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Acoustic Characteristics of Three Vowels of Standard Sri Lankan English

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Abstract: ***The phonology of Standard Sri Lankan English (SSLE) reflects a strong influence from the vernaculars of Sri Lanka: Sinhala and Tamil. This results in deviations from the donor colonial Standard British English pronunciation. This study provides measurements of formant frequencies in synchronically recorded sound data for six selected vowels, short and long monophthongs /ɔ/, /ɔ:/; /o/, /o:/ and /ɑ/, /ɑ:/ of SSLE.Evidence is compiled through formant readings of acoustic documentation from elicitations of ten female bilingual subjects.Of the ten bilingual subjects five have Sinhala and the rest Tamil as their first language while SSLE is their second language. Formant contoursare compared to parallel data in literature. Discriminant analysis showed that these SSLE vowels differ in terms of average frequencies of formants from Standard Southern British Englishand American English equivalents.***

Keywords: Sri Lankan English, pronunciation, acoustics, vowel formants

1. Introduction

According to the Optimality theory (Heinz et al., 2009[1]) universal grammar consists of a set of constraints, and language- specific grammars consist of different rankings of these constraints. Applying this to the contact setting of English in Sri Lanka it could be stated that codified endonorms of Standard Sri Lankan English (SSLE)pronunciation arise from the interaction between conflicting constraints between Standard British English (SBE) and the phonological grammars of the vernaculars Sinhala and Tamil. The three characteristics discussed below clearly signify unfaithfulness to the donor SBE pronunciation and Gunesekera (2005)[2] codifies them as characteristics of SSLEpronunciation.

1. The absence of /ɒ/;presence and the differentiation of the back vowels /ɔ/ and /o/.
2. The retreat of the SBEcentral mid /ʌ/and back /ɑ:/to central open position as /ɑ/ /ɑ:/.
3. The retreat of the diphthong /əʊ/ to /o:/

This paper utilizes formant (A formant is a concentration of acoustic energy around a particular frequency in the speech wave.
http://ecconcord.ied.edu.hk/phonetics_and_phonology/wordpress/learning_website/chapter_1_introduction_new.htm)
contrast of vowels in acoustic documentation to provide evidence for the emergence of these characteristics. Hayes (2013)[3],]and Styler (2012)[4]set down the following as general rules of vowel formants:

i. Vowel height is inversely correlated to F1 thus higher the F1 value, the lower (more open) the vowel. Moreover F1 is controlled by the jaw.
ii. F2 denotes the frontness of the vowel. Back vowels have low F2 frequencies while front vowels have high F2 frequencies. F2 is controlled by the front-back movements of the tongue body.
iii. F3 indicates the exolabial quality of a vowel.Catford (1988: 150)[5] states that exolabial rounding involves

vertical compression of the corners of the mouth, 'leaving a small central channel between the lips, of a slit-like flat elliptical shape rather than actually round. According to Ladefoged (2006: 188)[6] 'lip rounding is generally characterized by the lowering of the second and third formants. Lindblom and Sundberg (1971)[7] state that F3 is also controlled by the tongue blade elevation which opens a cavity under the tongue blade and returns a low F3.

Identifying the importance of Documentary Linguistics Himmelmann (2006: 15)[8] states that its main focus concerns the collection and analysis of an array of primary language data (Also see Widyalankara (2014)[10] for an acoustic analysisof characteristics which give rise to dialectal variation in Sri Lankan Englishpronunciation). In the context of this paper data collection and analysis consist of systematic recording, annotation and acoustic scrutiny of the spoken language samples collected from participants. According to Tench (1996)[9] the researchers must first, study a contrastive overlay of the two pronunciation systems, to determine asymmetry. Then they should record several subjects reading a list of words that contain the potential problems arising through this asymmetry. This study fulfills both requirements.

