production and perception of the final stops by English learners (L2) whose first language is Malay (L1). A total of 23 students, comprising 16 male and 7 female Malay subjects (L1 as Malay and their L2 as English) with normal hearing and speech development participated in this study. A short interview was conducted in order to gain background information about information about each subject, to introduce them to the study, to inform them about the process of recording, the materials to be used in the recording session, and how the materials should be managed during recording time. Acoustic measurements of selected segments occurring in word final positions (via spectrographic analysis, syllable rhyme duration and phonation) were taken. Results of the voicing contrast realisation in Malay accented English and Malaysian listeners' perceptual identification/discrimination abilities with final voiced/voiceless stops in Malay and English are presented and discussed. The findings revealed that the Malay students' realisation of final stops in L2 is largely identical to their L1. In addition, the results also showed that accurate 'perception' may not always lead to accurate 'production'.

**Keywords:** acoustic; Malay accented English; spectrographic analysis; voicing contrast; second language learning

## Introduction

Several influential speech studies (Best et al. 1988; Best & Strange 1992; Best 1994; Flege 1995; Strange et al. 1998) have been carried out using established speech learning models. These studies confirm that analysis of L1 and L2 at a phonemic level provides only a partial view of deeper relationships between languages in contact (Shahidi, 2006; Shahidi, 2008). Specifically, these studies have indicated that an account of L2 pronunciation errors cannot be achieved if the focus is solely placed at the phonemic level (similarity/dissimilarity in phonological systems across L1 and L2). More recent research suggests that analysis of L1 and L2 segment inventories at the phonemic level provides only a partial view of deeper relationships between languages in contact. Further, numerous interesting patterns of learner performance emerge if investigation centres on the phonetic realisational properties as produced by the learners.

The key point here is that the analytical focus of L2 research has moved to see cross-language *phonetic* differences as a causative factor in L2 learner difficulties. This kind of work has shown that detailed examinations of speech production in L2 and how listeners respond perceptually to the phonetic properties of L2 need to be examined thoroughly in order to build a complete picture of the L2 learner's difficulties and the phonetic properties of L2, as well as to extend our understanding of speech production and perception.

## Research Aims and Methodology

The specific research objectives are outlined below:

- i) To examine the acoustic features of Malay and English final stops /p, b, t, d, k, g/ as produced by Malay speakers.
- ii) To determine whether Malay speakers' perceptual performance in L2 is overlaid by their L1 or whether they could discriminate between L2 sound contrasts.
- iii) To determine the factors associated with Malay speakers' difficulties in producing and perceiving the phonemic contrasts of English as an L2.

## Experimental Method of the Production Test

### Material

A list of 12 target words (6 Malay and 6 English) was prepared (Table 1) containing the following Malay /p, b, t, d, k, g/ and English /p, b, t, d, k, g/ phonemes, in word-final position. The entire words were produced in isolation. Below is the word list:

Table 1: Word List for Production Test

Language Linguistic Variables	Malay	English
p	[kapʔ] /kap/	[t <sup>h</sup> æp] /tap/
b	[dabʔ] /dab/	[t <sup>h</sup> æb] /tab/
t	[tʃatʔ] /cat/	[sæt] /sat/

d	[hadʔ] /had/	[sæd] /sad/
k	[raʔ] /rak/	[ræk] /rack/
g	[dʒagʔ] /jag/	[ræg] /rag/

### Subjects

16 male and 7 female Malay subjects (L1 as Malay and their L2 as English) with normal hearing and speech development participated in this study. A short interview was conducted in order to gain information about each subject's background, as well as to introduce the study, the process of recording, the materials to be used in the recording session, and how they should be managed during recording time. The subjects were all able to speak and write in both Malay and English and pronounce the words used as linguistic materials<sup>1</sup>.

### Recording and Analysis Procedure

Two lists of 6 Malay and 6 English isolated words (consisting of target words and additional words) were read by the subjects. They were instructed to read the written material at a comfortable speech rate with minimum tone and stress differences. Additional words at the beginning and at the end of each list<sup>2</sup> were added in order to maintain their speech rate. The additional words, however, were excluded from analysis. Two recording sessions were made in the recording studio of the Faculty of Social Sciences and Humanities at Universiti Kebangsaan Malaysia (UKM), which was equipped with Sony condenser microphones and TASCAM 202 MK III tape recorders. The recordings in their entirety were carried out consecutively in Malay (first session) and English (second session). That is, in the English testing situation, instructions, materials, and the atmosphere in general were accentuated as being English, while in the Malay context the occasion was emphasized as being Malay.

All the recorded speech waveforms were digitised (at a sampling rate of 22 KHz and 32 bit resolution) and stored on a compact disk. The particular section of the recording which consisted only of the production of the token was carefully analysed using the PRAAT software system (a signal processing package). The programme (PRAAT) also included the function of expanding and amplifying the waveforms so that any measurement could be done to the nearest msec. These digitised tokens served as the basis for a waveform and wide band spectrogram. Parameters of the spectrograms were set up at their standard values; that is, a Frequency Range of 0-5000Hz, Window Length of 0.005 seconds, and dynamic range of 50 db.

