If in Doubt, Breathe out! Breathing and Support Based on the Accent Method

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Research into the Accent Method for the singing voice

This research was undertaken as part of a Ph.D. study. Although some singers and singing teachers have used the Accent Method as part of their breathing pedagogy, there has been no specific research into the efficacy of the method with the singing voice.

The Accent Method had been taught as part of the principal practical study of classical voice at the Queensland Conservatorium of Music at Griffith University (QCGU), Australia, for a number of years. Both the vocal professors and the students felt that the course of the Accent Method was beneficial. These anecdotal reports of benefit prompted the design and implementation of the study.

If you want more detailed information regarding the research, including the statistics and graphs, please read on!

As a guide, when statistical analyses are made, scores are considered significant when:

- $p = 0.05$ level, there is a 95% chance that the result is 'real'
- $p = 0.01$ level is considered highly significant. There is a 99% chance that the score is 'real'.

In an experimental study of this type, a significant or highly significant score would suggest that any differences would be due to the training (i.e. Accent Method).

Core concepts in Accent Method research

The study was a two group design:

- An experimental group received Accent Method instruction
- A control group received no Accent Method instruction

Following 10 weeks of Accent Method instruction in a group class, there were some significant differences between measurements in the experimental group.

- A very significant increase in the dynamic range, that is, the difference between the softest and loudest tones sung, was seen for the experimental group. This was not so in the control group.
- After training the experimental group had a significantly wider pitch range than before training.
- Abnormal air flow traces became more normal after Accent Method instruction.
- Four subjects in the experimental group had abnormal airflow tracings before training. Only one showed this after training.

The control group had five subjects with abnormal tracings at the beginning of the study. At the end of the study, there were two additional subjects with abnormal tracings, making a total of seven. These students had been, or were being, taught either 'belly out' or 'belly neither one nor the other' for breath management.

Trained judges (singing professors at a tertiary institution) preferred the singing of the experimental group after training than before. They did not show this preference for the control group.

There was no change in the maximum phonation time, or mean airflow in either group post -training.

Overall, the Accent Method was felt to be effective in improving the voices of young classical singing students.

The study was carried out to quantify the anecdotal reports of improvements and the efficacy of a 10-week Accent Method course. The study used 30 classical singing students in their first or second year from the Guildhall School of Music and Drama in London, where, at that time, the Accent Method was not routinely taught. The study was a simple two group design in which the experimental group received Accent Method instruction and the control group was seen for the same amount of time, but was given sight reading rather than Accent Method instruction. The two groups underwent a series of measurements before and after training to evaluate any differences that occurred. Both groups of students continued their usual timetable, including individual voice lessons throughout the period.

Based on the findings of Thyme-Frøkjær on normal speaking voices, four main measurements were taken:

- Maximum Phonation Time (MPT) on the vowels /a/and /i/ at modal speaking pitch
- Aerodynamic studies (consisting of mean flow rates through steady state vowels /a/ and /i/ at modal pitch and one octave above modal pitch)
- A phonetogram (the students sang every semitone in their vocal range as softly and then as loudly as possible)
- A perceptual judgement (where singing teachers rated a section of 'Caro Mio Ben' by Giordani) sung unaccompanied in the key chosen by the student's vocal professor.

The subjects were randomly assigned to either the control or the experimental group. The groups were balanced for males and females and for first and second year students. Following the participant selection process, 29 participants were included in the study, 14 in the control group and 15 in the experimental group.

At the initial assessment, all of the subjects undertook a standard perceptual voice rating protocol to ensure that at the beginning of the study they had normal voices. No subject had abnormal scores and all were able to participate. Table 5.1 shows the demographic breakdown of the experiment.

Table 5.1 Demographics

Group/Demographic	Control	Experimental
Age Range	18 – 23	18 – 25
Males	6	7
Females	8	8
First Year	6	9
Second Year	8	6

The demographic characteristics of the two groups are essentially balanced (Table 5.1), although there are three more first year singers in the Experimental group ($N = 29$. Control: $n = 14$. Experimental: $n = 15$).

A t-test for equality of means (Table 5.2) was then performed to identify any significant differences between the two groups in terms of vocal function characteristics. There was only one significant difference identified. The MPT of the /i/ vowel was longer in the control group than in the experimental group at the $p < 0.05$ level of significance. All other pairs of results evaluated showed no significant differences and the groups were felt to be appropriately randomised and equivalent prior to the experiment.

