

Reduced vowels in conversational Singapore English

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Introduction

Many writers have observed that there is a tendency for Singaporean speakers to use full vowels rather than reduced vowels in unstressed syllables (eg Brown 1988; Deterding & Poedjosoedarmo 1998:155), but most of these studies were impressionistic and not based on the detailed analysis of a corpus of data.

Low (1998) reports that there is indeed evidence of less vowel reduction in Singapore English (SgE) than British English (BrE) in carefully prepared read sentences. Deterding (2001) considers the degree to which the lack of reduced vowels may contribute to the syllable-timing in conversational SgE, but the focus of his study is on rhythm rather than reduced vowels per se.

This paper, which is based on Heng (2003), studies the occurrence of reduced vowels in the first syllable of polysyllabic words in SgE conversational data. Acoustic measurements and auditory judgements are combined to investigate the incidence of reduced vowels in data from the NIECSSE (Deterding & Low 2001).

Reduced vowels

Vowels near the outside of the vowel chart are more distinct from each other than those nearer the centre, and the latter can be termed reduced vowels (Ladefoged 2001:79). The symbol [ə] can be used to represent a reduced vowel.

Of course, things are rather more complicated than this. Reduced vowels are characterised not just by centralisation in the vowel space but also by a decrease in duration (Koopmans-van Beinum 1980:9), and in

many cases the duration is so short that the vowel gets completely absorbed by a neighbouring consonant (Shockey 2003:22). Inevitably, in cases of complete vowel absorption, no measurements of the formant frequencies of the vowel are possible.

Here, we are assuming a contrast between reduced vowels and full vowels, though this overlooks the possibility of partially reduced vowels. In cases where there is vowel absorption, we can simply classify the vowel as reduced, so there is no need to depend on formant measurements. In cases where the syllable does have a clear vowel, it is hoped that the frequency of the first two formants can give an indication of the quality of the vowel.

Data

The conversational speech of 30 young ethnically Chinese SgE speakers from the NIECSSE was analysed. Although this excludes data from other ethnic groups such as Malays and Indians, the study was restricted to Chinese speakers in order to limit the variables. For purposes of comparison, the speech of four young BrE speakers (BF1, BF2, BM1, BM2) from the NIECSSE was also investigated.

It has been shown by van Bergem (1995) that listeners are most consistent in their judgement of reduced vowels for the first syllable of polysyllabic words. For this reason, this study concentrates only on the first syllable of polysyllabic words with a potentially reduced vowel, which is defined as a vowel that is shown as [ə] in the first pronunciation listed in Wells (2000). On this basis, *vacation* is omitted from the analysis (Wells 2000:821), even though Roach, Hartman and Setter (eds 2003:573) only give [ə] for the British pronunciation of this word. Only words where the first syllable is spelled with *a*, *o* or *u* are considered, as unstressed initial syllables spelled with *e* or *i* are likely to be pronounced with [ɪ] rather than [ə].

A total of 118 tokens, from 62 different words, were identified in the SgE data. The distribution of these tokens according to the orthographic vowel in the first syllable is shown in Table 7.1. The occurrences of *con-* or *com-* are also shown separately from other words with *o*. All 118 tokens are listed in Appendix 7.1.

For the BrE data, a total of 13 tokens were identified. All these tokens are listed in Appendix 7.2.

Auditory analysis

Careful repeated listening of all 131 tokens was performed by the main researcher, the first author of this paper, and each vowel was indicated as either full or reduced.

Table 7.1: Incidence of SgE tokens listed according to spelling

Spelling	Number	Examples
<i>a</i>	37	<i>afford, traditional</i>
<i>u</i>	9	<i>suggestions, supposed</i>
<i>con-/com-</i>	36	<i>consider, computer</i>
<i>o</i>	36	<i>possessed, forget</i>
Total	118	

It is important to determine how reliable these judgements are, as previous research has shown that even experienced phoneticians may differ in their judgements of the phonetic nature of sounds in SgE data (Moorthy & Deterding 2000).