### Acoustic Measurements

Each target sounds were measured at the word final position. The beginning and ending of a particular measurement of a sound was judged from both the waveform and spectrogram.

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<sup>1</sup> Throughout meetings and interviews, this study verified that the subjects' level of English proficiency is almost equal. They were born and live in KL or Selangor and had been well exposed to the use of English as an L2 language and obtained band 3 in their MUET test before becoming UKM students.

<sup>2</sup> Additional Malay and English words at the beginning of each list includes [wan, mat] and [pɪl, fan] respectively, whereas, at the end includes [ton, lat] and [sɪl, man] respectively.

Several measurements including stops closure duration and any voicing prior to the stops released were probed in order to investigate stops in word-final position. However, the final stops in Malay had no release, hence, it was difficult to identify the duration of the closure. Therefore, the acoustic properties of the final Malay V-Stop sequence<sup>3</sup> as a whole (*i.e.* the entire syllable rhyme) were taken into consideration.

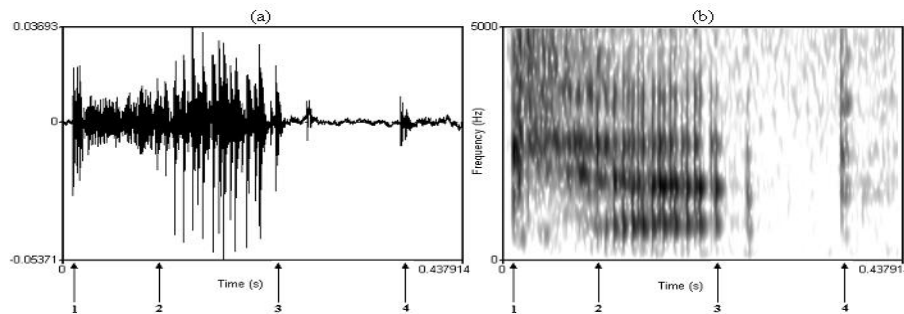


Figure 1: Waveform (a) and spectrogram (b) of the word [kæp] in English produced by a phonetically trained male RP speaker.

Based on Figure 1, the time interval indicated with arrows 3 to 4 represents the closure duration of a final stop. Arrow 3 points to the vowel offset (indicated by a sharp decrease in energy in the region of F1 and F2) which also represents the beginning of the closure duration. The beginning of the stop closure was determined by observing the point on the time scale at which the second and higher formant showed substantial decrease in amplitude. That is, although glottal vibration is still visible at the beginning of the consonant closure, the loss of energy in the higher formants suggests that the consonant constriction has been formed (the occlusion starting point). Hence it is marked as the beginning of the consonant closure in word-final position (Ladefoged, 2003). Arrow 4 indicates a noise burst signalling release of the stop closure.

However, if stops were unreleased in this particular position, then acoustic cues such as transient burst of noise and closure duration do not occur. The inaudible stop release phenomenon leads to an unclear boundary within the final V-Stop sequence. Therefore, in order to investigate properties that might differentiate such final voiced and voiceless stops, it was necessary to investigate acoustic properties of the entire syllable rhyme (the final V-Stop sequence as a whole), taking into consideration a range of measures including examination of the overall duration of the syllable rhyme duration and the patterns of phonation measured at the end of the syllable rhyme. Syllable rhyme durations were measured by positioning the cursors at the onset of energy in F1 (indicating the start of the [final] vowel) to the end of any voicing during the unreleased stop that the speaker might have been producing. In the absence of other clear means of distinguishing voiced and voiceless stops, it was also thought valuable to look at a set of other possible differentiating measures. This study, therefore, also involved measuring phonation patterns at the end of final V-stop sequences in order to identify any voice qualities differences (breathiness/creakiness). As vowel offsets preceding voiceless stops are often

<sup>3</sup> The final syllable with ‘\_VC#’ phonological structure which is termed here as syllable rhyme.

breathy as a result of the gradual abduction of the vocal folds, it was conceivable that a measure of breathiness could point to a subtle difference between final voiced and voiceless stops. Also, since creaky voice is often found in conjunction with glottal stops, it was also decided to investigate whether there is any evidence of creakiness as a differentiator of final voiced and voiceless stops. As aforementioned, vowels prior to voiceless stops are often produced with a breathy offset of voicing as the vocal folds begin to abduct for the following voiceless stop (in contrast to voiced stops). So, the issue for Malay is whether there is any evidence of this; if there is, then we could conclude that the vocal folds are abducted during the final stops of Malay; if there is not, then we do not have any evidence of vocal fold abduction.