2. Methodology

2.1 Participants

The research consists of acoustic documentation of English word elicitations from 10 participants and the selection procedure was purposive sampling. A linguistic profile was constructed for 30 participants: 15 with Sinhala as first language (L1), 15 with Tamil as L1. Thus they diversified in their first languages Sinhala and Tamil. A questionnaire obtained self-evaluated rating of proficiency in the second language(L2) of the 30 participants through a Likert scale. Age of exposure was obtained for maintaining uniformity of span. As gender influences formant settings (Deterding, 2000[11];Kent, 1997[12]) all participants were female and Standard Southern British English (SSBE)vowel formants of females in Deterding(1990: 49)[13] were used for comparative purposes. Vowel formants for American English(AE) were obtained from Hillenbrand et al (1995: 3103)[14]where AE average formants for female participants are recorded. This

was especially required for the formantsof /o/ which is an absent phoneme in SSBE (Deterding, 1990)[15]. All participants were within the age group 21-23and were healthy adults who had no known speech pathologies.Cheshire et al (2005)[16]state phonological variables show up with high frequencies in sociolinguistic interviews, and can be easily elicited through word lists.Thus an interview-pronunciation elicitation process utilizing a 25 word instrument judged the participants as users of or as deviators from SSLEpronunciation. This instrument contained lexicon compiled from literature thus they were recorded examples which illustrated pronunciation deviations from SSLE.Thefourdata collectors of this study represented the ethnic diversity of the participants. Two Sinhalese and two Tamildata collectors interviewed participants of their own ethnicity. They were graduates who had read English as a subject for their first degree with post graduate qualifications in Linguistics, werefamiliar with IPA and sensitive to pronunciation deviations from SSLE. Each participant was interviewed by a panel of two data collectors.On arrival at the examining locale each participant read the 25 word list provided to them. The two data collectors recorded whether the target deviation from SSLE was evidenced in the pronunciation of each word. The perceptive accuracy was dependent on both data collectors perceiving no evidence for the target deviation from SSLE pronunciation in a participant. If any participant evidenced a deviation in the 25 word instrument they were identified as users of a variety of SLE other than SSLE. The linguistic profiles of the short listedparticipantsare as follows.

Table 1: The linguistic profiles of participants for acoustic elicitations

#	Languages		Age of exposure to L2	Self assessed fluency rating in L2/5
	L1	L2		
1	Sinhala	SSLE	from birth	5
2	Sinhala	SSLE	from birth	5
3	Sinhala	SSLE	7 years	5
4	Sinhala	SSLE	5 years	5
5	Sinhala	SSLE	7 years	4.5
6	Tamil	SSLE	from birth	5
7	Tamil	SSLE	from birth	5
8	Tamil	SSLE	7 years	5
9	Tamil	SSLE	7 years	5
10	Tamil	SSLE	7 years	4.5

Fluency ratings in Table 2above reflect the calculated average of self-estimated ratings of proficiency in speaking, listening, reading and writing along a Likert scale of 1-5 (1-basic proficiency; 5-maximal/advanced proficiency). Age of exposure denotes the age at which the participant first began to learn their L2: English. Of the 30 participants 11 Sinhala and 12 Tamil participants were judged by the data collectors as users of SSLE pronunciation. Then through random sampling procedures 10 participants each with L1 Sinhala/Tamil were shortlisted. They were subjected to a second informal interview, were further evaluated and identified as strict users of SSLE pronunciation.

2.2 Instrument for lexical elicitations

The six words in Table 2compiled the instrument for acoustic documentation to evaluate formant movements in each target vowel.

Table 2: Target lexica for pronunciation elicitation

	Word	SSLE pronunciation	Target vowel
1	*Pot*	/pɔt̪/	/ɔ/
2	*Call*	/kɔ:l/	/ɔ:/
3	*Only*	/onli/	/o/
4	*Boat*	/bo:t̪/	/o:/
5	*Ganeshan*	/gane:ʃn/	/a/
6	*Arm*	/a:m/	/a:/

2.3 Procedure

Ethical consideration was paramount particularly in conducting, and evaluating this research. The study conferred maximum consideration to participants pertaining to ethnic diversity. Care was taken to ensure that the participants fully understood the nature of the study and the fact that participation is voluntary. A statement was made to the participants that confidentiality of recorded data will be maintained at all times. Each participant read the 6 words in the instrument presented on a PowerPoint screen. Individual audio-recording sessions oflexical elicitations were conducted in a sound proof environment utilizing *Praat.* Each acoustic file is annotated using *Charis Sil*, a font which is compatible with the software *Pratt.*

The annotated spectrogram and waveform files provide statistics on frequency, phonemic boundaries and acoustic measurements from narrow-band spectra consisting of formant frequencies F1-F3.The frequency ranges were adjusted to suit the clarity of a target phoneme in the spectra.The lexical item on the right hand side of the acoustic file, adjacent to the annotating tier, records the word the speaker sees on the screen. Lone word elicitation phonology was analyzed through annotated waveform and spectrogram documentation. The transcribed data are recorded for acoustic speech signals and annotations are aligned against them. The formants on the spectrographs made sound visible and measurable, thus enabling more accuracy in the findings.Formant values for the target phoneme were obtained for each elicitation across the ten participants.