Table 5.2 Assessment levels for different measures for the Control and Experimental group at initiation with differences assessed using Independent t-tests

Measurement	Group	*M*	*SD*	*t*	*df*	Sig. (2-tailed)
MPT /a/	Control Experimental	20.33 17.94	6.01 4.30	1.240	27	0.226
MPT /i/	Control Experimental	23.34 18.93	6.86 4.37	2.081*	27	0.47
Av DR	Control Experimental	21.56 21.61	5.90 6.32	−0.020	27	0.984
Max Semi	Control Experimental	37.57 35.73	3.48 2.55	1.631	27	0.115
MFR /a/	Control Experimental	155 159	69 55	−0.170	26	0.866
MFR /a/8va	Control Experimental	243 265	77 117	−0.585	26	0.564
MFR /i/	Control Experimental	153 171	74 54	−0.732	26	0.471
MFR /i/8va	Control Experimental	223 220	72 104	0.088	26	0.931

Note: MPT = maximum phonation time in seconds.
Av DR = average dynamic range in decibels.
Max Semi = maximum number of semitones sung.
MFR = mean flow rate in ml/s.
8va = one octave above modal pitch. * = $p < 0.05$.

Significant findings

Aerodynamic studies

The normative values for mean flow rates (MFR), taken in a steady state vowel /a/ at modal pitch, have been reported by Thyme- Frøkjær (2001) as 120 ml/s ± 20, giving a normal range of 100 to 140 ml/s. Initial assessment of the subjects in this study suggested a significantly higher value, as can be seen below.

Table 5.3 Mean flow rate in millilitres per second for all the subjects pre- and post-training

Condition	*M*	*SD*	*t*	*df*	Sig (2-tailed)
/a/ Modal Pre /a/ 8va Pre	152 254	57 101	−5.069***	26	0.000
/i/ Modal Pre /i/ 8va Pre	159 222	61 90	−3.515 **	26	0.002
/a/ Modal Post /a/ 8va Post	168 248	50 74	−6.845 ***	27	0.000
/i/ Modal Post /i/ 8va Post	176 224	63 83	−3.271 **	27	0.003

Note. ** = $p < 0.01$, *** = $p < 0.001$.

MFRs were significantly higher in the whole group than those reported by Thyme-Frøkjær (2001). The averages reported for the whole group are higher at both the pre- and post-training assessments.

MFRs were significantly higher for the vowels sung one octave above modal pitch. This difference occurred at both assessment points. However, there were no significant differences between the /a/ and /i/ vowels.

Table 5.4 Mean flow rates in millilitres per second in experimental and control groups pre- and post-training

Group/Task	*M*	*SD*	*t*	*df*	Sig (2-tailed)
Control					
/a/ Modal Pre /a/ Modal Post	155 183	70 62	−1.271	12	0.228
/i/ Modal Pre /i/ Modal Post	154 189	75 73	−1.431	12	0.178
/a/ 8va Pre /a/ 8va Post	243 251	77 79	−0.066	12	0.949
/i/ 8va Pre /i/ 8va Post	223 247	72 93	−0.738	12	0.475
Experimental					
/a/ Modal Pre /a/ Modal Post	159 163	55 52	-0.421	14	0.680
/i/ Modal Pre /i/ Modal Post	171 173	54 62	−0.189	14	0.853
/a/ 8va Pre /a/ 8va Post	265 254	117 77	0.429	14	0.674
/i/ 8va Pre /i/ 8va Post	220 204	104 67	0.778	14	0.450

There were no significant differences between the groups at either testing point and neither group showed significant change across the testing points. The differences between the modal voice and one octave higher recordings are in agreement for the statistics from the whole group of 29 subjects, with mean flow rates through the higher pitched vowels being significantly greater.

A crosstab of percentage of change (Table 5.5) was also carried out, evaluating movement around the mean. Change away from the normal range, one standard deviation on either side of the mean, was considered as deterioration, while change towards the normal range was considered improvement.

Table 5.5 Percentage of the subjects showing change by group.

Group	Deterioration	No Change	Improvement
Control	6	4	3
Experimental	5	4	6

The results shown in Table 5.5 suggest that the Experimental group showed more improvement and less deterioration than the Control group. Analysis, however, indicated that these results were not statistically significant (Pearson Chi-Square Value 4.998, $df = 4$, $p = 0.358$). The Pearson Chi-Square is another less powerful statistical test that is used with this type of comparison for identifying differences.

All data used for the above statistical analysis consisted of the Mean Flow Rate through steady state vowels. Further detail is provided through qualitative assessment of the Aerophone II tracings (see Figures 5.1–5.4), which demonstrate some significant differences in tracing morphology that would not appear when mean flow measures were taken.