For the SgE data, a total of ten subjects listened over high-quality headphones to a selection of 36 tokens. These listeners consisted of three British and three Singaporean lecturers, all with a background in phonetics, and four Singaporean students, all with some training in phonetics. They could listen to each token as many times as they wanted before indicating whether they considered it a full vowel or a reduced vowel. There was unanimous agreement among all ten listeners for 21 of the 36 tokens, just one dissenting judgement for a further 10 tokens, and two dissenting judgements for 2 more, so there was agreement by at least eight out of ten listeners for all but 3 of the tokens. Furthermore, the judgements of the main researcher were validated by at least half of the listeners in every case.

For the BrE data, two British phoneticians listened to all 13 tokens, and both these listeners agreed that all the tokens had reduced vowels.

The unexpected level of agreement among the listeners indicates that the auditory judgements are in fact highly consistent. It seems that, for SgE data, judgements of vowel quality may be more reliable than those of the dental fricatives studied in Moorthy and Deterding (2000).

Acoustic analysis

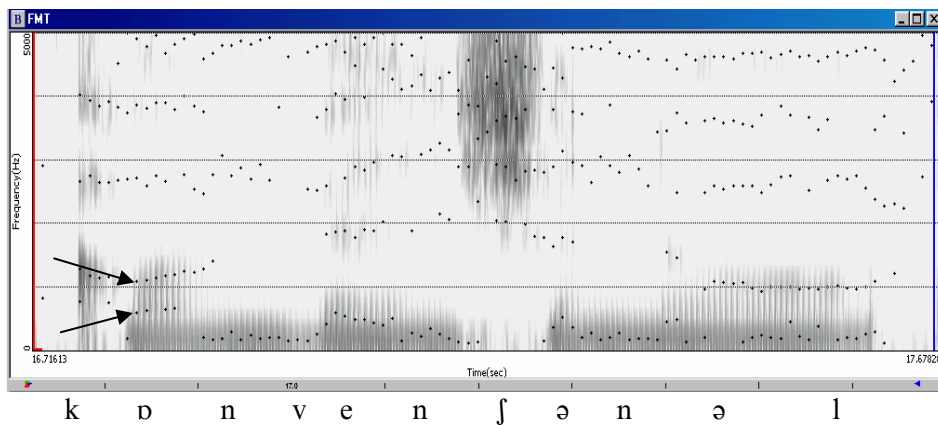
Attempts were made to measure the first two formants of all the potentially reduced vowels in the data from computer-based spectrograms with overlaid LPC formant tracks using Multispeech 3700 software from KAY.

As a reduced vowel is characterised by centralisation in the vowel space, one might expect this to be reflected in the formants of the first

two formants. For example, for a female SgE speaker, one would expect [ə] to have formant values appropriate for a mid central vowel, with F1 at about 560 Hz and F2 at about 1670 Hz (Deterding 2003).

Figure 7.1 shows a spectrogram of an SgE instance of *conventional* with the arrows indicating the first two formants for the vowel in the first syllable. F1 is at 654 Hz and F2 at 1131 Hz, and these values, particularly the low value of F2, are more characteristic of [ɒ] than [ə]. This confirms that this vowel is a full vowel and not a reduced vowel, and this concurs with the auditory impression for this token.

Figure 7.1: Spectrogram of *conventional* (F24-f:16). Arrows indicate F1 and F2. Horizontal lines are shown at 1000 Hz intervals.

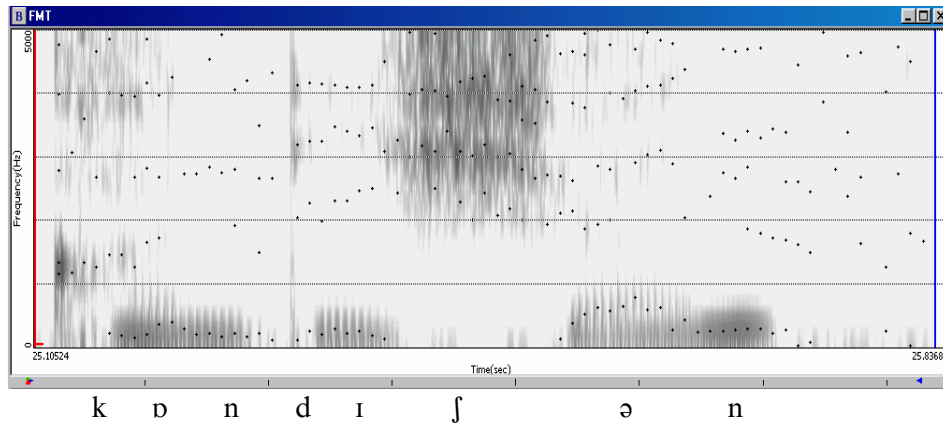


Unfortunately, not all vowels were so easy to measure. Figure 7.2 shows an instance of *condition*, a token which all ten listeners perceived as having a full vowel in the first syllable. However, the F1 in this syllable seems to be at 300 Hz or below, which is not appropriate for an open vowel; and the formant track for F2 is rather unstable, so it is not possible to make any reliable estimate of F2.