The signals were also presented to a panel of 4 listeners for phoneme identification. An average value for the formants was calculated and a contrast was conducted with SSBE and AE formant values for the target phoneme.Spectral change information too is included. This carries external validity as the acoustic documentation analyses articulatory interpretations of formant data and general observations can be made and extended to larger, relevant speech populations within Sri Lanka. In the following discussion the acoustic files for the six target words from participant #1 S/SSLE and #2 T/SSLE bilinguals are recorded. But in the calculation of average formant values readings from all ten participants were considered.

3. Results and analysis

3.1 The back vowels /ɔ/, /ɔ:/ and /o/, /o:/ of SSLE

Gunesekera (2005: 117)[17] classifies /o/, /o:/ and /ɔ/, /ɔ:/as back vowels in the codified vowel inventory of SSLE. The contrast is in the open/close positions and roundness of the vowels. Thus /o/ which is a half close vowel in SSLE (ibid) will have a lower F1 formant than the mid vowel/ɔ/. In contrast while the vowels /o/ and /o:/ are absent in SSBE but the presence of /ɒ/ the nearly open, back, weakly rounded vocoid is evidenced as indicated in Table 3below.

Table 3: Contrasting the inventories of selected back vowels in SSBE, SSLE, Sinhala and Tamil

SSBE Deterding (1990: 49)	SSLE Gunesekera (2005: 117)	Sinhala Wasala, Gamage (2005: 474)	Tamil Gair et al (2005: xix)
	o	o	o
	o:	o:	o:
ɒ	ɔ		
ɔ:	ɔ:		

Also note that /o/ and /o:/ are unmarked vowels in Sinhala and Tamil. During the colonial contact with British English the diphthong /əʊ/ underwent glide omission and emerged as the unmarked long and short monophthongs /o/ and /o:/ in SSLE. /ɒ/an alien phoneme in the two vernaculars retreated to the less open /ɔ/in SSLE**.**

The following figure compares the placement of the first three formants for the vowels /ɔ/and/o:/ and will be strictly used for the purpose of discussion and will not be used in the discriminant formant analysis between the vowels.

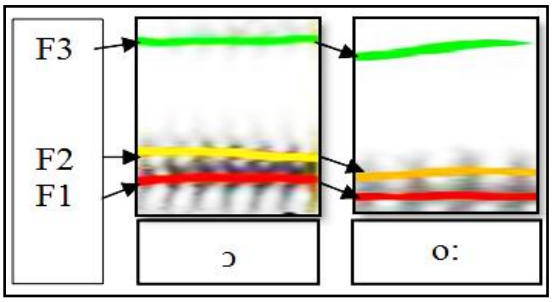

Figure 1: Contrasting the formants for the vowels /ɔ/ and /o:/ (Mannell, 2008[18])

As both /o/ and /ɔ/are back vowels they will normally have equal frontness thus equal F2s. But Ladefoged (2006: 188[19]) states 'lip rounding is generally characterized by the lowering of the second and third formants'. Thus /o/ which is the higher back vowel is more intense in the rounding and lowers both its F2 and F3 as seen in the above spectral slices. Recall that Gunesekera (2005: 117)[20] does not record the between half open and open vowel/ɒ/in SSLE. Confirmation is obtained through the acoustic documentations below which evidence the emergence of /ɔ/in the token *pot* as /pɔt/ in SSLE. This study will discuss formant values of/ɔ/in contrast with similar values for /ɒ/in SSBE and AE.

3.1.1 Documentation of the pronunciation of the word *pot* SSLE: /pɔt/

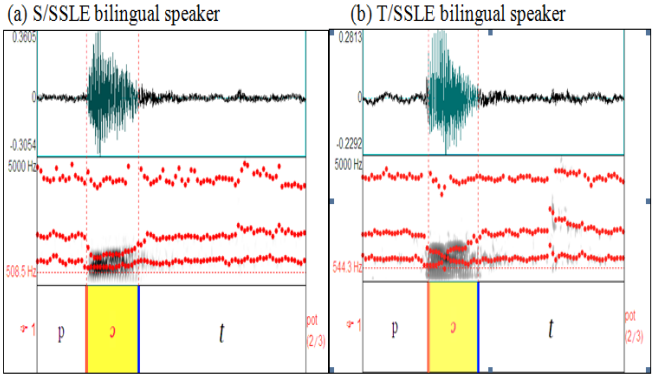

Figure 2: Annotated spectrogram and waveform files for *pot*: /pɔt/

Formant settings for the vowel /ɔ/ SSLE: /pɔt/

	F1	F2	F3
S/SSLE	508	1234	3684 Hz
T/SSLE	544	1222	3732

Note the close parity in the emergence of /ɔ/ in the two bilingual participants.

