IMPROVING VOICE QUALITY IN PULMONARY-
ASSISTED ALARYNGEAL SPEAKERS THROUGH THE APPLICATION
OF SINGING TECHNIQUES

DOCUMENT

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Musical Arts in the Graduate
School of the Ohio State University

by

Kimberle I. Moon, B.M., M.M.

*

The Ohio State University

1984

Reading Committee:

Professor Mario Alch
Dr. Jerry Lowder
Professor Helen Swank

Approved by:

Adviser
School of Music

Co-Adviser
School of Music
To Janell and Cratty
ACKNOWLEDGMENT

For her generous and invaluable assistance in preparation of this document Professor Helen Swank has earned my genuine gratitude. Sincere appreciation is also hereby expressed to Professor Mario Alch and to Dr. Jerry Lowder who worked with Professor Swank in comprising the reading committee for this paper.

I would like to acknowledge Dr. Jane Jarrow for the time, counsel and valuable insight relating to the physiological, social and emotional needs of the female laryngectomee which were most generously shared with me.
VITA

February 3, 1952 . . . . . . Born - Dayton, Ohio

1974 . . . . . . . . . . . Bachelor of Music in Voice
Ohio University
Athens, Ohio

Summer 1975 . . . . . . Studies in Voice and Opera
The American Institute of Musical Studies
Graz, Austria

1976 . . . . . . . . . . . Master of Music in Voice
Ohio University
Athens, Ohio

1978-79 . . . . . . . . French Teacher
Miamisburg Middle School
Miamisburg, Ohio

1979-80 . . . . . . . . German Teacher
Stebbins High School
Dayton, Ohio

1980-81 . . . . . . . . Director of Theatre and
Instructor of Voice and Piano
Chipola Junior College
Marianna, Florida

1981-84 . . . . . . . . Graduate Teaching Associate
The Ohio State University
Columbus, Ohio

FIELDS OF STUDY

Major Field: Voice Performance

Studies in Applied Voice, Professor Helen Swank
Studies in Speech Pathology. Dr. Jane Jarrow

Studies in Vocal Pedagogy. Professor Helen Swank

PERFORMANCES

Recital 1

Kimberle Moon, soprano

Graduating Recital Series
Wednesday, May 4, 1983
8:00 p.m. Weigel Auditorium

Richard Rytel, piano

Assisted by:
Rick Moon, tenor

Supervised by:
Professor Helen Swank

Presented in partial fulfillment of the requirements for the degree Doctor of Musical Arts

PROGRAM

I

Seufzer Tränen . . . . . . . . . . . . . J.S. Bach
from Kantata #21
Amarilli, mia bella . . . . . . . . . . . . . . G. Caccini
Se Fiorindo è fedele . . . . . . . . . . . . . A. Scarlatti

II

Vier Letzte Lieder . . . . . . . . . . . . R. Strauss
Frühling
September
Beim Schlafengehn
Im Abendrot
INTERMISSION

III

Le Paon ................. M. Ravel
Le Grillon .............. M. Ravel

from Histoires Naturelles

Au bord de l'eau ........ G. Fauré
Notre Amour ............ G. Fauré

IV

Silver Swan ............. N. Rorem
A Piper ................ J. Duke
At the Cry of the First Bird ...... D. Guion
I'm a Person, Too .......... L. Bernstein

from I Hate Music

Tell Me, O Blue, Blue Sky .... V. Giannini

V

Sempre libera ............... G. Verdi

from La Traviata

Recital 2

Kimberle Moon, soprano

Graduating Recital Series
Sunday, March 4, 1984
8:00 p.m. Weigel Auditorium

Timothy Huffman, piano

Assisted by:
Maria Annoni, guitar & lute
Steven Jobe, viola da gamba

Supervised by:
Professor Helen Swank

Presented in partial fulfillment of the
requirements for the degree Doctor of Musical Arts
PROGRAM

I

It was a lover and his lass ...................... T. Morley
Flow my tears .................................... J. Dowland
Never love unless you can ....................... T. Campion

II

Du bist wie eine Blume ............................... R. Schumann
Du bist wie eine Blume ............................... A. Rubinstein
Du bist wie eine Blume ............................... F. Liszt
Allerseelen .......................................... E. Lassen
Allerseelen .......................................... R. Strauss

INTERMISSION

III

Clair de Lune ....................................... G. Fauré
Clair de Lune ....................................... C. Debussy
Mandoline ........................................... G. Fauré
Mandoline ........................................... C. Debussy

