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STUDENTS REPORT
SUBJECTIVE EFFECTS OF TRAINING
BY USE OF PHONATION TUBE
ON SINGING TECHNIQUE

Research report (pdf)

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ABSTRACT

Background: Voice therapy aims at curing voice problems. Various studies on persons with voice disorders have shown positive effects of therapy with the method using a so-called phonation tube. **Purpose:** The purpose of this project was to investigate student reported effects of training by use of phonation tube on the singing technique. **Methods:** The training was performed by eight students, studying at the Malmö Academy of Music at Lund University to become music teachers. All students in this study had a less-than-perfect singing technique in common. The students filled out questionnaires concerning self-evaluations of their vocal abilities before and after the training. They wrote logbooks during the training period of two weeks. They also wrote conclusive summaries after the training. The voices of the students were perceptually assessed by two speech therapists and registered by so-called phonetograms. The students underwent clinical examinations by a phoniatician. **Results:** In this thesis the data gathered from the reports of the students are described and analyzed. All eight students reported improvements as described in thematic analysis after two weeks training with the phonation tubes. The improvements described by the students concerned not only better rand voice, better control, greater depth and increased range but also increased self-confidence and clear awareness of the singing technique. **Conclusions:** The estimation of the participants' answers before and after the training indicates substantial effects regarding almost every aspect that is of importance concerning the technique of singing. The results speak in such a way that there is reason to continue this pilot study with a thorough study based on a more sophisticated training program with the phonation tube.

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CONTENTS

ABSTRACT.....	2
ACKNOWLEDGMENTS.....	3
1. INTRODUCTION.....	5
1.1 Experiences of teaching in singing.....	5
1.2 Aim of the study and research question.....	6
2. BACKGROUND.....	6
2.1 On voice training methods.....	6
2.2 On phonation into a tube as a voice training method.....	7
3. METHOD.....	8
3.1 Participants, ethical approval and permission.....	8
3.2 Methodological considerations.....	9
3.3 Material.....	9
3.4 The procedure - that lasted three weeks.....	11
3.5 Analysis of collected material.....	12
4. RESULTS.....	12
4.1 Change – no change.....	12
4.2 Thematic results, based on conclusive reports.....	14
5. DISCUSSION.....	16
5.1 Discussion of results.....	16
5.2 Discussion of method.....	19
6. CONCLUSIONS.....	19
REFERENCES.....	20

1. INTRODUCTION

1.1 Experiences of teaching in singing

I work as a senior lecturer in singing and as a speech therapist at the Malmö Academy of Music, Lund University.

Research and descriptions of experiences show that many persons, having completed their studies to become teachers, after some time in their work are affected by voice problems (Lyberg Åhlander, 2011). Similar observations have been made concerning students already during early years of their studies. Simberg, Laine, Sala & Rönnekaa (2000) in a study conducted in order to find out the prevalence of voice disorders among students studying to be teachers, found that 20 % of the studied population reported two or more vocal symptoms and that 19 % had an organic voice disorder. Kooijman, de Jong, Thomas, Huinck, Donders, Graamans & Schutte (2006) found in a study concerning risk factors for voice problems, that teachers who experienced voice problems during their training reported more voice problems during their career.

From personal experience at the Academy of Music I can say that every semester there are a dozen students having such speech/voice problems that they are in need of a speech therapist. In such cases I have, inspired after a lecture by Simberg, introduced them to and supervised them in voice-training with phonation tube (Simberg, 2009). The students have reported immediate and good effects of this training.

Of the 30 students I teach singing and speech to every semester, approximately 15 have an unsatisfactory singing technique.

After more than 20 years of professional experience I have arrived at the conclusion that the problems described below occur frequently among students in singing.