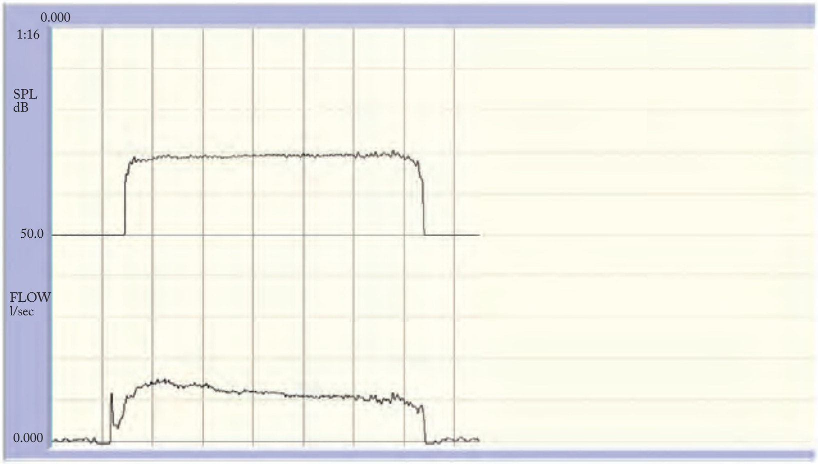


Figure 5.1 Airflow tracing morphology. MFR tracing /a/ 8va from a female subject, showing typical morphology

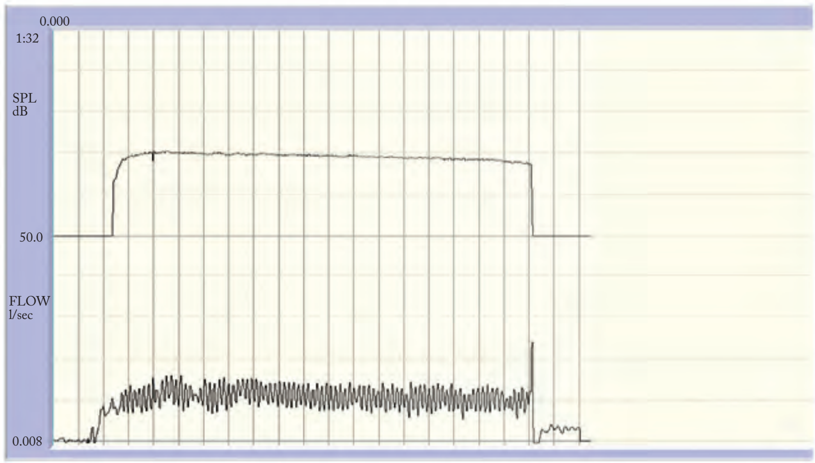


Figure 5.2 Airflow tracing morphology. MRF tracing /a/ 8va from a female subject showing atypical morphology

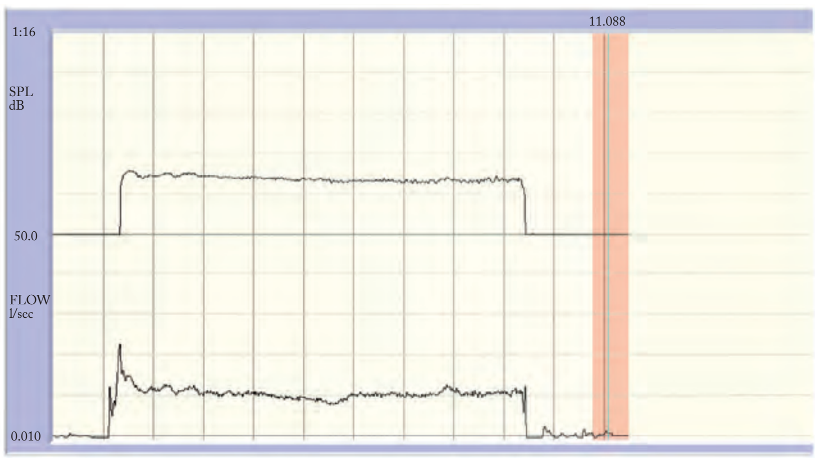


Figure 5.3 Airflow tracing morphology. MFR tracing /a/ 8va from a male subject showing typical morphology