IV

Prayers from the Ark ............................... T. Kirk
  The Prayer of the Little Bird
  The Prayer of the Goldfish
  The Prayer of the Cat
  The Prayer of the Lark
  The Prayer of the Butterfly
  The Prayer of the Dove

V

Caro nome che il mio cor .......................... G. Verdi
  from Rigoletto

vii
Recital 3
Kimberle Moon, soprano
Graduating Recital Series
Wednesday, May 9, 1984
6:00 p.m. Weigel Auditorium

Timothy Huffman, piano

Supervised by:
Professor Helen Swank

Presented in partial fulfillment of the
requirements for the degree Doctor of Musical Arts

PROGRAM

I
O, Worse than Death
Angels Ever Bright and Fair ......... G.F. Handel
from Theodora
O! Had I Jubal’s Lyre ............. G.F. Handel
from Joshua

II
Frauenliebe und Leben ............. R. Schumann
Seit ich ihn gesehen
Er, der Herrlichste von allen
Ich kann's nicht fassen nicht glauben
Du Ring an meinem Finger
Helft mir ihr Schwestern
Süßer Freund
An meinem Herzen
Nun hast du mir den ersten Schmerz getan

INTERMISSION

viii
III

Prendi per me sei libero ............... G. Donizetti
from L'Elisir d'Amore

Una voce poco fa ..................... G. Rossini
from Il Barbiere di Siviglia

IV

Adieu notre petite table ............... J. Massenet
from Manon

Ah! Je veux vivre ..................... C. Gounod
from Roméo et Juliette

V

Embroidery ............................. B. Britten
from Peter Grimes

Zerbinetta's recitative and aria .......... R. Strauss
from Ariadne auf Naxos

Recital 4

Kimberle Moon, master teacher
Friday, May 25, 1984
12:00 p.m.
Room 13 Hughes Hall

Assisted by:
James Gallagher, piano
Carlton Weber, piano
Jack Hennette, piano

Supervised by:
Professors Mario Alch & Helen Swank

Presented in partial fulfillment of the
requirements for the degree Doctor of Musical Arts

PROGRAM

ix
Angels Ever Bright and Fair ........ G.F. Handel
Lori Lazenby, vocalist

An die Laute ................ F. Schubert
Jennifer Gast, vocalist

Jesus, Jesus Rest Your Head .... folk song
Kathy Parsley, vocalist

The Crucifixion ................. S. Barber
Lora Roberts, vocalist
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEDICATION</td>
<td>ii</td>
</tr>
<tr>
<td>ACKNOWLEDGMENTS</td>
<td>iii</td>
</tr>
<tr>
<td>VITA</td>
<td>iv</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xii</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td><strong>Chapter</strong></td>
<td></td>
</tr>
<tr>
<td>I. THE LARYNGECTOMY</td>
<td>3</td>
</tr>
<tr>
<td>II. POST-LARYNGECTOMY VOCAL REHABILITATION</td>
<td>10</td>
</tr>
<tr>
<td>Recent Developments in Speech Restoration</td>
<td>12</td>
</tr>
<tr>
<td>III. THE DEVELOPMENT OF GOOD POSTURE</td>
<td>14</td>
</tr>
<tr>
<td>IV. THE DEVELOPMENT OF EFFICIENT BREATHING</td>
<td>18</td>
</tr>
<tr>
<td>FOR SPEECH</td>
<td></td>
</tr>
<tr>
<td>Inhalation</td>
<td>18</td>
</tr>
<tr>
<td>Exhalation and Breath Management</td>
<td>23</td>
</tr>
<tr>
<td>V. THE DEVELOPMENT OF EFFECTIVE Resonance</td>
<td>26</td>
</tr>
<tr>
<td>FOR SPEECH</td>
<td></td>
</tr>
<tr>
<td>VI. THE DEVELOPMENT OF ARTICULATE SPEECH</td>
<td>37</td>
</tr>
<tr>
<td>Consonants</td>
<td>40</td>
</tr>
<tr>
<td>VII. CONCLUSION</td>
<td>43</td>
</tr>
<tr>
<td>LIST OF REFERENCES</td>
<td>45</td>
</tr>
</tbody>
</table>
## LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>T-shaped incision is made in the neck</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>Suprahyoid muscles detached and infrahyoid muscles divided</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>Inferior constrictor muscles divided</td>
<td>5</td>
</tr>
<tr>
<td>4.</td>
<td>Surgical removal of the laryngeal mechanism</td>
<td>6</td>
</tr>
<tr>
<td>5.</td>
<td>Removal of excess tissue before the esophagus is sealed</td>
<td>6</td>
</tr>
<tr>
<td>6.</td>
<td>Suturing of mucosa -- first layer</td>
<td>7</td>
</tr>
<tr>
<td>7.</td>
<td>Suturing of sub-mucosa -- second layer</td>
<td>8</td>
</tr>
<tr>
<td>8.</td>
<td>Suturing of muscles -- third layer</td>
<td>8</td>
</tr>
<tr>
<td>9.</td>
<td>Suturing of trachea to the neck</td>
<td>9</td>
</tr>
</tbody>
</table>
INTRODUCTION