Measurements of breathiness or creakiness were identified from the analysis of first, the difference between the amplitude of the first harmonic (that is, the height of the first harmonic in the Fast Fourier Transform spectrum representation indicated as H1 in Figure 2) and the amplitude of the second harmonic (that is, the height of the second harmonic in the Fast Fourier Transform spectrum representation indicated as H2 in Figure 2); and second, the difference between the amplitude of the first harmonic and other formants peak (that is, difference between the H1 and the strongest/highest harmonic in the first formant range [indicated as A1] and third formant range [indicated as A3], as shown in Figure 2):

(a) H1 – H2

This represents the difference between the amplitude of the first harmonic (H1) and the amplitude of the second harmonic (H2). It is an indicative measure of open quotient (that is, the percent of the cycle in which the glottis is open). The larger the value, the breathier it is (See Hanson et al. 2001, Blankenship 2002, Blankenship 1997, for fuller discussion). Smaller value of H1 – H2 indicates a creaky voice.

(b) H1 – A1

This is the difference between the amplitude of the first harmonic and the amplitude of the strongest harmonic in the first formant range (A1). H1-A1 is an indicative measure of acoustic losses at the glottis, where the larger the value, the greater the acoustic losses at the glottis, and thus the breathier it is (See Hanson et al. 2001, Wayland & Jongman 2003, for further explanation). The smaller the value, the lesser the acoustic losses at the glottis, and thus the more creaky it is.

(c) H1 – A3

This represents the difference between the amplitude of the first harmonic and the amplitude of the third formant range (A3), and is a measure of spectral tilt. A larger spectral tilt usually means a glottal configuration with a glottal “chink” that never closes during a cycle of vibration, and thus the breathier it is (See Gordon & Ladefoged 2001, for fuller discussion). Smaller value of H1-H3, on the other hand, usually indicates a creaky voice.

Further illustrations of the phonation measurements at the end of a syllable rhyme are shown in Figure 2 with the assistance of the spectrogram and spectrum slice of vowel [a].

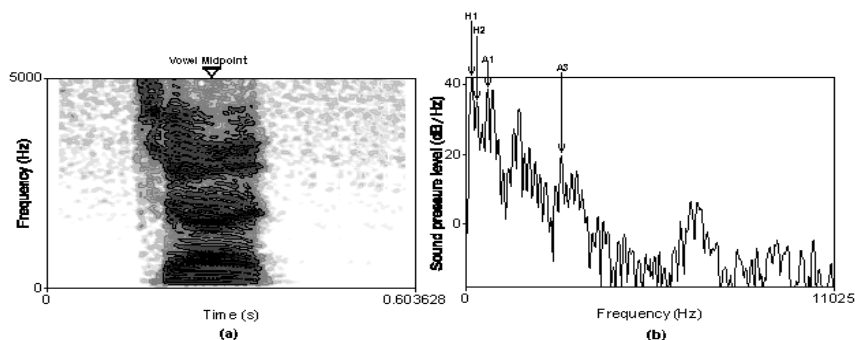


Figure 2: Spectrogram of a Malay word [tʃatʰ] (a) and spectrum slice (b) taken from midpoint of the vowel /a/.

Figure 2 is the spectrogram of a word [tʃatʰ] and the position of the relevant harmonics. The voiced portion of the target vowels was tagged at 10 msec intervals starting from the vowel mid-point<sup>4</sup> until vowel offset. The vowel offset point was identified by a change in the shape of the waveform and a sudden drop in the frequency of F1, along with the disappearance of higher formants. An FFT (Fast Fourier Transform) was calculated over a 20 msec window centred at each tag. H1 – H2, H1 – A1, H1 – A3 differences calculated from FFT spectra were used as the measures for assessing phonation patterns. This was done by positioning the cursor to the first harmonic (to obtain the H1 amplitude reading), the second harmonic (H2 amplitude reading), the strongest harmonic in the first formant range (A1 amplitude reading) and the third formant prominence (A3 amplitude reading).

Analysis of H1 – H2, H1 – A1 and H1 – A3 was carried out to determine whether the phonation pattern at the end of the final V-Stop sequence is related to either breathy or creaky voice. The specific objective here is to investigate whether these different voice qualities are used as correlates of the stop voicing contrast as realised by Malay speakers (clarifying how the speakers distinguished final voiced and voiceless stops). We might find here, for example, breathy offset of vowels before voiceless stops (in contrast to voiced stops). A breathy voice pattern refers to the activity of inefficient vocal folds vibration (that is, vibrations of vocal fold that are further apart and fairly abducted) whereas creaky voice pattern is the result of adducted vocal fold vibration (Gordon & Ladefoged 2001; Chasaide & Gobl 1997).

## Result of the Production Test

### Spectrographic Analysis of Final stops

When listening to Malay and English words with final V-Stop sequences as produced by the Malay subjects of the present study, it was found that the stops were systematically inaudibly released. Spectrographic analysis of these word-final stops confirmed that stops

<sup>4</sup> This study aware that the Malay and English words used for comparison have different initial consonants and thus could produce different transition into vowel effects. In order to avoid transitional effects, therefore, the measures are taken after the vowel mid-point.

showed no release bursts in the speech waveform, as is shown below in spectrograms taken from the present data.