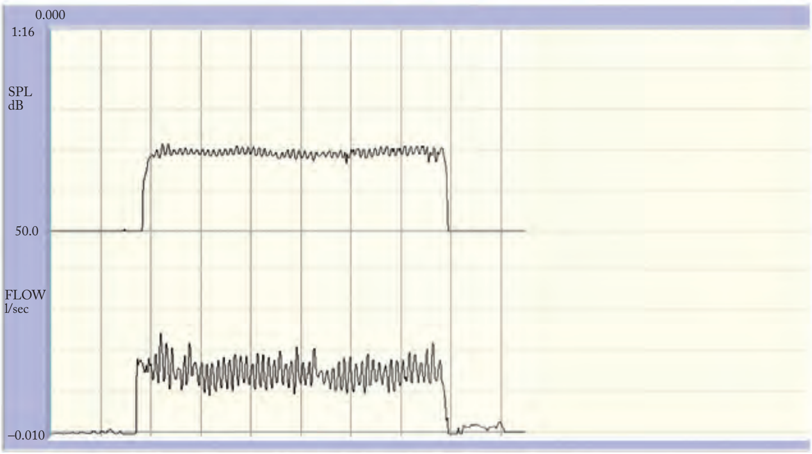
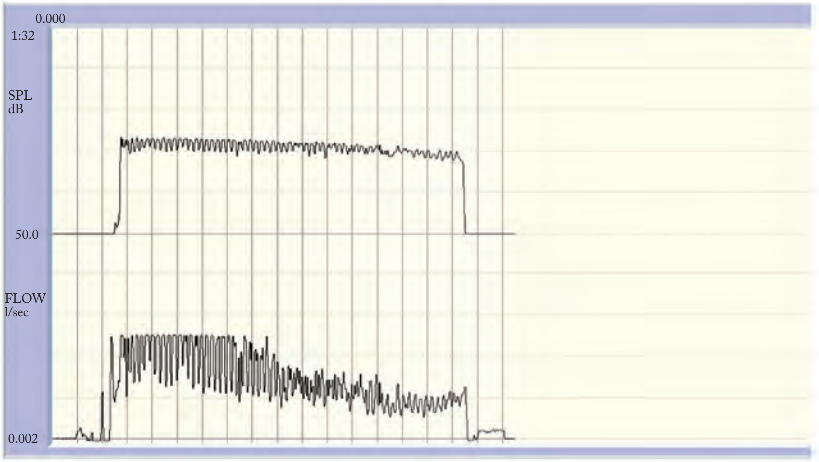
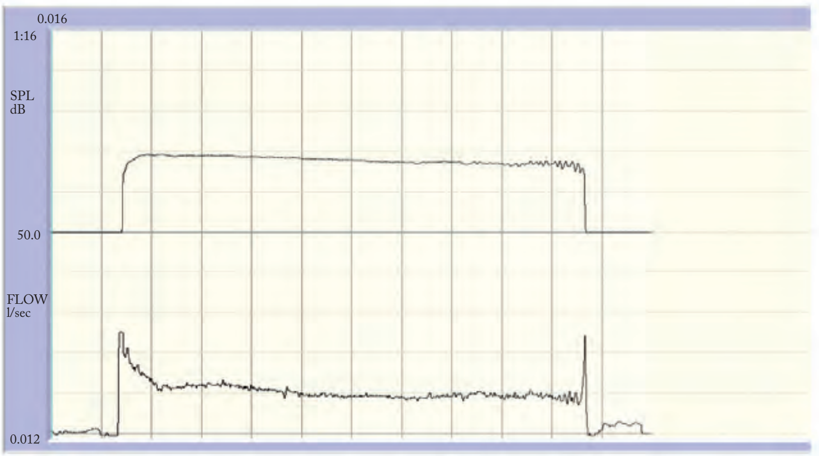


Figure 5.4 Airflow tracing morphology. MFR tracing /a/ 8va from a male subject showing atypical morphology

As these four MFR tracings show, there are two distinct patterns of airflow emerging. In the typical samples, there is a relatively steady flow of air which supports a steady volume level for most of the sustained vowel. This pattern is that expected from the literature and from the Aerophone II manual, and can be considered to represent normal airflow traces. In the atypical tracings, there is a rapid perturbation in the airflow not shown in the actual MFR value which is averaged. There is still a relatively steady volume level in the resultant sustained vowel, although in the male tracing (Figure 5.4) some perturbation in the SPL (volume trace), matching that of the airflow, can be detected. This atypical morphology appeared to be more obvious when the subject was sustaining a vowel one octave above modal pitch, when the MFR was always higher. These atypical tracings were seen in five subjects of the control group at the initial pre-training assessment and in an additional two of the control group at the second post-training assessment (total of seven subjects). There were four subjects from the Experimental group who had these atypical morphologies at the initial assessment, but only one of them still demonstrated the atypical morphology at the second, post-training assessment.