Many years of experience as a singer and a teacher of singing have provided me with a wealth of knowledge about the human voice and how it functions. This knowledge has helped me repeatedly in dealing with various vocal problems both in my own singing and in that of my students. A constant search for a more thorough understanding of the voice led to further study in the area of speech pathology on the assumption that greater knowledge of the speaking voice would improve my vocal teaching skills. It was at this time that I learned of the medical procedure called laryngectomy and came into contact with persons whose lives had been devastated by this surgery.

As a teacher of singing it has been my responsibility to alter the quality of the voice in order to achieve an aesthetically pleasing tone. The many ways of altering voice quality (by correct posture, breath support, diction, etc.), suggested that these techniques could be used to assist laryngectomees in approaching an acceptable voice quality.

This work has been designed for use with female laryngectomees, specifically pulmonary-assisted alaryngeal
(p.a.a.) speakers (Trudeau, 1982). While it is impossible to draw a profile of the "ideal" client, this group has been targeted because of the ability of these speakers to sustain voicing for longer periods of time than that of esophageal speakers.

The purpose of this document is to aid speech clinicians in furthering post-laryngectomy rehabilitation therapy through the use of vocal teaching techniques. It is hoped that through these singing techniques, p.a.a. speakers will be taught to maximize the acceptability of voice quality and intensity by altering resonance properties and increasing pulmonary air intake and its exhalation management.
CHAPTER I

THE LARYNGECTOMY

The devastation to the life of a laryngectomee is readily understood upon examination of the laryngectomy surgery. A laryngectomy is the surgical removal of the larynx and generally involves the total extraction of the laryngeal mechanism. Although this procedure may be performed for a variety of reasons, it is usually carried out to stop the spread of cancer of the larynx. The following drawings of the laryngectomy procedure (Figures 1-9) are reprinted with permission from CLINICAL SYMPOSIA, illustrated by Frank H. Netter, M.D., © Copyright 1964 CIBA Pharmaceutical Company, Division of CIBA-GEIGY Corporation. All rights reserved.

Figure 1. T-shaped incision is made in the neck.
As seen in Figure 1, a T-shaped incision is made in the neck to expose the laryngeal mechanism. Figure 2 shows the sternohyoid, sternothyroid, omohyoid and (Figure 3) the inferior constrictor muscles which are divided in order to reach the cancerous larynx.

Figure 2. Suprahyoid muscles detached and infrahyoid muscles divided.
Figure 3. Inferior constrictor muscles divided.

Figures 4 and 5 show how the hyoid bone, the thyroid cartilage and its contents, the cricoid cartilage, the upper two or three rings of the trachea, the epiglottis and the strap muscles are separated and surgically removed.
Figure 4. Surgical removal of the laryngeal mechanism.

Figure 5. Removal of excess tissue before the esophagus is sealed.
In Figures 6 and 7 the esophagus is sealed by a double suture line of mucosa to insure watertight closure, which is then reinforced (Figure 8) by reconnecting the constrictor muscles, strap muscles and the base of the tongue (Kirchner, et. al., 1963).

Figure 6. Suturing of mucosa -- first layer.
Figure 7. Suturing of sub-mucosa -- second layer.

Figure 8. Suturing of muscles -- third layer.
The trachea is then pulled forward, as seen in Figure 9, and attached to the neck creating the stoma through which the air will enter and exit the lungs.

Figure 9. Suturing of trachea to the neck.