Average /ɔ/for the 10 SSLE participants.
Average /ɔ/SSLE: 520 1152 3708 Hz

A comparison is drawn with the SSBE/ɒ/ below:
/ɒ/SSBE: 751 1215 2790 Hz

A comparative analysis identifies the followingdifferences between/ɔ/of SSLE and/ɒ/ of SSBE. The higher F1 suggests that theSSBE /ɒ/is more open while the F2 states that in backness both vowels are equal. The slight lowering in the F2 value of SSLE/ɔ/suggests more lip rounding as does its higher F3 value. Recall that /ɔ/ is an absent vowel in Sinhala and Tamil where in both languages the most open back vowel is /o/. Also recall that according to Lindblom and Sundberg (1971)[21] F1 is controlled by the jaw. One observed feature in the Sinhala and Tamil speakers is the averseness to downward jaw movement. Thus it can be suggested that influenced by the vernaculars the SSBE /ɒ/ emerges with less jaw lowering as/ɔ/in the user of SSLE.

3.1.2 Documentation of the pronunciation of the word *call* SSLE: /kɔ:l/

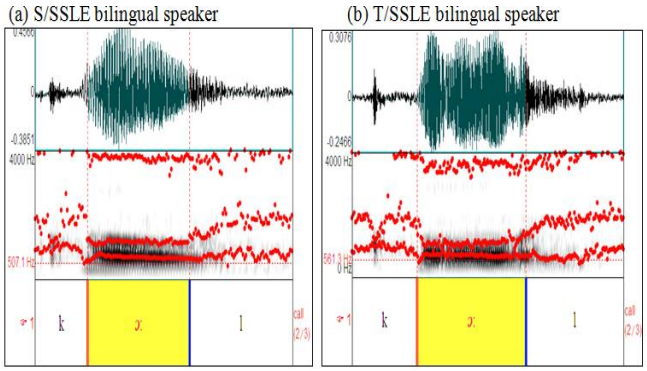

Figure 3: Annotated spectrogram and waveform files for *call*: /kɔ:l/

Formant settings for the vowel /ɔ:/SSLE: /kɔ:l/

	F1	F2	F3
S/SSLE	507	935	3215 Hz
T/SSLE	561	988	3334

Note the close parity in the emergence of /ɔ/in the two bilingual participants.

Average /ɔ:/for the 10 SSLEparticipants.
Average /ɔ:/SSLE552 951 3312 Hz

A comparison is drawn with the SSBE below which denotes that the SSLE /ɔ:/differs from itsSSBEequivalent:
SSBE /ɔ:/389 888 2796

The difference in the formant comparison illustrates that the SSLE /ɔ:/is more open, moves slightly to the front and is higher in lip roundedness.