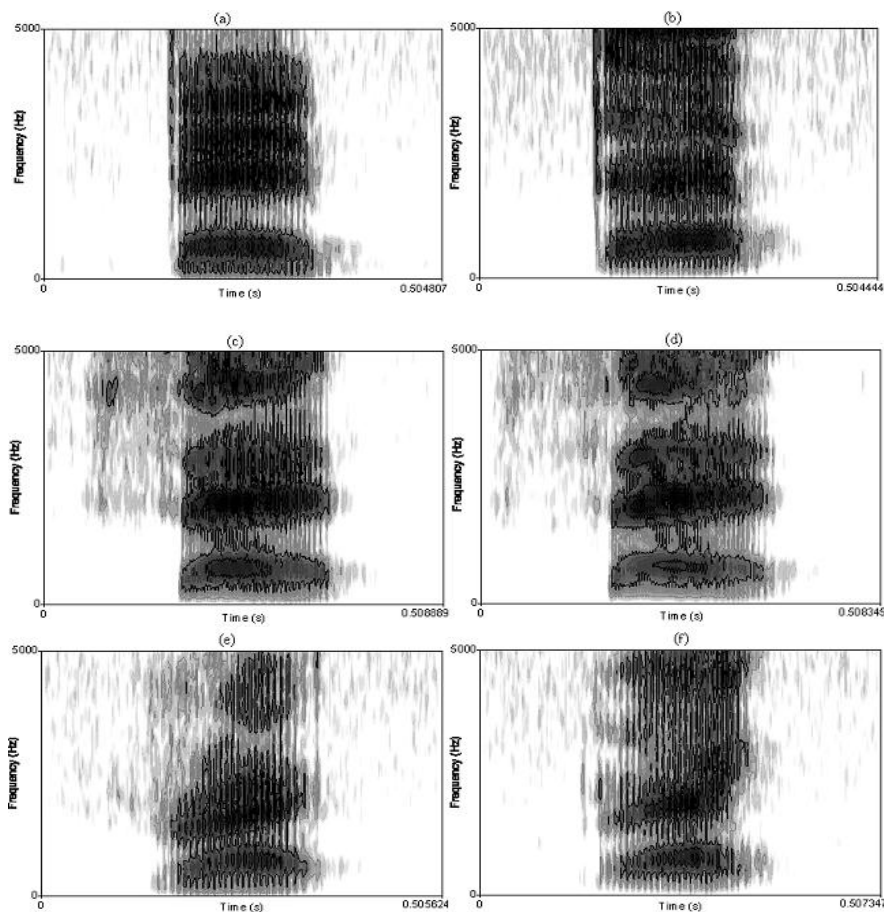


Figure 3: Spectrograms of English words (a) /tap/, (b) /tab/, (c) /sat/, (d) /sad/, (e) /rack/ and (f) /rag/ as produced by Malay speakers.

The spectrograms in Figure 3 demonstrate the absence of acoustic cues for the release of a final stop such as a transient burst of noise to mark any occurrence of [p], [b], [t], [d], [k] and [g] in final position of English words /tap/, /tab/, /sat/, /sad/, /rack/ and /rag/. A similar pattern is also found in spectrographic analysis of Malay words /kap/, /dab/, /tʃat/, /had/, /rak/ and /dʒag/. Generally, the spectrograms illustrate that Malay and English final stops as realised by Malay speakers are systematically inaudibly released. Laryngealisation patterns were present towards the end of some final syllables in the V-Stop target sequence. This particular pattern is commonly found in the final syllable of the Vowel-Voiceless Velar Stop sequence but not in other final Vowel-Stop sequence. In addition, the edges of the steady state frequencies (particularly F2) of the vowel of final Vowel-Labial Stop sequence were lowered towards the base line, while the second formant frequency of other final V-Stop target sequence (with the exception of voiceless velar stops) was raised towards higher formants.

Significantly, spectrographic analysis confirmed a clear contrast between voiced and voiceless velar stops of Malay and of English as produced by Malay speakers. Malay data shows the occurrence of glottal stops for final /k/ as expected, and exactly the same for English word final /k/ (for example in /rack/ [ræk] as produced by Malay speakers). This particular final syllable (the ‘final Vowel-Voiceless Velar Stop sequence) indicates a creaky voice pattern; a regular correlate of a glottal stop. On the other hand, the acoustic pattern at the end of the final syllable of the Vowel-Voiced Velar Stop sequence showed no clear glottal stop pattern (see Figure 3). Such dissimilar patterns might provide a basis for perceptual cues for the voicing contrast in the specific case of Malay and English velar stop pairs as produced by the Malay speakers.

The focus of investigation now shifts towards investigating the phonetic correlation of the voicing contrast of Malay and English final labial and alveolar stops as produced by Malay speakers. These final stops were produced with absence of release bursts, thus, making it impossible to identify acoustic intervals corresponding to the syllable-final vowel and consonant of target words. It was therefore impossible to measure vowel duration (vowel in final V-Stop target sequences) and stop closure duration independently or separately.

As pointed out earlier, since final stops are produced without a release burst, it is necessary to adopt measures which do not rely on identifying the stop closure in order to evaluate the differential properties of labial and alveolar stop pairs. These include the measurement of overall duration of the syllable rhyme (final V-Stop target sequences) and a range of phonation measurements. Results are presented below.