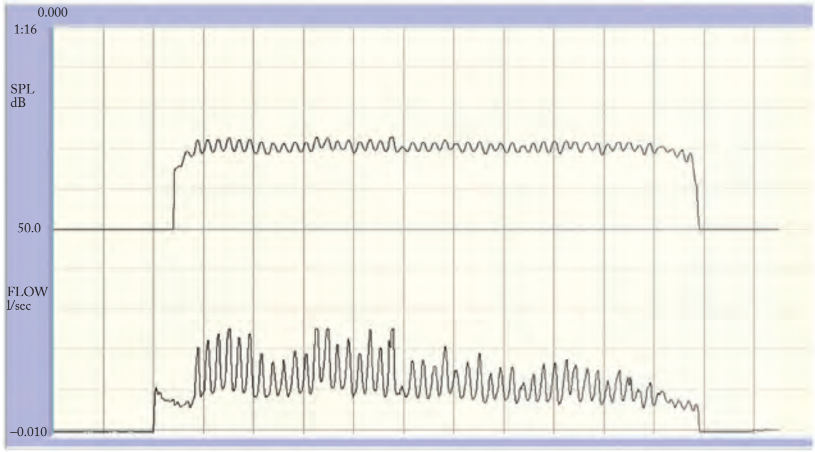
A. Pre-intervention



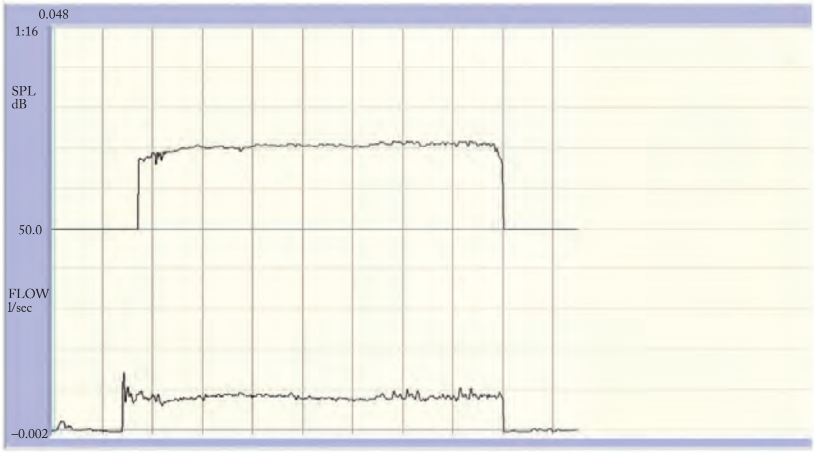
B. Post intervention

Figure 5.5 MFR tracing /a/ 8va from Subject 1 (Experimental group male) showing atypical morphology pre-training (a), but typical morphology in post-training (b)

At the initial assessment pre-training, this subject showed a very atypical pattern of airflow that was also affecting the steadiness of the SPL trace. Post-training with the Accent Method, this subject is now showing a normal pattern, with both steady airflow and steady SPL traces.



A. Pre-intervention



B. Post intervention

Figure 5.6 MRF tracing /a/ 8va from Subject 3 (Experimental group female) showing atypical morphology Pre-training (a), but typical morphology Post-training (b).

Subject 3's airflow traces (Figure 5.6) again show an atypical pattern at the initial assessment but typical airflow and dB SPL patterns at the second assessment following training with the Accent Method. This subject showed a marked fluctuation in the dB SPL trace initially, but this was eliminated in the post-training tracing.

As none of the subjects in the Control group who had atypical patterns at initial assessment changed towards more typical patterns at the second post-training assessment, it appears that training with the Accent Method was instrumental in bringing about change towards a more typical pattern. Two additional subjects from the Control group showed atypical patterns at the post-training session having shown typical patterns initially, but no subjects from the Experimental group changed from a typical to an atypical pattern.

Phonetograms

The results of the phonetograms were averaged to allow easier statistical analysis (Table 5.6). Averaging dynamic ranges and the maximum number of semitones sung allowed the male and female singers, who have different pitch ranges, to be analysed together.

Table 5.6 Average dynamic range in decibels by Control and Experimental groups

Group/Task	*M*	*SD*	*t*	*df*	Sig (2-tailed)
Cont Pre Cont Post	21.56 24.40	5.90 4.32	−1.843	13	0.088
Exp Pre Exp Post	21.61 28.41	6.32 3.45	−4.757 ***	14	0.000

Note. Cont = control group, Exp = experimental group, *** = $p < 0.001$. Please note that this is even more significant than $p = 0.01$; it suggests that there is a 99.9% chance that the change is due to the Accent Method.

The Experimental group had a significantly wider dynamic range post-training than at the initial pre-training assessment. On the other hand, the Control group showed no statistically significant differences across the two testing points. This suggests that the training received by the Experimental group was responsible for bringing about change.

The maximum number of semitones was also assessed by group (Table 5.7).

Table 5.7 Maximum number of semitones sung by Control and Experimental groups

Group/Task	*M*	*SD*	*t*	*df*	Sig (2-tailed)
Cont Max S Pre	37.57	3.48	−1.415	13	0.180
Cont Max S Post	39.00	2.03			
Exp Max S Pre	35.73	2.54	−3.437 **	14	0.004
Exp Max S Post	38.73	3.49			

Note. Max S = Maximum number of semitones sung, ** = $p < 0.01$.