Lack of: *self-confidence, ability to manage dynamics (i.e. power / strength to sing loudly and variation of dynamics and/or volume).*

Incapacity to: *support airflow (struggling to control flow) and/or verbalize concepts within topic.*

Not satisfactory: *range, vowel-equalizing, tone quality / timbre, voice speed, flexibility, elasticity and/or smoothness, control of vibrato in throat or in larynx and/or body consciousness.*

Problems with: *different register and register passages . Inability to relax – problems with tension/inability to relax, leaky voice, nasality, tiredness, exhaustion, hoarseness, voice stability (especially with difficult passages), and/or applying or putting into practice a good song technique (automate and connection).*

Confused: *picture of singer's own voice.*

No perfection: *when it comes to rand song that is control of larynx muscles, compactness, perhaps low in volume, core tone.*

(Personal, professional experience 1987 – 2011.)

It goes without saying that the problems mentioned are very serious for those persons who, when they have completed their studies, must be able to use their voices satisfactorily in classroom settings, at concerts or in work with choirs.

I follow research on voice training in order to find new methods of training that can be used in order to give the students a good singing technique. The problem is that it is difficult to find evidence-based methods in singing technique.

During the last few years interesting reports have been written about voice therapy using the phonation tube. Reports about this method (Story, Laukkanen & Titze, 2000, Simberg, 2001, Bele, 2005, and Gaskill & Erickson, 2010) seem to provide enough evidence to test this as a training method in order to obtain a good singing technique.

It was now possible for me to test this method on the students at the Academy of Music. I wanted to find out how the students experienced phonation tube training on their own singing-technique.

1.2 Aim of the study and research question

The aim of the study is concentrated on the research question whether the students experience changes in their singing technique after phonation tube training. In this study the focus is on the participants' own self-evaluations and reports. This study is to be regarded as a pilot study aiming at knowledge concerning effects of phonation tube training on singing technique. The hypothesis was that when training with the phonation tube can be used as voice therapy for persons with voice problems (Simberg, 2001) it is likely to presume that such training also can improve students' singing technique. The research question is the following: What is reported by the students as subjective effects by use of phonation tube training? The project reported here concerns a study during which students at the Malmö Academy of Music have been given the opportunity under supervision to test phonation tubes as a new training method.

2. BACKGROUND

2.1 On voice training methods

A basic thought for this study is that voice training can have effects on students' experiences such as learning and self-confidence. Before looking at studies on phonation into a tube as a voice training method, it might therefore be appropriate to take a glance at studies concerning general voice training. Broaddus-Lawrence, Treole, McCabe, Allen & Toppin (2000) studied the effects of vocal hygiene education on the vocal hygiene behaviours and perceptual vocal characteristics of untrained singers. Eleven adult untrained singers participated in the study.

Results revealed minimal changes in vocal hygiene behaviours and perceptual voice characteristics. However, the participants did report a high degree of benefit and learning.

There are not many qualified studies on students and their experiences of voice training. But Timmermans, De Bodt, Wuyts & Van de Heyning (2004) performed a study in order to define the long-term influence of vocal hygiene education and the effectiveness of voice training in 46 students. The objectively measured voice quality of the trained group improved significantly due to training. The outcome of the study proved to be positive and emphasized the need for well-organized voice training in future professional voice users. – In this context it is also of interest to note that Hazlet, Duffy & Moorhead (2011) presented a review of the impact of voice training on the vocal quality of professional voice users. Their findings indicated that there was no conclusive evidence that voice training improved the vocal effectiveness of professional voice users. But they also found that some studies did show that voice training significantly improved the knowledge, awareness, and quality of voice. They emphasized the need for robust research to empirically confirm this.

Another basic thought for this study is that the phonation tube can be a means of improving the technique of singing by creating a clear awareness. Benninger (2010) argued the following:” *The human voice is not only the key to human communication but also serves as the primary musical instrument. Many professions rely on the voice, but the most noticeable and visible are singers.*” (Benninger 2010, p.1.) Benninger also gave an overview of the care and prevention of professional voice disorders and concluded that the care of the singer requires an in-depth understanding of the anatomy of the voice and the intricate physiological principles that result in elite voice production.

2.2 On phonation into a tube as a voice training method

Phonation tubes have been used as a form of voice therapy in a number of countries for several years. . In some cases beneficial effects have been noted from this form of therapy, but the mechanisms behind the effects are unknown, thus the need for more research.