### Overall Duration of the Syllable Rhyme

The results show that the duration of syllable rhyme is systematically longer in Malay English<sup>5</sup> than in Malay, as shown in Figure 4. Statistical results, a 4-way ANOVA (by Language, Gender, Voicing and Place of Articulation) however, do not indicate statistically significant dissimilarity across the languages.

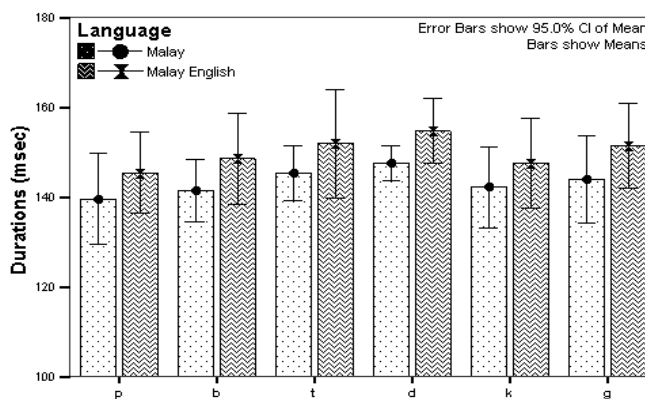


Figure 4: Durations of syllable rhyme in V-Stop target sequences

<sup>5</sup> The term Malay English here refers to the English as realised by Malay subjects of the present study.



It is therefore shown that with respect to syllable rhyme duration Malay speakers do not differentiate between Malay word-final voiced and voiceless stop pairs (with the exception of the velar contrast) and that these same patterns are transferred to Malay English. However, it should be noted that although no significant differences of Voicing or Language were found here, there appears to be a consistent difference in the graph – an obvious pattern just not a big enough difference. The average mean for voiced stops in both languages is always higher than for voiceless and mean difference of syllable rhyme duration is always bigger for Malay English. The data shows that there is to some extent an attempt made by few subjects of the study to produce length differences across stop pairs, or across the two languages.

### Phonation Measurements at the End of Syllable Rhyme (Word-Final Position of V-Stop Target Sequences)

Phonation measurements for Syllable Rhyme (including H1 – H2, H1 – A1 and H1 – A3) were carried out in order to ensure a full exploration of all possible ways in which speakers might differentiate voiced and voiceless stops in word-final position. Since the result of syllable rhyme duration suggested that the contrast is neutralised by the speakers in their performance of Malay and Malay English, this kind of data (measurements of aspects of phonation) therefore provides further information regarding the realisation of the voiced/voiceless contrast in word-final positions of Malay and Malay English. Results are shown below using Figure 5, 6 and 7:

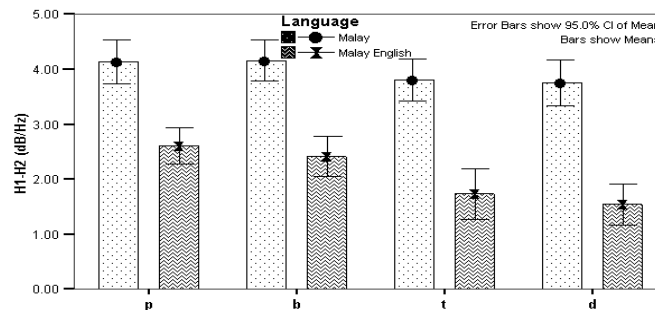


Figure 5: H1 - H2 values of word-final V-Stop target sequence (measured at the end of voicing of syllable rhyme)

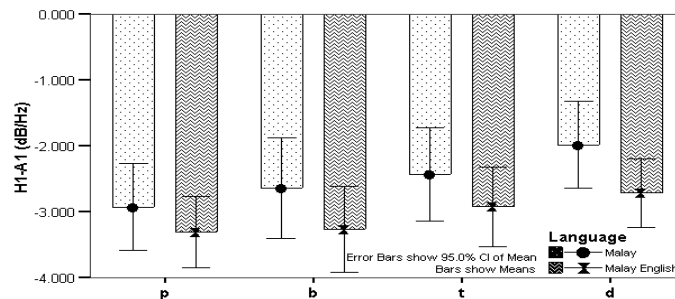


Figure 6: H1 – A1 values of word-final V-Stop target sequence (measured at the end of voicing of syllable rhyme)

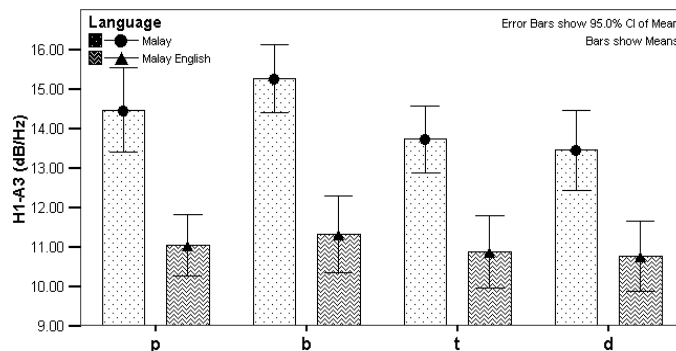


Figure 7: H1 – A3 values of word-final V-Stop target sequence (measured at the end of voicing of syllable rhyme)