These results (Table 5.7) indicate that the experimental group had significantly more semitones in their range post-training than they did initially. There were no significant differences for the control group.

Average dynamic ranges were used in the statistical analysis of the data. This allowed an easy comparison between the two groups, as differences in the number of semitones sung would not affect the outcome. It is also possible to look graphically at the phonetograms that were obtained for each group, presented in Figures 5.7–5.9. Average minima and maxima for each semitone sung were calculated, and male and female singers were combined to provide a single phonetogram based on each group's data.

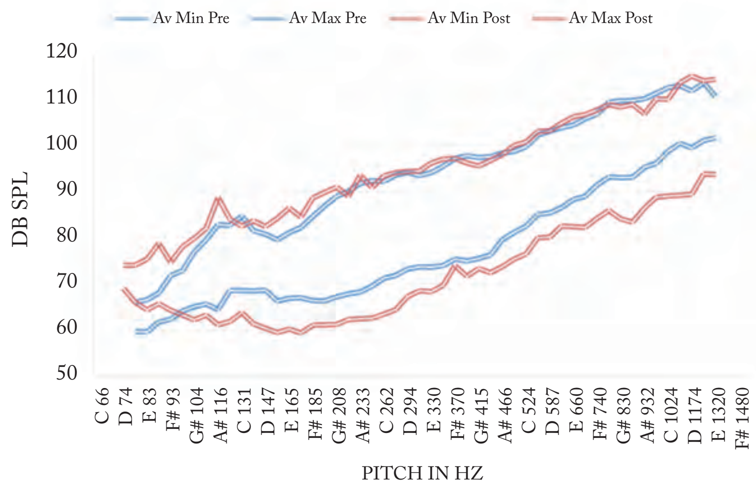


Figure 5.7 Phonetogram for the Control group pre- and post-training

This phonetogram (Figure 5.7) shows that there was some change in the dynamic ranges for the singers in the Control group. These changes were not statistically significant, but they do show some ability to sing more softly at the post-training assessment than was possible initially (t = –1.843, df = 13 and p =0.088).

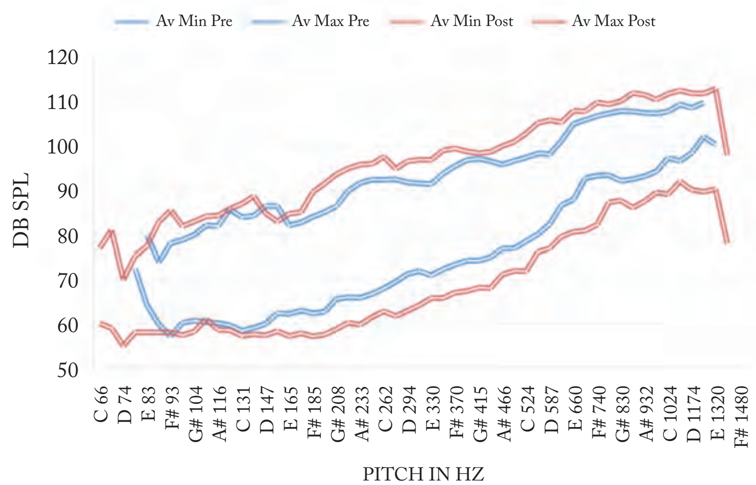


Figure 5.8 Phonetogram for the Experimental group pre- and post-training with Accent Method

The phonetogram in Figure 5.8 shows a clear difference between the pre- and post-training recordings. A highly significant difference was seen in the average dynamic range measures ($t = -4.757$, $df = 14$ and $p = 0.000$.), with the subjects in the Experimental group showing improvement in their ability to sing both softly and loudly. The total number of semitones sung was also significantly greater ($t = -3.437$, $df = 14$, $p = 0.004$).

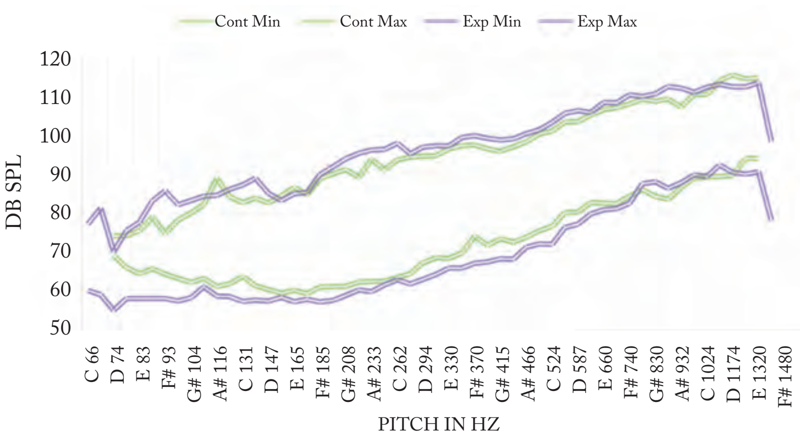


Figure 5.9 Comparison of the Control and Experimental group phonetograms post-training

The phonetogram (Figure 5.9) for the Experimental group is larger overall, with both soft and loud tones showing an advantage. The mean dynamic ranges were statistically significant ($t = -2.768$, $df = 27$ and $p = 0.01$).