Voice therapy by artificial extension of the vocal tract has been described by, among others, Story, Laukkanen & Titze (2000), and by Bele (2005). Phonation into a glass tube, whose free end is held down in water, has been used as a method of voice therapy in several countries, as early as the 1960s. These so-called phonation or resonance tubes are used in different ways depending on the patient's diagnosis and the purpose of the voice therapy. Simberg (2001) has described the most common ways to use the phonation tubes. She has also (2009) given a detailed scheme how to perform the training.

Further, in a study, investigating the principles behind training and therapy approaches that use semi-occluded vocal tract shapes, Titze (2006) summarized that epilarynx tube narrowing can make the voice more efficient and more economic in terms of tissue collision.

Titze and Laukkanen (2007) studied the question whether vocal economy in phonation can be increased with an artificially lengthened vocal tract. They concluded by stating that phonation into a tube may assist a trainee in finding an optimal glottal and epilaryngeal setting for the greatest vocal economy.

Gaskill and Erickson (2010) have in a recently published study stated that the use of resonance tubes can have a distinct effect on glottal closure, but that the mechanism behind this change remains unclear. They underline that the implication is that vocal loading techniques such as this need to be studied further, with specific attention paid to the underlying mechanism of any measured changes in glottal behaviour, and especially to the role of instruction and feedback in the therapeutic and pedagogical application of these techniques.

It is possible to conclude that several studies indicate good effects in voice therapy of the training by use of the phonation tube. However – no reports concerning the subjective effects on singing techniques can be found.

3. METHOD

3.1 Participants, ethical approval and permission

All 23 students, studying to become music teachers and attending the author's course at the Malmö Academy of Music on the art of singing, were invited to participate in the study. The students were informed that the participants in the study should be transported by car from the Academy in Malmö to the Department in Lund and back again, but that no remuneration for the participation should be paid. – After this invitation 15 students declared their interest to participate.

To be included in the study the students had to meet the following conditions:

- 1) They had, due to logistics, to be able to come on two different occasions, before and after the training, to the Department of Logopedics, Phoniatics and Audiology in Lund. on the first occasion to take part in medical examinations by a phoniatrician, for registrations of phonetograms and for recordings of a song. In the second occasion to repeat the same procedures.
- 2) They had to be willing to train and report their training with the phonation tube for two weeks in the assigned period.
- 3) If it was observed during the first laryngeal examinations that the student was affected by any disease of the vocal cord, that student could not take part in the study.

Having taken note of these conditions, eight students confirmed that they could participate in the study. All eight students, six women and two men, participated in and completed the study. Hereafter they will be called A – H. Their ages were 24 – 25. Four of them have singing as “main instrument” in their studies at the Academy.

The ethical committee at Lund University, Department of Logopedics, Phoniatics and Audiology vetted and approved of the study.

The performing of the study was approved by the head-masters of the Malmö Academy of Music on January 31, 2011.

3.2 Methodological considerations

The question whether the use of the phonation tube can be a means of improving the technique of singing can be examined with different methods. This study – which should be regarded as the first part of a larger study - is concentrated on **the subjective effects** of the students' training.

It is the intention, at a later date, to conduct a “cross-examination” based on the observations registered by the author as the students' teacher and speech therapist, on the audio-recordings of the students' singings of the traditional song “Ack Värmeland Du Sköna”. This song was chosen because of its great range and the fact that it requires good technique, and on the registrations by use of phonetograms performed by her experienced colleague. The phonetogram was chosen because it displays the dynamic range of the human voice in terms of both fundamental frequency (pitch) and intensity (loudness). Measured ranges can give information on the quality of the voice source. The phonetogram gives a two-dimensional representation of individual intensity and frequency ranges. (Sulter, Wit, Schutte, & Miller, 1996). The data now mentioned and already collected will not be presented in this study.

The students' self evaluations will therefore in this master thesis form the basis for the discussion of the results. This leads to the conclusion that the method used shall be evaluative, an “assessment of the impact of an intervention” (Bryman, 2009, p. 262).