The data confirm that there is no differentiation for any of the phonation measures across the stop voicing categories in Malay or Malay English. A Four-way ANOVA test was carried out for each of these measures testing for the effects of Voicing Contrast, Language, Gender and Place of Articulation. The test for H1 – H2 yielded no significant differences within either Malay English or Malay, with the exception of the factor of Language [ $p < 0.001$ ] and Place of Articulation [ $p < 0.001$ ], while the ANOVA test for H1 – A3 values also yielded similar results. A significant difference across the languages was found only for the Language factor [ $p < 0.001$ ] and Place of Articulation [ $p < 0.05$ ]. In addition, H1 – A1 showed no significant differences within either Malay English or Malay, with the exception of the Place of Articulation factor [ $p < 0.05$ ].

Similarity of phonation features across the languages substantiates earlier tests of the study, that is, the strong presence of Malay phonetic properties. Interestingly, however, the H1 – H2 and H1 – A3 values for Malay are significantly larger than Malay English, suggesting more ‘breathy productions’ at the end of the syllable rhyme in L1 in contrast to L2; this applies to both voiced and voiceless stops.

Production test results, therefore, triggers question on whether any prominent difference between L1 and L2 sounds will be discernable by the L2 learner (Malay). Perception test were therefore carried out in order to scrutinize this issue.

## Experimental Method of the Perception Test

### Material

A list of 18 words comprising 12 English words (6 X 2 groups of speakers; native English and Malay speakers) and 6 Malay words (uttered by the same Malay speaker) were prepared as a stimulus. The vast majority of the words used in the present study were real but they were supplemented by a small number of nonce words (highlighted with \* in Table 2) or words drawn from North Coastal Peninsula Malay dialects<sup>6</sup> (highlighted with \*\* in Table 2). Specific words from both nonce and North Coastal

<sup>6</sup> Based on researcher’s experiences especially in a conversational context with Malaysian colleagues, words that were drawn from North Coastal Peninsula Malay dialects are familiar to the Malay listeners.

Peninsula Malay dialects were used here in order to keep cross-language consistency in the structure of the test items. The target Malay and English sounds consisted of /p, b, t, d, k, g/ in final position and syllable structure for the words containing target consonants was CVC.

Table 2: List of words consisted of target final stops

Language Linguistic Variables	Malay	English
p	/kap/	/tæp/
b	/kab/ *	/tæb/
t	/hat/ **	/sæt/
d	/had/	/sæd/
k	/dʒak/	/tæk/
g	/dʒag/	/tæg/

### Subjects

20 native Malay speakers participated as listeners in the experiment (10 male and 10 female). All of them had normal hearing and normal speech development, aged between 20 and 23, and could speak and understand English fairly well<sup>7</sup>.

Each subject was approached a few days prior to the testing sessions in order to gain information regarding the background of the subjects. The experimenter also gave a general introduction to the research, the test procedure and the materials to be used in the testing session and how they would be asked to respond to these materials.

### Stimuli

A phonetically trained male RP speaker read the list of 6 English words in randomised order (stored and labelled as Tape 1). A native Malay speaker then read the same list of 6 English words (stored and labelled as Tape 2) and a list of 6 Malay words (stored and labelled as Tape 3) in a randomised order. The speech items were recorded on a TASCAM professional-quality DAT tape recorder for maximum clarity in the studio attached to the Speech and language Sciences Section at the University of Newcastle upon Tyne, United Kingdom.

The data gathered thus consisted of 12 English words (Tapes 1 and 2) produced by two speakers from different language backgrounds. These words were next blended together in a single recording (in a randomised order) which was labelled as Tape 4. The perception stimuli then comprised 12 English words (Tape 4) and 6 Malay words (Tape 3). The DAT tapes were then fed into a computer in order to have a 5-copied digitised

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<sup>7</sup> Throughout earlier meetings and interviews, this study verified that the subjects' level of English proficiency is almost equal. They were born and live in KL or Selangor, had been well exposed to the use of English as an L2 language and had their MUET test with band 3 before becoming UKM students. Yap et.al (2010) studies on Malays identification of English vowels show that the learners' level of English proficiency had little influence on their perceptual performance.

repetition of each target word with one second intervals between the five repeated words and with an inter-trial interval of three seconds, using Creative Audigy Software at a 22 KHz sampling rate; these words were then burned onto a digital audio CD. The CD data was then re-recorded onto DAT tape for use in the perception test.

### Perception Test Procedure

On the day of the test, subjects were asked to discriminate between two words where voicing category in a final consonant differed. Two-alternative forced-choice identification test took place in the studio of the Fakulti Sosial Sains dan Kemanusiaan (FSSK), UKM, Bangi Selangor. Each participant was tested individually in a studio room. Throughout the trial, the stimulus was presented through headphones and, using the provided answer sheet, subjects then circled one of the two choices representing the word that they perceived through the headphones.