In fact, these problems are not entirely surprising. A vowel before a nasal undergoes anticipatory nasalisation, and for nasalised vowels, F1 is often missing (Ladefoged 2003:135) and the LPC algorithm does not work well (Ladefoged 2003:137; Johnson 2003:100). We will, nevertheless, derive a plot of some of the formants in the next section, to gain an estimate of extent of the problem.

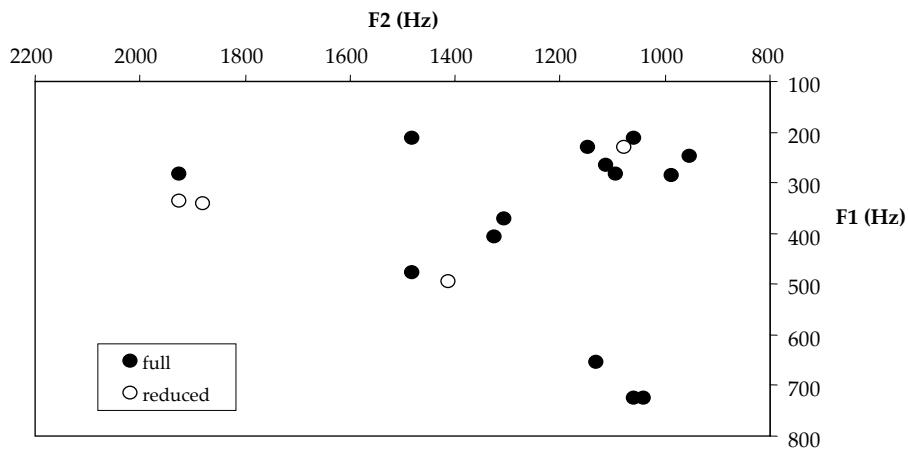
Figure 7.3 shows a plot of F1 and F2 of all the female tokens with *o* in the spelling (including those with *con-*) for which clear formant measurements were possible. Even though there is a tendency for the full vowels to have a lower frequency F2 (and so be on the right of the plot as

Figure 7.2: Spectrogram of *condition* (F24-a:25), illustrating the problems of making formant measurements in unstressed syllables



expected for a relatively back vowel), the separation is not clear. For example, one token that was perceived to have a full vowel (*construct*, F22-a:10) has a high F2 at 1926 Hz, and one token that was perceived to have a reduced vowel (*considered*, F9-h:26) has a low F2 at 1078 Hz. Furthermore, as illustrated in the spectrogram in Figure 7.2, the F1 of many of the tokens with an open vowel is not what one would expect.

Figure 7.3: Formant plot of female SgE tokens with *o* in the spelling



This therefore confirms that the acoustic measurements are not reliable. We will therefore depend on the auditory judgements, especially as they were found to be rather consistent between different listeners.

Results

Table 7.2 shows the total number of potentially reduced vowels that were actually realised as reduced vowels and full vowels. As only 45% of the SgE vowels were reduced in contrast to all of the BrE vowels, it is quite clear that the incidence of reduced vowels in SgE is lower than in BrE, confirming that SgE speakers do indeed sometimes use a full vowel where a reduced vowel would be expected in BrE. However, it is not true that there are no reduced vowels in SgE.

Table 7.2: Number of reduced and full vowels in the SgE and BrE data

	SgE	BrE
Reduced	53 (45%)	13 (100%)
Full	65 (55%)	0 (0%)
Total	118	13

Analysis of the words in which these vowels occurred indicates that the incidence of reduced vowels in SgE depends quite extensively on spelling. Table 7.3 shows the occurrence of reduced vowels in the SgE data according to the orthographic vowel in the syllable where the potentially reduced vowel occurs.