Because a laryngectomy is major surgery, it is a traumatic experience for the body. The patient is left with a variety of physiological side effects, the most significant being the need to learn to speak again.
CHAPTER II
POST-LARYNGECTOMY VOCAL REHABILITATION

In normal speech, air coming from the lungs meets with resistance from the vocal cords setting the air into vibration. This air is then sent into the mouth where it is modified by the articulators to form speech. After a laryngectomy, the vocal cords are absent and the restructured throat no longer includes an air passage from the lungs to the mouth; therefore, traditional speech is impossible for the laryngectomee. Early attempts at speech restoration gradually gave way to two preferred methods: the artificial larynx (or electrolarynx) and esophageal speech. Both methods, however, do have disadvantages.

The electrolarynx is a battery operated vibrator, about the size of a small flashlight with a thin, flexible disk, like a microphone on one end of the tube. This apparatus is held with the disk pressed against the upper part of the neck. The vibrations of the disk are transmitted to the oral cavity where they create a buzzing sound that is formed into speech by articulatory movements (Brodnitz, 1971). The voice produced, however, is extremely artificial and machine-like, and for that reason is socially
unappealing, especially for female laryngectomees. Moreover, this apparatus monopolizes the use of one hand, creating problems in many situations.

Esophageal speech is a method of oral communication which utilizes air that is swallowed or injected into the esophagus and expelled in controlled eructations or belches (Brodnitz, 1971). The vibration of air necessary for phonation is produced by the action of the upper sphincter of the esophagus (P-E segment). The voice produced by this method is very low and gurgling, and the length of voicing is a problem because of the smaller volume of air that can be contained in the esophagus. Normal speakers (pre-surgery) use approximately 1500 c.c. of air to support their speech efforts. With esophageal voice (post-surgery), the speaker will use 25-70 c.c. of air, producing a speech sound of limited duration (Brodnitz, 1971). If esophageal speakers rely on gastric air in an effort to lengthen their speech, they may suffer the added embarrassment of emitting stomach odors. Therefore, good esophageal speakers learn to trap air in the esophagus without letting it enter the stomach.

A further drawback is the length of time it takes to learn and to become proficient in this type of speech. Because anywhere from three to twelve months may be spent in perfecting esophageal speech, many laryngectomees become frustrated and learn to rely on written communications
(Boone, 1977) or return to the electrolarynx.

Recent Developments in Speech Restoration

The communication gap left by these traditional approaches has recently been filled by several surgical/prosthetic methods. These techniques provide a way for pulmonary air to be diverted into the esophagus, creating the continuous airflow needed for speech. At the time of the laryngectomy or as a separate surgical procedure at some time after the laryngectomy, a puncture is made from the trachea into the esophagus. A day or two after the surgery a short plastic-like tube is placed in the puncture and voicing is achieved in a matter of minutes. (Although many prosthetic devices have been developed, this writer has chosen to deal solely with the Blom-Singer prosthesis and the tracheostoma valve.)

The Blom-Singer prosthesis is a tubular-shaped apparatus. At the esophageal end of the tube, the prosthesis has a one-way valve that allows air to enter the esophagus and prohibits food or liquids from entering the stoma, or worse, the lungs. An opening at the tracheal end, near the base of the prosthesis, permits the passage of air from the lungs, through the prosthesis, and into the esophagus for speech (Jarrow and Kirshner, 1981). This process, however, will occur only when the stoma is covered by a finger or
the tracheostoma valve which is secured directly over the stoma. This valve opens to allow air to enter and leave the lungs for normal respiration, but closes during exhalation for speech in order to direct air into the esophagus.

This process of diverting the air from the lungs into the esophagus may be viewed as an extension of esophageal speech because the initial sound is like that of esophageal voice. However, the Blom-Singer prosthesis provides the ability to sustain voicing for longer periods of time. The reestablishment of continuous airflow for speech suggests that Blom-Singer prosthesis users could learn to change the quality and intensity of their voices.

The chapters that follow offer suggestions to aid the clinician in post-laryngectomy rehabilitation therapy. Objectives, verbal directives and exercises, adapted from the field of singing, are presented in an effort to increase the social acceptability of the alaryngeal voice.
CHAPTER III
THE DEVELOPMENT OF GOOD POSTURE

Controlled breathing is essential for singing; however, most people do not realize the relationship between good posture and proper breathing. Posture determines the alignment or balance of the body and good bodily alignment is the beginning of efficient breathing (Bunch, 1982).