3.1.3 Documentation of the pronunciation of the word*only*SSLE: /onlɪ/

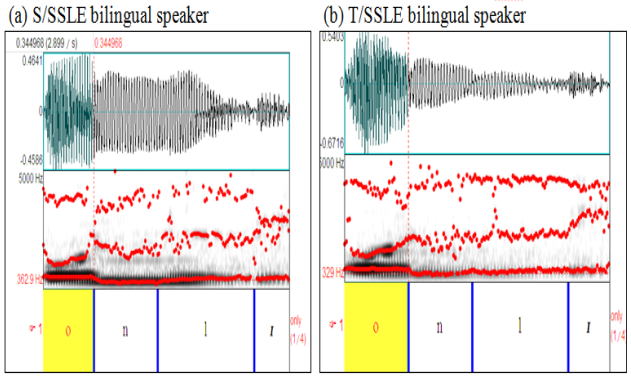

Figure 4: Annotated spectrogram and waveform files for only: /onlɪ/

Formant settings in Hz for /o/ SSLE:/onlɪ/

	F1	F2	F3
S/SSLE	362	1034	3610 Hz
T/SSLE	329	1020	3416 Hz

Average /o/ for the 10 SSLE participants.
Average /o/ SSLE 350 1052 3528 Hz

A comparison is drawn with the AE equivalent below:
/o/ AE: 555 1035 2828

When compared to average /ɔ/of SSLE(F1: 520; F2: 1152;F3: 3708 Hz)the lower F1 and the lowering of F2 and F3 are noticed in its formant values for /o/. Thus what is acoustically validated is Gunesekera's (2005: 121) observation that 'in SSLE /o/ and /ɔ/are distinct phonemes' and /o/ is a half close vowel while /ɔ/is less open. A comparison is also drawn with the AE equivalent as /o/ which is a marked vowel not present in SSBE and thus formant values are not provided in literature. When compared with AE formants the /o/ of SSLE is less open, slightly more fronted and more rounded.

3.1.4 The retreat of the diphthong/əʊ/ in SBEto the long vowel /o:/ in SSLE

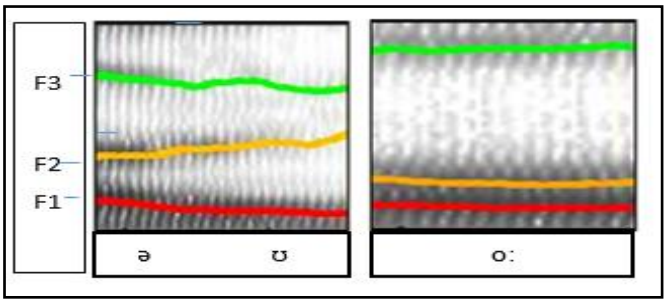

Figure 5: Comparing formant movements /əʊ/vs /o:/ (Mannell, 2008)

Theory on spectral analysis (Deterding, 2000[22]; Ladefoged, 2006[23]; Styler, 2012[24]) state that front vowels have their F2 closer to F3 than to F1. Note that in the mid vowel /ə/ the F2 is straddled at roughly equal distance from F3 and F1 while in the back vowel /o:/ the F2 is closer to F1 than to F3. Also note the F1 lowering and the rise of the F2 when /ə/in the diphthong /əʊ/ moves to the glide/ʊ/. In the following documentations scrutiny is on the pronunciation of the orthographic combination *oa*in the token *boat* which emerges in SSBE as /əʊ/. /əʊ/ can be classified as a closing diphthong and according to Deterding (2000: 97)[25] its average Rate of Change (ROC) = -1387 Hz/sec in a user of SSBE. To achieve this measurement, the difference in F1 at the beginning and end of the vowel is obtained and the value is divided by the time duration.

3.1.4.1 Documentation of the pronunciation of the word*boat* SSLE:/ bo:t/

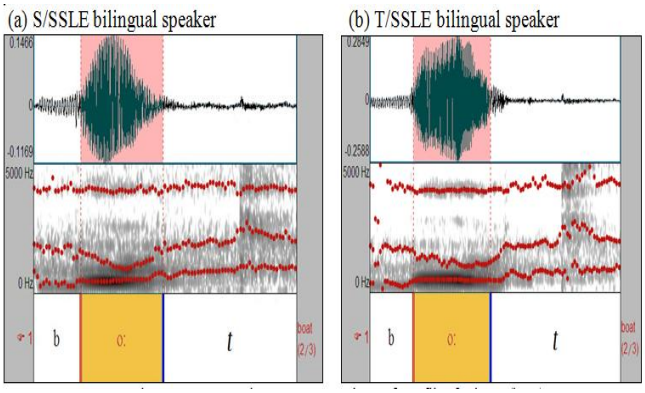

Figure 6: Annotated spectrogram and waveform files for boat: / bo:t/

Discussing F2 frequencies Ladefoged (2006) [26] states that they are higher for front vowels and lower for back vowels. /o:/ is a half close back vowel in SSLE (Gunesekera, 2005: 117) [27]. Note the low F1 and the low F2 which defines /o:/. Notice that there is a dip in F2 in the abovefiles unlike in the formants for /o/ in Figure 5. According toHayward (2000)[28] plosives modify the placement of formants in the surrounding vowels. Note that in the above files /o:/ is couched between 2 plosives which dips the second formant. The most important measurement in this instant is the average ROC for the monophthong /o:/ which is given in Table 4 below.