One model of evaluation is that of Donald L. Kirkpatrick (Kirkpatrick, D.L. & Kirkpatrick, J., 2008). Kirkpatrick's model calls for four levels of evaluation. The levels are: *Reaction, learning, behaviour and results*. At each level the evaluator asks questions. On the *results* level Kirkpatrick has argued that some of the results that can be examined include improvement and quality changes.

Accordingly the following methods for data-collection were used: a) two open-ended questionnaires, concentrating on reactions, learning, behaviours and results, b) logbooks containing daily notes were constructed along with c) a form for conclusive commentaries in order to get exhaustive pictures of the students' opinions concerning the effects.

3.3 Material

When choosing the phonation tubes for this study the instructions given by Simberg (2009) were followed, but modified by the author to be adapted to singing technique. In conformity with the instructions the diameter of the tubes was 9 mm and the length of the tubes was 26 cm for sopranos and 27 cm for mezzo-sopranos and baritones. – The tubes were acquired from the manufacturer SCIENTIFIC-LAB GLASS AB (www.labglass.net).

Table 1. Overview of the participants' type of voice and the chosen length of tube depending of type of voice.

STUDENT	TYPE OF VOICE	LENGTH OF TUBE (CM)
A	Mezzo-soprano	27
B	Soprano	26
C	Mezzo-soprano	27
D	Baritone	27
E	Soprano	26
F	Soprano	26
G	Mezzo-soprano	27
H	Baritone	27

The questions in the questionnaires were the following:

Question 1: Where do you feel that your speech-tone level lies?

Question 2: How great is your utmost range, i.e. from the lowest to the highest tone?

Question 3: Describe the timbre/resonance of your tone/sound; i.e. rich- sound, poor-sound, pressed phonation, leakage, rich of overtones.

Question 4: What registers do you use in song and speech and where are these passages?

Question 5: How do you feel that your equalising capacity is over the whole range?

Question 6: How do your passages function?

Question 7: Where in your range is your best sound? Tessitura.

Question 8: What do you consider to be your technical singing strengths? Write at least three things, preferably in order!

Question 9: What do you feel are your technical singing problems?

Question 10: What do you want to improve?

In order to implement the training program a training scheme had been prepared by the author. The scheme is detailed and based on vocal technical exercises. The scheme comprises different exercises, intended to be performed ten minutes in the morning and ten minutes in the evening. As this schedule shall be given copyright protection, it is not published in this thesis.

3.4 The procedure- that lasted three weeks

Day 1, Day 4, Day 7 – 21 and Day 24.

3.4.1 Information to participants

Day 1

The participants were informed about previous research, the laryngeal examinations by use of laryngoskopi (the examination of the throat performed by a phoniatician using a laryngoscope), the phonetograms, the airflow measurements and the recording of a song. The students were also informed of the possibility of obtaining a minor local anaesthesia if so desired.

Thereafter the students were informed about the questionnaires to be answered before and after the training, the schedule for observations during the training (“the logbooks”) and the paper concerning each student’s conclusions after the training.

All students were given written information about what had so far been mentioned, studied it and signed the information note. Each one of the students received a phonation tube, the training scheme and a plastic bar – the same size bar for every student.

Then the students were informed how to perform the training and when and how much time to use during the period of two weeks. The information was based on the already mentioned instructions, written by Simberg (2009), but modified by the author. According to the author’s scheme the tube must be held 1 – 2 mm between the upper and lower lips and the end of the tube should be held 1 – 2 cm below the surface of the water. The participants were also informed that the training should take place twice every day during the two weeks of training, ten minutes in the morning and ten minutes in the afternoon.

The participants were also given a schedule of “singing” to be performed during the exercise.

3.4.2 The first laryngeal examinations and the registrations

Four days later all participants were examined by an experienced phoniatician, with high-speed-imaging at the Department of Logopedics, Phoniatrics and Audiology in Lund. The examinations showed no sign of effects by disease of the vocal cords. Thereafter the registrations of the phonetograms took place in the department’s studio. The students’ singings of the Swedish song “*Ack Värmeland Du sköna*” were registered in the studio. – The participants also underwent an airflow measurement performed by an experienced specialist using the Phonatory Aerodynamic System (PAS), Model 6600.