There were also considerable variations in the phonetograms of individual singers. No subject's phonetogram was smaller at the post-training assessment than it was initially. The phonetograms shown below (Figures 5.10–5.13) represent the degree of change seen for two male and two female subjects in the Experimental group.

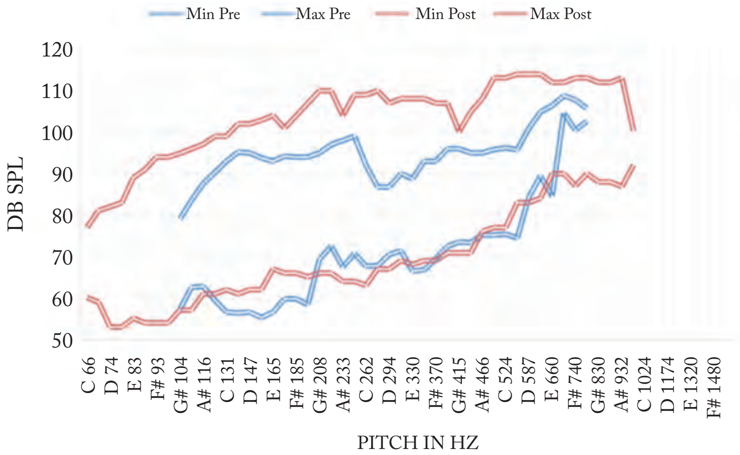


Figure 5.10 Phonetogram of a male subject from the Experimental group showing a large degree of change

The phonetogram for Subject 13 (Figure 5.10) shows an increase in both the dynamic range and in the maximum number of semitones sung. This subject shows a clear advantage for the louder tones throughout the frequency range, with his average dynamic range increasing by 10 dB. An additional eight semitones were available at the lower end of his range, with four more available in his highest register.

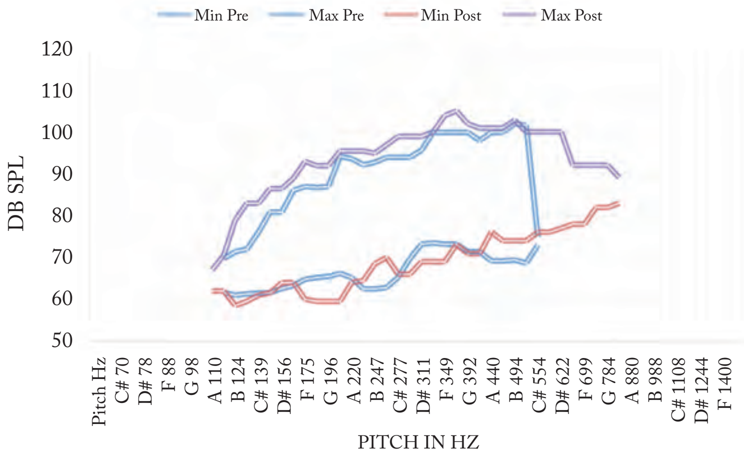


Figure 5.11 Phonetogram of a male subject from the Experimental group showing a lesser degree of change

Subject 10's phonetogram (Figure 5.11) does show improvement between the two testing points, although the difference is not as great as that for subject 13. Subject 10 shows an increase in the average dynamic range of less than 1 dB, but there was an increase of eight semitones in the higher registers.

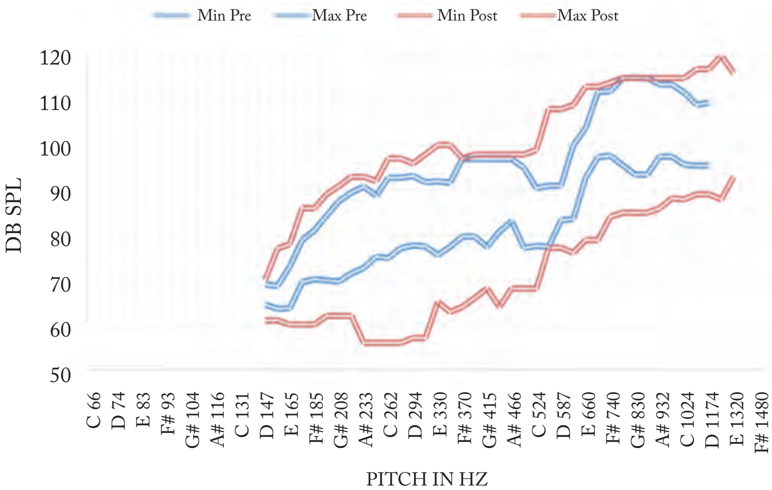


Figure 5.12 Phonetogram of a female subject from the Experimental group showing a large degree of change

Subject 11 again shows a large increase in the dynamic range across the two testing points (Figure 5.12), with an increase in the average dynamic range of 15 dB. Her improvement in the total number of semitones sung was smaller, with only two additional semitones sung.