Table 7.3: Number of reduced and full vowels in the SgE data according to the spelling of the potentially reduced syllable

	<i>a</i>	<i>u</i>	<i>con-/com-</i>	<i>o</i>
Reduced	30 (81%)	9 (100%)	3 (8%)	11 (31%)
Full	7 (19%)	0 (0%)	33 (92%)	25 (69%)
Total	37	9	36	36

The instances of *a* occurred in words such as *afford*, *approached*, *traditional* and *particular*, and 81% of these vowels were reduced. For *u* there was one token of *suggestions* and eight tokens of *suppose* or *supposed*,

and all of these were perceived as reduced. So it seems that when *a* or *u* occurs in the spelling, there is a high incidence of reduced vowels.

In contrast, when *o* occurs in the spelling, in words such as *together*, *forget*, *possessed* and *profession*, then a full vowel is highly likely, as a reduced vowel occurred in only 31% of the tokens, and this trend for occurrence of a full vowel is especially marked for words beginning with *con-* or *com-*, such as *consider*, *convinced*, *computer* and *communicate*, with just 8% of these tokens having a reduced vowel.

Conclusion

It has been shown that although SgE speakers use fewer reduced vowels than BrE speakers, they do use some reduced vowels, particularly when there is an *a* or *u* in the spelling, such as in the first syllable of words like *afford*, *traditional* and *suppose*. However, these results confirm that, in conversational data, SgE speakers generally use a full vowel where the potentially reduced vowel is spelled with an *o*, especially for words that begin with *com-* or *con-*.

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Appendix 7.1: SgE tokens

	Location	Word	Vowel	Location	Word	Vowel
<i>a</i>	M3-b:21	<i>ability</i>	reduced	M2-f:39	<i>casino</i>	full
	F5-i:12	<i>accommodation</i>	reduced	M11-a:13	<i>familiar</i>	reduced
	F5-i:16	<i>accommodation</i>	reduced	F24-f:15	<i>majority</i>	reduced
	M10-b:24	<i>according</i>	reduced	M7-e:34	<i>majority</i>	reduced
	F14-h:30	<i>accumulate</i>	full	F3-h:62	<i>pagoda</i>	reduced
	F22-c:09	<i>adventurous</i>	full	F3-i:06	<i>pagoda</i>	reduced
	M6-c:23	<i>affect</i>	reduced	F3-i:08	<i>particular</i>	reduced
	F17-f:33	<i>affected</i>	reduced	M7-f:15	<i>particular</i>	full
	F18-e:23	<i>afford</i>	reduced	M8-b:23	<i>particular</i>	reduced
	M2-e:13	<i>allowed</i>	reduced	M11-c:25	<i>particular</i>	reduced
	F17-a:32	<i>apartment</i>	reduced	M11-a:22	<i>particularly</i>	reduced
	M3-c:30	<i>approach</i>	reduced	M10-b:26	<i>tradition</i>	reduced
	M3-c:40	<i>approach</i>	reduced	F24-f:14	<i>traditional</i>	reduced
	M3-c:43	<i>approaching</i>	reduced	M7-e:26	<i>traditional</i>	reduced
	F9-b:25	<i>assignment</i>	reduced	M7-f:26	<i>traditional</i>	reduced
	F3-a:24	<i>assignments</i>	reduced	M7-f:45	<i>traditional</i>	reduced
	F9-f:07	<i>attached</i>	full	F24-f:19	<i>traditions</i>	reduced
	F12-f:10	<i>attached</i>	full	M7-e:20	<i>traditions</i>	reduced
	F9-c:21	<i>attention</i>	full			
<i>u</i>	F24-d:41	<i>suggestions</i>	reduced	M8-f:03	<i>supposed</i>	reduced
	M7-b:04	<i>suppose</i>	reduced	M8-i:13	<i>supposed</i>	reduced
	M1-c:32	<i>supposed</i>	reduced	M12-a:28	<i>supposed</i>	reduced
	M1-d:08	<i>supposed</i>	reduced	M12-b:02	<i>supposed</i>	reduced
	M7-d:19	<i>supposed</i>	reduced			
<i>con-/</i>	F15-g:05	<i>commercial</i>	full	M6-a:19	<i>computer</i>	full
<i>com-</i>	M4-c:07	<i>committed</i>	full	M6-c:16	<i>computer</i>	full
	M4-h:33	<i>committed</i>	full	M6-c:25	<i>computer</i>	full
	F14-h:47	<i>committee</i>	full	M6-c:40	<i>computer</i>	full
	F3-c:12	<i>communicate</i>	full	F24-a:25	<i>condition</i>	full
	F12-d:14	<i>communicate</i>	full	M7-b:41	<i>conducting</i>	full
	F12-d:15	<i>communicate</i>	full	F24-f:22	<i>conservative</i>	full
	F24-d:29	<i>communication</i>	full	M7-e:28	<i>consider</i>	full
	M9-d:13	<i>communication</i>	full	F1-f:18	<i>considered</i>	full
	F10-d:37	<i>compare</i>	full	F9-h:26	<i>considered</i>	reduced