Table 4: The average Rate of Change in Hz/sec for the monophthong /o:/ by two SSLE participants

Bilingual speaker	*Boat*	Start F1 (Hz)	End F1 (Hz)	Change (Hz)	Duration (sec)	ROC (Hz/sec)
S/SSLE	/o:/	339	396	57	0.131	+435
T/SSLE		459	498	39	0.114	+342

Comparing the ROCs for /o:/ of the SSLEparticipantsabove with /əʊ/ of SSBE it is noted that Deterding (2000: 97)[29] records an average ROC = -1387 Hz/sec for the latter. The positive ROC in the SSLE users denotes that the diphtongization is lacking. Notice the parity in the positive emergence of the long vowel in S/SSLE and T/SSLE subjects. Thus this study presents acoustic evidence for 'the use of the long vowel /o:/ instead of the SBE diphthong/əʊ/' (Gunesekera, 2005: 121)[30] in speakers of SSLE.

Formant settings for the vowel /o:/SSLE: /boːt/

	F1	F2	F3
S/SSLE	339	932	3979
T/SSLE	459	988	3855

Average /o:/for the 10 participants:
Average /o:/ SSLE: 396 955 3850

3.1.5 Discriminant analysis of back mid vowelsof SSLE

Following is a comparison of the formants in Hz for the purpose of analyzing the qualities which differentiate SSLE vowels from SSBE and AE equivalents.

Table 5: Discriminantformant analysis of back vowels of SSLE, SSBE and AE

Back vowel	F1	F2	F2
SSLE /ɔ/	526	1178	3708
SSLE /ɔː/	552	951	3312
SSLE /o/	350	1152	3528
SSLE /oː/	396	955	3850
SSBE /ɒ/	751	1215	2790
SSBE /ɔː/	389	888	2796
AE /ɔ/	781	1130	2824
AE /o/	555	1035	2828

Analyzing the F3 values (lower the F3 higher the exolabialness) note the high F3s in the SSLE back vowels. Recall that according to Catford (1988: 150)[31]exolabial rounding involves vertical compression of the corners of the mouth, 'leaving a small central channel between the lips, of a slit-like flat elliptical shape rather than actually round'. Thus the SSLE back vowels reflect the highest F3s and thus the lowest exolabialness. Also note that the/ɒ/ of AE has the lowest F3 value and thus the highest exolabialness.

Hayward (2000)[32]and Ladefoged(2006)[33]recommend the use of a plot of F1 against F2 to define the quality of the vowels. They state that this kind of plot of F1 against F2 has been used by analysts to show the quality of the vowels in a wide range of languages.The vertical axis in the above figure represents F1, and the horizontal axis represents F2 in Hz.

Following is a graphical representation of the contrastive formant values for F1 and F2 of the back vowels.

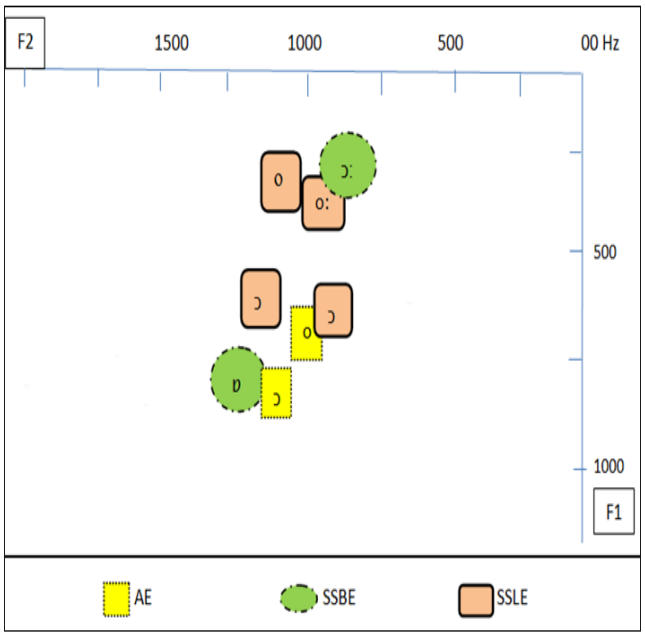

Figure 7: Formant chart comparing the quality of SSLE /o/ and /ɔ/ with SSBE /ɔ, ɒ/ and AE /o. ɔ. ɒ/.