Two separate testing sessions were run in the FSSK studio; communications in the first session were in Malay throughout and in English in the second. Instruction, materials and the atmosphere in general were thus specifically identified first as ‘Malay’, and secondly as ‘English’.

### Result of the Perceptual Test

#### Perceptual Analysis of Voiced and Voiceless Stops in Malay Word-Final Position

As discussed above, word-final position stops in Malay and Malay English are systematically produced in an unreleased manner and there was no significant difference in voicing contrast in duration of the syllable rhyme in Malay/Malay English productions. Hence, the suggestion is that listeners probably cannot tell apart final voiced from voiceless stops as there appear to be no cues which differentiate the two. Somewhat surprisingly in light of the above matter, perception of final Malay voiceless stops and voiced velar stops (/p, t, k, g/) in Malay words is relatively high. In contrast, final voiced stops /b/ and /d/ are poorly identified. Findings suggest that neutralised production of voiced stops in final position results in perception by listeners as /p/ and /t/. Figure 8 illustrates this finding:

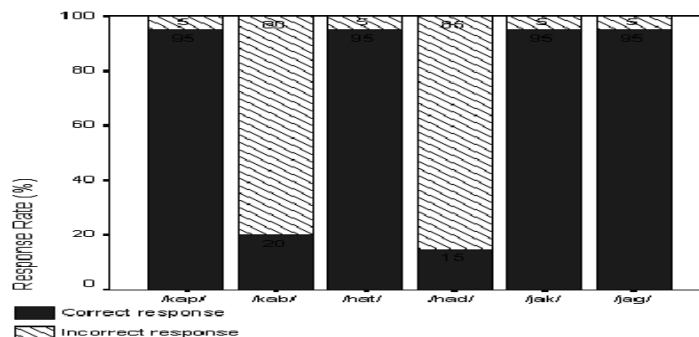


Figure 8: Pooled responses across listener-group subjects’ perception of Malay stops in word-final position as produced by a Malay English speaker.

Interestingly, however, the listeners could successfully identify all Malay words with velar stops in word-final position when spoken by the Malay speakers. Spectrographic analysis of stimulus produced by the Malay speaker indicates a creaky voice pattern at the end of the final voiceless velar stops. A similar pattern, however, was not evidenced in other word-final stop stimuli. The creaky pattern which systematically occurs in Malay production of final voiceless velar stops (in contrast to final voiced velar stops) may be a major contributory factor in correct responses; a greater degree of perceptual distinction between the final velar stop pairs than between stop pairs produced at other places of articulation.

### Perceptual Analysis of Voiced and Voiceless Stops in English Word-Final Position Produced by Malay Speakers

The second perception test yielded variable response percentages in word-final /p/, /b/, /t/, /d/, /k/, /g/, /s/, and /z/ in Malay English.

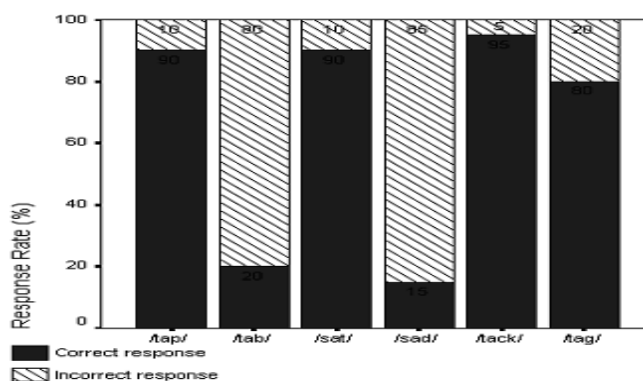


Figure 9: Pooled responses across listener-group subjects (English stops in word-final position produced by Malay speaker).

This study shows that final voiceless stops were perceived with high levels of accuracy. However, listener performance in perceiving final voiced stops (with the exception of velar stops) in Malay English is very poor, much as in perceiving final voiced stops in Malay itself.

As mentioned earlier, English final stop pairs produced by Malay speakers were produced without an audible release (‘unreleased manner’) and labial and alveolar stop cognates were ‘neutralised’ in word-final position. It is, therefore, suggested that this phonetic feature may lead the listener group to identify most voiced stops in final position as voiceless. Moreover, the voiceless response seems to be predominant overall in this particular two-alternative forced-choice identification task. It is because word-final voiced stops are less frequent in the lexicon and of use than a final voiceless stop in Malay phonological system, as discussed.

### Perceptual Analysis of Voiced and Voiceless Stops in English Word-Final Position Produced by Native English Speaker

The third perception test also showed that subjects could reliably identify English words with final /p/, /t/, /k/ and /g/ when produced by a native English speaker. However, the listeners are not being able to consistently distinguish word-final voiced and voiceless stops, as shown in Figure 10.