Besides hindering the ability to use the breath properly, poor posture can create fatigue. Those persons with poor posture are capable of maintaining their physical balance but only at the cost of unnecessary muscular activity. The position of the head, in particular, is vital because it governs all postural reflexes. If the head is misaligned other parts of the body may move in and out of line to maintain balance, and thus energy is expanded to counteract the effect of gravity (Bunch, 1982). Therefore, if the body is freely aligned it can use its energies far more efficiently because all undue tension, which causes fatigue, has been removed.

In dealing with laryngectomies it is evident that the postural techniques used to increase vitality, stamina, or the laryngectomie's self-image, may also aid in improving
voice quality. Learning to freely align the body is the first step towards this goal.

In order to improve posture the client ideally should be able to keep the body comfortably erect, the neck relaxed, the chest comfortably high, and the shoulders back and down. If this is done properly the client will not appear stiff and mannequin-like, but poised and relaxed. The capabilities of each client will vary. For example, the laryngectomy surgery may involve the removal of muscles necessary to lift the chest; calcification of various cartilages, sometimes apparent in old age, may affect the position of the neck; arthritis may impair the client's ability to align the body. With these possible limitations in mind, the writer has listed the following objectives and verbal directives for improving posture.

**Target 1:** to raise the sternum and keep the chest comfortably high.

**Purpose:** to enlarge the diameter of the rib cage. With the rib cage enlarged, the lungs are permitted to fill with air more fully because the bones, which could have hindered the expansion of the lungs, have been pulled away.

**Directives:** "feel as though there is a meat hook attached to the sternum which is pulling the chest high and towards the ceiling"

"stand as though you feel proud"

"try to lift your rib cage upward and out of your waist"

"feel the muscles on the inside of your ribs pushing forward so you can keep the sternum as high as possible"
Target 2: to stretch the spine at the level of the neck.

Purpose: to enhance maximum upward extension of the neck. If the neck is allowed to pull forward during speech, the space within the oropharynx will change which in turn will change the resonances in speech.

Directives: "make your head feel like it is a spool of thread on a sewing machine - very free and able to move easily from side to side"

"feel as though a string is attached to the back of your neck and is pulling it to the wall behind you"

"feel as though you are a puppet on a string and you are hanging from the ceiling with only the string attached to the top of your head"

Target 3: to align the spine along its entire length.

Purpose: to maximize the upward extension of the entire length of the spine in order to enhance proper body alignment. This posture also creates the proper conditions needed for diaphragmatic-intercostal breathing (see Chapter IV).

Directives: "stand tall or feel proud"

"feel as though your head is attached to the ceiling and gravity is pulling the rest of your body towards the ground"

"feel as though there is a string attached to the small of your back which is being pulled to try to straighten the curve in your back"

"tuck your hips under your body slightly while you are standing"

"try to feel tall even when you are sitting"
The following exercises are suggested as a few of many possible ways of achieving the preceding postural objectives.

1. Lean forward at the waist with the knees bent and the head and arms hanging loosely. Begin to stand by slowly rolling upward as though you were stacking each vertebra one by one. It will help to keep the knees bent throughout the exercise. This may also be done while sitting.

2. Stand with your back against the wall and your feet about eight inches from the wall. Try to put the small of your back and the back of your neck against the wall, too.

3. Stand with your back, head, buttocks, and heels pressed against the wall and imagine that your body is growing freely up the wall. This exercise will help to create dynamic rather than static posture (Bunch, 1982).

4. If the client becomes too stiff, relaxation exercises may be useful. Besides the obvious types of relaxation exercises, head rotations, shaking arms and hands, etc., excellent ways of dealing with tension can be found in books on Alexander Technique, Yoga, and possibly desensitization therapy (developed by J. Wolpe).

Whatever method or methods are used to aid the client in achieving correct posture, the clinician must be certain that the "pose" is natural looking, and should not allow the client to feel like a mannequin. Any illustration or exercise to which the client may relate, whether it is ballet, football, etc., should be used. Because correct posture is the foundation for all that is presented in this document, it is imperative that at least the minimum standards of good posture be mastered before any further objectives are considered.
CHAPTER IV

THE DEVELOPMENT OF EFFICIENT BREATHING FOR SPEECH

The breath is the power upon which the voice depends, and therefore the control over the breath is the foundation of all good voice production. In teaching the client to breathe properly for speech, two important points should be kept in mind by the clinician:

1. The lungs should be inflated sufficiently without any efforts causing fatigue.

2. Adequate control over the exit of the air should be acquired to allow for steady, even, efficient, and uninterrupted airflow, turning all breath into tone.