3.4.3 The self evaluations and the training

Before the start of the training **day 7** all students answered the questions in the first questionnaire.

From **day 7 to day 21** the students performed their training and gave descriptions in their logbooks.- The author was available every day at the Academy, prepared to answer questions.

After two weeks of training and logbooks the students answered the questions in the second questionnaire. At the same time they wrote their conclusions.

All logbooks and papers were collected.

3.4.4 The second laryngeal examination and the second registrations

Day 24 all participants were examined a second time by the same phoniatician, with the high-speed-imaging. The second laryngeal examinations showed that student H had a slight cold. A control question about whether this cold had been an obstacle for him in performing the training got the answer that there had been no problems at all.

Thereafter the registrations of the second phonetograms took place in the department studio. The students' second singings of the Swedish song "*Ack Värmeland Du sköna*" were registered in the studio. Due to computer problems it was not possible this time to perform acoustic measurements.

3.4.5 The registrations

All registrations were done in the studio and with the appropriate software of the Department of Logopedics, Phoniatics and Audiology in Lund.

3.5 Analysis of collected material

The analysis in this study is based on the students' answers on the two self-evaluations (before and after the training) and the conclusive statements. The logbooks were checked in order to see whether the students had followed the training program. As mentioned above the data from the registrations will not be treated in this thesis.

After the analysis all material was translated into English.

4. RESULTS

4.1 Change – no change

Table 2 shows the reported results concerning change/no change. The concept "**change**" has in this thesis been used in order to define answers that show improvement of self-knowledge and identity, developed talents and potential, and realized aspirations. The concept is not limited to self-development but includes knowledge for developing others, in roles such as teacher, musician or conductor of a choir. Finally, as personal development takes place in the context of institutions, it also refers to the methods, programs, tools, techniques and assessment systems that support human development at the individual level in organizations.

Table 2. Summary of the participants' answers concerning change or no change after training.

Participants:	A	B	C	D	E	F	G	H
Questions:								
1. Where do you feel that your speech-tone level lies?	1	1	0	1	1	1	0	1
2. How great is your utmost range, i.e. from the lowest to the highest tone?	1	1	1	1	1	0	1	1
3. Describe the timbre/resonance of your sound; i.e. rich- sound, poor-sound, pressed phonation, leakage, rich of overtones.	1	1	1	1	1	0	1	0
4. What registers do you use in song and speech and where are these passages?	1	1	1	1	0	1	0	1
5. How do you feel that your equalising capacity is over the whole range?	0	0	1	1	1	1	0	1
6. How do your passages function?	0	1	1	1	1	1	1	1
7. Where in your range is your best sound? Tessitura.	1	0	0	0	0	0	0	1
8. What do you consider to be your technical singing strengths? Write at least three things, preferably in order!	1	1	1	1	1	1	0	1
9. What do you feel are your technical singing problems?	1	1	1	-	1	0	1	1
10. What do you want to improve?	1	1	0	1	1	1	1	0

Table values 0 and 1 are based on a comparison of responses in the same questionnaire completed by the eight participants before and after training. The value 0 indicates no change while the reported value of 1 means change of any kind.

4.2 *Thematic results, based on conclusive reports*

4.2.1 Some definitions

The concept *rand register* is defined as falsetto register with the addendum that vocal fold vibration occurs only in the vocal fold edges. For the female singing voice is used in addition to chest register the term middle register for the middle part of the range. For the highest part of the range the term head register might be used (Sundberg, 2001). - It should however be noted that the participants in this study – in keeping with practice at the Academy – also use the concepts *rand voice or rand register* in order to describe tightness and dense timbre. According to the participants rand voice can be used in falsetto register, middle register and head register.

The concept *equalizing* means smoothing of the differences in voice quality between different areas of pitch, vowels or registers (Sundberg, 2001).