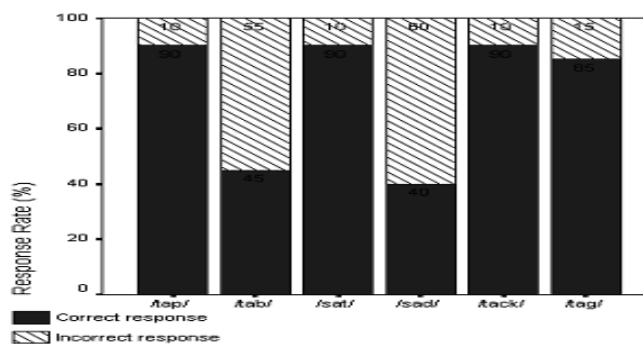


Figure 10: Pooled responses across listener-group subjects (stops in word-final position produced by native English speaker).

Test results confirm that 50% of voiced stops (/b/ and /d/) in word-final position are identified or misperceived as voiceless stops (/p/ and /t/) respectively. In other words, although the release burst is present in native English speaker speech, some Malay learners do not perceive it, and therefore transfer their L1 patterns into L2. Data shows that the listeners are not sensitive to these phonetic cues, as evidenced by the considerable inaccuracy in perceiving English final voiced stops. The result may also suggest that the listener (most of them) do not learn to acquire the abilities (perceptual abilities) to accurately perceive the final stops (with the exception of the velar stops). The findings, to some extent, consistent with Yap et.al (2011) studies on Malays identification of English stops voicing contrast. Nevertheless, the results also reveal that stimuli items produced by native English speakers may be more comprehensible compared to those produced by Malay speakers.

Final velar stops represent a different case, however. Even though there is a realisational difference between L1 and L2 in respect of the final velar stop pair, Malay listeners nevertheless do seem to be capable of interpreting the realisation of the English pair in a way which allows them to correctly identify /k/ vs. /g/; and maybe the fact that this is the pair that they can successfully distinguish in Malay and in Malay accented English facilitates this. It is suggested that this is because Malay voiceless velar /k/ in final position is always realised as a glottal stop /ʔ/. Phonetic properties of final voiced velar stops in native English speech were not linked with /k/ by the Malay learners (specific phonetic cues related to the glottal stop patterns are not present). In this case, the alternative answer in the two-alternative forced-choice test will be /g/. So, as expected, the percentage of accuracy for /g/ was higher.

It should be stressed here that accurate ‘perception’ may not always lead to accurate ‘production’. The production and perception processes need to be considered separately. Here, I found that the learners of English perceptual ability (successful in perceiving final /p, t, k/ produced by native English speaker) however, does not assist them to produce the sound similarly to the one produced by native English speakers.

### **Discussion and Conclusion**

The data shows that final stop voicing contrasts in Malay and English were neutralised by Malay speakers (with the exception of the velar contrast). Spectrographic analysis verified that final stops in Malay and English words were produced by Malay speakers as inaudibly released. This unreleased final stop pattern corresponded to the absence of release bursts in the spectrogram. Importantly, the measurement at the end of voicing for syllable rhyme also indicates larger H1 - H2 and larger H1 - A3 measures for Malay, all of which points to breathier phonation.

Moreover, the Malay listener-group does encounter problems in perceiving final /b, d/ which are produced either by Malay or English speakers. It is suggested that in the case of English final voiced stops as produced by Malay speakers the contrasts are ‘neutralised’ due to the influence of L1. This neutralised pattern is confirmed by spectrographic analysis of Malay English stimuli recorded for the perception test which has been discussed here. In the case of native English speech, my assumption is that the Malay listener may not be sensitive to the existing phonetic cues (such as the strength of the release burst values and the durational differences of vowel or closure phase) in such a context (final position) for they have never learnt to tune in to these systematically. The results suggest that their patterns of response are largely governed by the perceptual knowledge drawn from their knowledge of L1 phonetic realisations<sup>8</sup>. However, it should be noted that their performance are better when the stimuli presented were those produced by native English speaker compared to those produced by Malay speakers.

The results of this study show that similar phonemes in L1 and L2 are realised identically to L1 sounds<sup>9</sup>. Specifically, this finding suggests that there is significant interference from the speaker’s native language on phonetic properties produced in English, a process which is very likely facilitated by the congruence of phonemic systems (particularly, the consonants) across the two languages. It is therefore concluded that L2 sound production for the present speakers is derived entirely from L1 (that is, the speakers are simply equating the L2 phonology with their L1 and generating the corresponding L1 phonetic realisations).

Importantly, one practical point to emerge from the production and perception tests carried out in this study is the need to provide specific instruction and practice for Malay learners by directing attention to those sounds found to be problematic. In this way, the

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<sup>8</sup> There has been a substantial research regarding the influence of Bahasa Malaysia over the learning of English (see, Normazidah et al. 2012).

<sup>9</sup> This finding corresponds to the previous study of Malay learner’s production of English initial stops. See, Shahidi & Rahim 2011.

'obstruction' can perhaps be 'overcome'. The type of input that the L2 learners received may seem as a major impact on the phonetic pattern found in this study. The absence of a strong L2 model highlights the importance of a suggested instructional focus on intelligible production in English as a second language as taught in Malaysia.

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