Appendix 7.1 (cont'd)

	M9-f:43	<i>compare</i>	full	M7-c:41	<i>conspiracy</i>	full
	F20-d:29	<i>compared</i>	full	F2-b:12	<i>constraints</i>	full
	F24-i:18	<i>compared</i>	full	F22-a:10	<i>construct</i>	reduced
	M8-b:26	<i>compared</i>	full	M5-a:37	<i>consultant</i>	full
	F9-h:27	<i>compulsory</i>	full	M5-a:39	<i>consultants</i>	full
	F24-a:30	<i>computer</i>	full	F19-e:05	<i>conveniently</i>	reduced
	M5-b:05	<i>computer</i>	full	F24-f:16	<i>conventional</i>	full
	M6-a:06	<i>computer</i>	full	F3-h:48	<i>convince</i>	full
<i>o</i>	F13-d:22	<i>collide</i>	reduced	M6-a:36	<i>profession</i>	full
	M7-c:41	<i>domestic</i>	full	M6-c:08	<i>profession</i>	full
	M4-d:37	<i>forget</i>	full	F10-g:04	<i>professional</i>	full
	M3-c:10	<i>forgetting</i>	full	F20-i:11	<i>prohibited</i>	full
	F23-a:49	<i>forgot</i>	full	M6-c:44	<i>promote</i>	full
	F9-a:25	<i>forgotten</i>	full	F11-d:35	<i>promotes</i>	full
	F22-e:38	<i>forgotten</i>	full	M9-d:03	<i>pronounce</i>	reduced
	F18-a:06	<i>November</i>	full	M9-c:25	<i>pronunciation</i>	reduced
	F18-a:12	<i>November</i>	full	M9-g:39	<i>proposed</i>	full
	F18-a:32	<i>November</i>	full	F22-c:06	<i>romantic</i>	full
	F17-e:03	<i>officially</i>	full	M7-c:17	<i>romantic</i>	full
	F18-e:04	<i>police</i>	full	F18-f:13	<i>society</i>	reduced
	M8-e:19	<i>pollution</i>	reduced	F18-f:14	<i>society</i>	reduced
	M5-b:27	<i>position</i>	reduced	M9-g:37	<i>together</i>	full
	F1-a:40	<i>possessed</i>	reduced	M6-h:12	<i>together</i>	full
	M9-b:08	<i>proceeded</i>	full	M7-b:43	<i>together</i>	full
	F17-f:19	<i>production</i>	reduced	M10-a:29	<i>together</i>	full
	F20-c:08	<i>productions</i>	reduced	M10-b:30	<i>together</i>	reduced

Appendix 7.2: BrE tokens

Location	Word	Vowel	Location	Word	Vowel
BF2-c:04	<i>accommodation</i>	reduced	BM2-c:04	<i>suppose</i>	reduced
BM2-d:09	<i>accommodation</i>	reduced	BM1-c:21	<i>supposed</i>	reduced
BM1-h:14	<i>appeal</i>	reduced	BF2-g:19	<i>compared</i>	reduced
BM1-h:20	<i>appeals</i>	reduced	BM1-c:34	<i>continue</i>	reduced
BM1-d:23	<i>particular</i>	reduced	BM1-c:13	<i>convenient</i>	reduced
BM2-g:31	<i>particularly</i>	reduced	BM2-a:34	<i>opposed</i>	reduced
			BF2-h:21	<i>together</i>	reduced