The concept *support* is used to describe the feeling of balance between activity in the respiratory muscles and the phonation. Physiological support seems to be associated with an appropriate management of the subglottal pressure, i.e. the air pressure in the airways below the glottis (Sundberg, 2001). – At the Academy the concept support is used equally with **body anchorage**.

4.2.2 The results

The letters A – H signify the eight participants. The added letter /M, /S or /B signifies type of voice; M = mezzo-soprano, S = soprano and B = baritone.

When analysing the eight conclusive reports the following themes and aspects were discovered. Theme 1, “*Techniques of voice*”, is constituted by the eight aspects: rand voice, density and sound, control, dynamics, range, depth (as a part of range), equalizing, finding registers and nasality. Theme 2, “*Body*”, is constituted by the two aspects: body anchorage/support and efforts/relaxation. Theme 3, “*Consciousness*”, is constituted by the three aspects: awareness, self confidence and transfer/application.

Theme 1: Techniques of voice constituted by eight aspects

Aspect; rand voice (density and sound):”When the rand song works, it's easier to sing in a higher and lower pitch.” (F/S) ”My rand voice works better after practice.” (B/S) ”My voice feels tighter and has more bottom.”(B/S) ”The tube trains my rand voice well.”(C/M) ”Much better rand voice technique, which has given me a much tighter singing voice.”(B/S) ”My rand song has developed; I can pick it up when I want and keep it.” (G/M) ”My rand song came up and it felt comfortable to sing.” (H/B)

Aspect; control:”I can more easily fend off and control my vocal passages between different registers.” (C/M) ”I can control my flow and my long phrases better without becoming breathless.” (C/M) ”I can control air flow, vibrato and really everything concerning singing. I can also control and vary the lighter and darker timbre.” (E/S)” I have more control over what

I want the voice to do.”(F/S) ”Much more control on the flow, which gives me less of a struggle.” (F/S) ”It was a big eye-opener”. (F/S)

Aspect; range: ”The range has increased and I can now sing especially high tones a lot better.”(A/M) ”I can more easily sing both high but especially low.”(E/S) ”Easier to sing high tones.”(C/M)

Aspect; depth (as a part of range): ”My downward range has become greater.” (A/M) ”After just a few days of practicing, I could come down a few notes in depth”. (B/S) ”Some days during the exercise period, I have had extra depth in my voice.” (D/B)

Aspect; dynamics: ”I now have better opportunities to sing dynamically, varying between singing strongly and weakly (fortissimo and pianissimo).”(E/S)

Aspect; equalizing: ”I can now better equalize between different registers and offset registers passages”. (B/S) ”Register passages work much more equalized”. (E/S) ”I can equalize different vowels now.”(E/S) ”My voice has become more even, smoother and equal throughout the range.” (F/S) ”The voice is a whole now, smooth and equalized. The sound is finer and smoother.” (F/S)

Aspect; finding registers: ”My modal register feels more steady and easier to find when I have practiced in the tube.”(A/M) ”I have finally found the falsetto that has grown stronger and widened.” (D/B)

Aspect; nasality: ”I have been able to practice without singing nasally, which has previously been a problem.” (C/M) ”I have been practicing difficult passages without being nasal and leaky”. (C/M)

Theme 2: Body constituted by two aspects

Aspect; body anchorage/support: ”The combination of Alexander Technique and the exercises with phonation tube gave me better body anchorage and bottom in my voice.” (B/S) ”I have got more and better bottom anchorage.” (C/M) ”Now my support and my body anchoring function all the time in song.” (F/S) ”I start fast with rooted anchorage in the body and voice.” (F/S) ”I have found it difficult to feel rooted in my song, but after staccato-exercises in the tube, I feel a lot more body anchorage” (G/M).