Subject 6 showed a lesser degree of change. Her phonetogram (Figure 5.13) showed a greater facility for soft singing, which was reflected in an additional 7 dB in the average dynamic range, but she was only able to increase her total semitones sung by one.

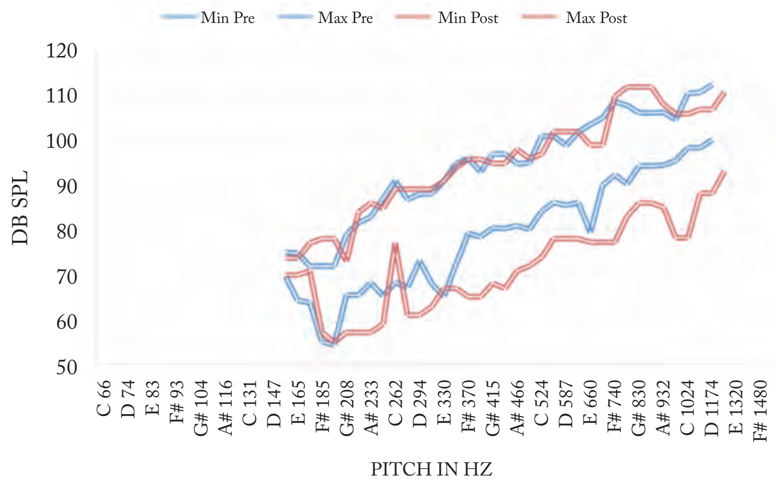


Figure 5.13 Phonetogram of a female subject from the Experimental group showing a lesser degree of change

Perceptual judgments

Perceptual judgment remains one of the most important ways to evaluate voices. This is particularly important when the singing voice is under scrutiny. The opinion of trained judges is considered to be highly valuable for identifying change. Judge preferences were taken into account in this study by giving a value of 1 when the judge preferred the pre-training recording, and a value of 2 if they preferred the post-training recording. The results are shown in Table 5.8.

Table 5.8 Judge's preferences for recording of 'Caro Mio Ben' by group

Group	*M*	*SD*	*t*	*df*	Sig (2-tailed)
Control	1.41	0.36	−2.624 *	27	0.014
Experimental	1.73	0.29			

Note. * = $p < 0.05$.

These results (Table 5.8) indicate that more of the post-training recordings from the Experimental group were preferred over those pre-training. In the Control group however, a greater number of the pre-training recordings were preferred.

Maximum phonation times

Maximum phonation times (MPT) were recorded by asking the subjects to take a breath and sustain the required vowel for as long as possible, at a comfortable level of loudness. A standard microphone was used for the recording. The results are detailed below in Table 5.9.

Table 5.9 maximum phonation times in seconds via the microphone for recordings /a/ and /i/, with results from paired t-tests assessing difference across the training

Group/Task	*M*	*SD*	*t*	*df*	Sig. (2-tailed)
Control					
/a/ Pre /a/ Post	20.33 22.22	6.01 7.02	−1.561	13	0.142
/i/ Pre /i/ Post	23.34 24.18	6.86 6.91	−0.706	13	0.493
Experimental					
/a/ Pre /a/ Post	17.94 18.19	4.30 3.91	−0.255	14	0.803
/i/ Pre /i/ Post	18.93 19.63	4.37 4.87	−0.933	14	0.366

Note. Pre = January (pre-training), Post = March (post-training).

There were no significant differences observed post-training within either the Control or Experimental groups. Both groups showed a slightly longer phonation time post-training, than at the initial assessment, but these differences were not statistically significant. Analysis of the results between groups showed a longer phonation time for the /i/ vowel in the control group at the post-training recording, (t = 2.058, df = 27, p = .049). The difference is very similar to that observed between the two groups pre-training, and suggests that the difference seen on initial assessment has continued to exist.

In conclusion, although there was no improvement in the maximum phonation times or mean airflow measures in the study, there were very significant improvements in the dynamic ranges and airflow tracing morphology that could be attributed to the Accent Method. Trained and experienced judges also preferred the singing of the students who had received the Accent Method training.