Note that in the SSLE users the F1s of all four back vowels have low frequencies. Thus they are low in openness.The only exception is the /ɔː/of SSBE. Most importantly the 526 Hz F1 for /ɔ/ of SSLE does not reach the751Hz F1 openness of /ɒ/ in SSBE pronunciation or the 781 Hz F1 of/ɔ/of AE. Thus codification of/ɔ/as the most open back vowel and the absence of a vowel reaching the openness ofSSBE /ɒ/ or/ɔ/of AE in SSLE recorded by Gunesekera (2005: 117)[34] are thus confirmed. The F2 of these vowels reflect the frontness. Note the close parity of the vowels crowding as back vowels.Thus /o/, /oː/ and /ɔ/, /ɔː/ in the participants of this study emerged as less open and more rounded than the SSBE vowel /ɒ/and AE/ɔ/and /o/.

3.2 The SSLEcentral open vowels /ɑ/, /ɑː/

Hayward (2000: 149) [35] states that as the first formant corresponds to vowel openness thus open vowels such as /ɑ /have a high F1 frequency as illustrated in the figure below.

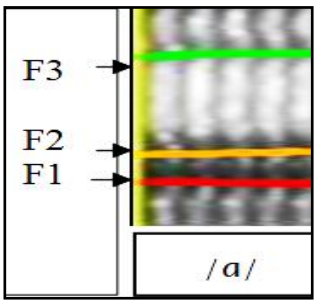

Figure 8: Formants for the vowel /ɑ/(Mannell, 2008)[36]

In Sinhala and Tamil /ɑ/, /ɑː/ are open central vowels. The table below denotes that the equivalent short vowel in SSBE /ʌ/is enunciated centrally between half open and open position while its long counterpart /ɑː/ is an open, back vowel.

Table 6: Contrasting the vowel inventories of /ɑ/, /ɑː/ and /ʌ/ in SBE, SSLE, Sinhala (WasalaandGamage, 2005)[37]and Tamil (Gair et al, 2005)[38]

SSBE Deterding (1990: 49)	SSLE Gunesekera (2005: 117)	Sinhala Wasala,Gamage (2005: 474)	Tamil Gair et al (2005: xix)
Mid, central /ʌ/	Open, central /ɑ/	Open, central /ɑ/	Open, central /ɑ/
Open, central /ɑː/	Open, central /ɑː/	Open, central /ɑː/	Open, central /ɑː/

3.2.1 Documentation of the pronunciation of the word*Ganeshan* SSLE: /gɑneːʃn/

The following documentation uses a proper noun *Ganeshan* /gɑneːʃn/which is given to Tamil males with a high frequency of occurrence in Sri Lanka. Thus it is claimed that the /ɑ/ in*Ganeshan* differs from the mid, central /ʌ/ of SSBE as the latter is not a vowel in Sinhala and Tamil.

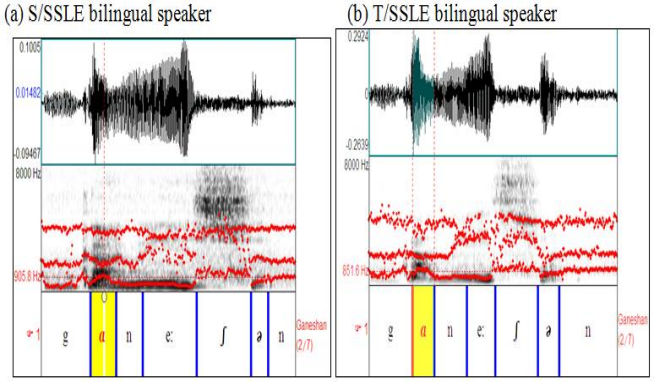

Figure 9: Annotated spectrogram and waveform files for *Ganeshan* /gɑneːʃn/

Formant values for/ɑ/:

	F1	F2	F 3
S/SSLE	905	1725	3601Hz
T/SSLE	851	1801	3915

Average /ɑ/for the 10 participants:
SSLE/ɑ/87817633754

3.2.2 Documentation of the pronunciation of the word*arm* SSLE: /ɑːm/

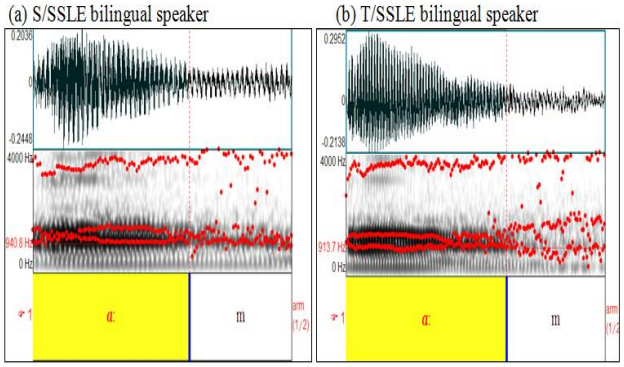

Figure 10: Annotated spectrogram and waveform files for arm/ɑːm/

Formant values for/ɑː/:

	F1	F2	F 3
T/SSLE	918	1755	3620Hz
S/SSLE	940	1771	3621

Average /ɑː/for the 10 participants:
SSLE/ɑː/9131742 3630

3.2.3 Discriminant analysis of central open/mid vowels of SSLE

Table 7: Discriminant formant analysis of central open/mid vowelsof SSLE, SSBE and AE

Vowel	F1	F2	F2
SSLE central open /ɑ/	878	1763	3754
SSLE central open /ɑː/	913	1742	3630
SSBE central mid /ʌ/	914	1459	2831
SSBE back open /ɑː/	910	1316	2841
AE back open /ɑ/	936	1551	2815
AE back lower mid /ʌ/	753	1426	2933

All enunciations of /ɑ/and /ʌ/in Table 7 above have almost equal values for F1 and thus in openness. But as seen in Figure 11 below they differ in values for F2 (frontness). Note the low F2 of SSBE /ɑː/which denotes that it is a back vowel. Then note the higher frontnessdenoted by F2 of SSLE /ɑ/and /ɑː/which confirms that they are central vowels in SSLE as recorded by Gunesekera (2005: 117)[39]. It is suggested that the influence for the centralness of SSLE /ɑ/ and /ɑː/ comes from the L1s: Sinhala and Tamil as /ɑ/and /ɑː/are central vowels in both languages.

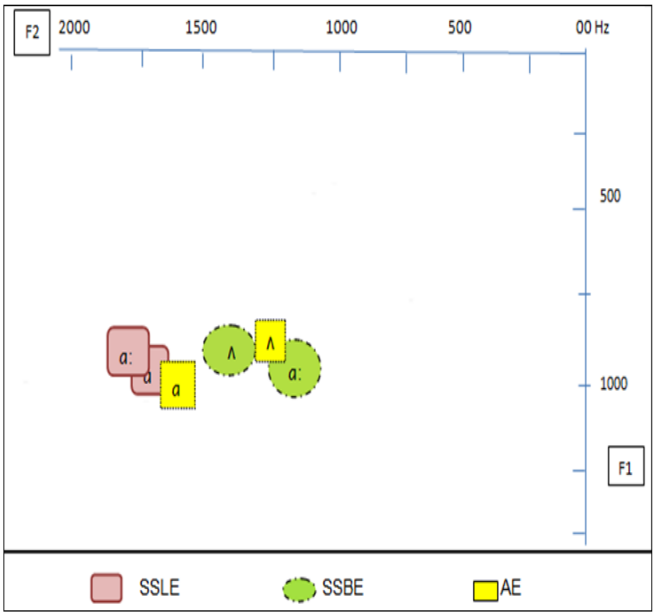

Figure 11: Comparison of the first twoformants for central open/mid/back vowels ofSSLE, SSBE and AE

3. Conclusions

This study provides synchronically recorded acoustic data for sixselected vowels: short/long monophthongs/ɔ, /ɔː/; /o/, /oː/ and/ɑ/, /ɑː/of SSLE. Average formant frequencies of the vowels were obtained through a six word instrument enunciated by five S/SSLE and five T/SSLE participants.

What was witnessed is that the formant values provided acoustic validity that/ɔ/, /ɔ:/; /o/, /o:/are distinctive back vowelsin SSLE. Discriminant analysis illustrated that they differed from the SSBE /ɒ/and/ɔ:/as well as AE/ɔ/ and/o/.In Sinhala and Tamil/ɑ/, /ɑ:/are central open vowels whereas the SSBE/ʌ/is central mid while/ɑ:/ is an open back vowel. Thus a strong influence of the vernaculars is witnessed in the enunciation of /ɑ/, /ɑ:/as central vowels bySSLE bilinguals.

Keeping in mind that this investigation is of a preliminary nature I propose that the results from this study, improved with a larger corpus of participants and further articulatory parameters can serve as a base-line for pronunciation characteristics of back and centralvowels of SSLE. However, acoustic recordings of this study illustrate that central open/mid vowels of SSLE can be identified through discriminant analysis with a high degree of accuracy through formant change information.

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