Aspect; efforts/relaxation: ”I have been able to relax when practising.” (C/M) ”I often experienced fatigue in the throat after many exercise periods.” (D/B) ”I never get hoarse now. I feel no tension when singing.” (E/S) ”The volume functions easier and more relaxed.” (F/S) ”As it is now easier to sing, I feel more relaxed when singing.” (F/S) ”I have experienced tensions when practicing”. (G/M)

Theme 3: Consciousness constituted by three aspects

Aspect; awareness: ”I have become more conscious of my singing capacity.” (A/M) ”I have been able to work more consciously on my technical difficulties.”(C/M) ”I have become aware

of my voice, its possibilities and the techniques of singing and speech. ” (H/B) ”You could say that I have awakened, got insight and understood that singing technique is important. ” (H/B)

Aspect; self confidence: ”I have obtained awareness of the voice line conditions that I have, which has increased my confidence.”(A/M) ”My confidence has improved and I am vocally good now.” (E/S)

Aspect; transfer/application: (The concept *transfer/application* is used in this thesis in order to describe the participant’s ability to use acquired technique when singing.) ”Now when I sing as usual without the tube, I think it is easier than and not as laborious as before practicing. Especially in the octave between $c^2 - c^3$. ” (G/M) ” I learned to deal with and understand the different vocal technical/technique concepts physically and cognitively.” (H/B) ”The tube is a great way to train your vocal chords.”(H/B) ”Now it is easier to apply the vocal technique that I have had trouble with, to sing easily and right and find the body anchorage and bottom in my voice.” (B/S) ”It is easier to sing at last. The voice seems fuller and richer in tone”. (B/S) “I can use more automatically the technique learnt by use of the tube into normal singing, especially the passages.” (F/S)

5. DISCUSSION

In the following text the results referring to what the participants have noted concerning change or no change after the training are discussed. Thereafter, when discussing the thematic results, the same order as shown in 4.2 will be followed. .

Finally methodological issues will be discussed.

5.1 Discussion of results

If it is possible to find a simple and inexpensive method by which students themselves can alleviate their voice problems and achieve a better singing technique, this would be greatly profitable for them as teachers and for the health care system as a whole.

5.1.1 Discussion of change or no change after training

Table 2 shows clearly that with very few exceptions changes were noted by the students after the training with the phonation tubes. In comparing the table with the students’ comments it is also possible to conclude that for most participants training improved the voice range, the timbre/ the resonance, the rand voice and the equalising capacity.

Question 1: *Where do you feel that your speech-tone level lies?*

Most participants believed that the modal voice (natural or normal voice) had changed. Conclusive comments suggest that it had dropped for almost everyone. – These answers are consistent with the conclusions drawn by Laukkanen et al. (1994) and Titze (2006).

Question 2: *How great is your utmost range, i.e. from the lowest to the highest tone?*

All but one participant reported extended range after the training. This can be explained by better relaxation. When a person trains at the low range and with this type of rand song that

makes the voice tight, that person gets an extended range. This conclusion is supported by the conclusions put forward by Gaskill and Erickson (2010).

Question 3: *Describe the timbre/resonance of your tone/sound; i.e. rich- sound, poor-sound, pressed phonation, leakage, rich of overtones.*

The majority of the participants experienced change of voice timbre. This can be explained by the fact that training with the tube induces/causes rand voice. The rand voice is characterized by i.a. density. Gaskill and Erickson (2010) have underlined that the use of phonation tubes can have a distinct effect on glottal closure.

Question 4: *What registers do you use in song and speech and where are these passages?*

The participants seem to find more registers after exercising, the same conclusions provided by the summaries, in particular modal and falsetto register. The training with the phonation tube seems to give the effect that passages cannot be forced and that the passages obtain a more natural position. This observation finds support in Titze's and Laukkanen's (2007) descriptions.

Question 5: *How do you feel that your equalising capacity is over the whole range?*

Not so great a preponderance of change reported. This can be explained by the fact that equalizing is a more abstract experience. The art of equalizing requires more of the singer and a considerable time for training.

Question 6: *How do your passages function?*

In connection with the answer on question 4 it is interesting to note that so many participants feel that the passages work better. The tube affects the passages so that the singer cannot force the passages.

Question 7: *Where in your range is your best sound? Tessitura.*

In this context the word **tessitura** describes the most musically acceptable and comfortable range for the singer; the range in which a given type of voice presents its best-sounding texture or timbre. - With two exceptions no change in tessitura was noted. It is interesting to learn from the answers that the tessitura is not affected by the training with phonation tube. There was of course no intention to obtain changes in the students' tessitura.

Question 8: *What do you consider to be your technical singing strengths? Write at least three things, preferably in order!*

It is noteworthy that the technical problems of a singer - that are often difficult to access - have changed. This is positive and shows effects of the training.

Question 9: *What do you feel are your technical singing problems?*

The conclusion noted under question 8 also applies to question 9.

Question 10: *What do you want to improve?*

The two baritones and one soprano report certain efforts when training with the tube. That soprano has a dramatic voice, and that kind of singer often has difficulties in the beginning of the studies singing softly and with rand voice. The training with the phonation tube has probably been good for her, but difficult to perform with such a large voice. The men describe efforts. The fact that one is a beginner may explain the troubles for him.

5.1.2 Discussion of thematic results

In the following text, the results are discussed in the same order as shown in 4.2.

Theme 1: Techniques of voice

Aspects; rand voice (density and sound), control and depth: It should be mentioned that these aspects are among the most difficult for the teacher. It is therefore very positive that the results in these parts indicate a good way of learning. Titze (2006) has given a good explanation of the effects of training with phonation tube in these respects.

Aspect; dynamics: Not too far-reaching conclusions can be drawn when discussing the results of the training on *dynamics*. It is perhaps presumptuous to assume that there can be a slight change in behaviour based on better self-confidence, but it might be so that a teacher's individual training of the student is necessary to obtain satisfactory results.

Aspects; range and equalizing: The participants' comments concerning *range and equalizing* give rise to the conclusion that their learning of the training method and their handling of the training have improved their capacities in these respects – two essential parts of the singer's technique.

Aspects; finding registers and nasality: When looking at the comments concerning *finding registers and nasality* it is interesting to note that the participants refer the good results to the training with the phonation tubes.

Theme 2: Body

Aspect; body anchorage/support: Such good results cannot have been achieved without positive reactions to the training method and following the indicated way of training.

Aspect; efforts/relaxation: Positive reactions to the training method combined with daily training seem to have had good results for most of the participants concerning *efforts/relaxation*. If "no tension when singing" can be achieved by this training method, the method will be of considerable interest for teachers at the music academies.

Theme 3: Consciousness

Aspects; awareness and self confidence: Here the author found that the participants' reactions when learning the method were quite positive, that the log-books clearly show that they conscientiously followed the training scheme and that results are good. The author argues that those two themes are among the most important for a singer.

Aspect; transfer and application: Several positive comments were given regarding *transfer and application*. The author thinks that the following quotation can be the conclusive comment: "I learned to deal with and understand the different vocal technical/technique concepts physically and cognitively" (H).

5.2 Discussion of method

The qualitative method used for this study gives a good picture of the reactions of the participants after the performed training. From the Table 2 it is also possible to understand that the training program had comprehensive impact on the voices of the majority of the participants.

I'm conscious of the fact that my role as a teacher can have had an influence on the students' reactions after the training. As a teacher at the Academy I have significant authority that is reinforced by my role as a speech therapist. The students depend on and trust me. - These observations call for cautious and careful conclusions.

6. CONCLUSIONS

The aim of this study was to investigate self reported effects of training by use of phonation tube concerning the technique of singing.

It should be noted that one female participant (G) in her conclusive report declared that she to some extent felt difficulties in finding positive effects. The baritones D and H experienced tensions when using the phonation tube. - All participants, however, have in their conclusive reports declared positive effects of the training with the phonation tubes.

The reports given in the participants' conclusive comments indicate that the participants experienced many positive effects. A cautious estimate of the participants' answers before and after the training indicates substantial effects regarding almost every aspect that is of importance to the technique of singing.

A final conclusion, based on the participants' answers before and after the training as well as their conclusive comments, might be that there is every reason to continue this research project with a thorough study based on a more sophisticated training program.

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