Inhalation

The best way of filling the lungs for the purpose of speech is by the unimpeded action of the muscles of respiration, both voluntary and involuntary. The diaphragm, the primary muscle of respiration, is large and powerful and separates the lungs from the abdomen. Its outer edges are attached to the inner surfaces of the costal margin of the lower six ribs, the sternum, and two muscular slips from the first, second and third lumbar vertebrae (Bunch, 1982).
When in a non-active state, the diaphragm is curved upward into the chest cavity. In its active state, or upon inhalation, the curve lessens by contraction of the diaphragm which, moving downward, enlarges the cavity of the chest by lowering its floor. This downward movement creates a vacuum which immediately is filled by air (inhalation by diaphragmatic breathing).

The expansion of the rib cage is an additional way in which the capacity of the chest cavity can be increased. This expansion, which makes room for even more air to enter the lungs (inhalation by intercostal breathing), is necessary if maximal air intake is to be achieved.

The first stages of diaphragmatic-intercostal breathing therapy may be very difficult because most clients will have become laryngectomies as a result of cancer caused by heavy smoking (The Indianapolis Star, 1984). This may indicate that the only time diaphragmatic breathing alone may occur is during the time the client rests or sleeps, a period when the muscles of respiration are permitted to take over.

Smoking generally causes a very high chest or clavicular breathing habit which may remain a habit because of the shortened airway to the lungs after the laryngectomy surgery. Clavicular breathing is very shallow and consists of raising and lowering the chest and shoulders during inhalation and exhalation. This may be done as an extension
of diaphragmatic breathing or it may occur without much use of the diaphragm at all using imperfect expansion of the ribs. This is a deterrent to good voice quality as well as vitality because it allows the smallest amount of air to enter the lungs with the greatest amount of exertion. The lungs are smallest at the top of the chest and have the potential to contain less air than at their base. They are surrounded by hard, unyielding bones (ribs), and the effort to expand these surroundings can cause much localized fatigue. This fatigue is increased by the necessity for more frequent breaths in order to compensate for the much smaller quantity of air taken in by clavicular breathing than by other breathing methods.

Often after the laryngectomy surgery many muscles have been severed which will cause problems for the client. For someone who habitually uses clavicular breathing, the loss of control over the muscles necessary for lifting the ribs and shoulders may necessitate retraining in diaphragmatic-intercostal breathing. Because the clavicular breathing habit may be an extremely difficult one to break, the following objectives and verbal directives are suggested as ways to create some physical awareness of diaphragmatic-intercostal breathing.
Target 1: to expand the rib cage and create an awareness of lower breathing.

Purpose: to prohibit the unnecessary action of the muscles which lift the shoulders, and to promote the awareness of diaphragmatic-intercostal breathing by expanding the rib cage before inhalation. This may be very difficult if not impossible for the aging laryngectomee. Calcification and therefore hardening of the cartilages (ribs) may occur with age making intercostal breathing impossible (Bunch, 1982). However, diaphragmatic breathing still must be stressed with the emphasis perhaps being on the abdomen rather than the rib cage.

Directives: "breathe in like you are filling a glass with water - from the bottom of the glass up"

"pretend that you are inhaling space instead of air"

"as you breathe in try to feel like you are trying to yawn - a very slow and relaxed breath"

"pretend that you are sipping air through a straw as you breathe in"

"breathe in slowly like you are smelling freshly baked cookies"

"pretend that there is an inner tube around your waist and you must fill it all around as you breathe in"

"before you breathe in, feel as though you must hold up a pair of pants that are too large for you. You must hold them up with your ribs"

"feel as though there is a little man inside your rib cage pushing against the walls of your ribs"

"feel that every inhalation is pulling your shoulders to the ground"
The following exercises are suggested as ways of achieving these diaphragmatic breathing objectives.

1. Lie on the floor on your back and put a book on your stomach. As you breathe in and out make sure that the book rises as you inhale and lowers as you exhale.

2. Lie on the floor on your stomach with your head turned to one side. Relax. Concentrate on the area of your stomach and nothing else. The stomach area should move in a manner to cause the body to rise slowly on inhalation and lower slowly on exhalation.

3. Press your fingers against the bottom part of your sternum and push against your fingers as you breathe in.

4. Raise your arms above your head and breathe in. Then lower your arms keeping the chest high and breathe in again.

5. Let out all of your air and hold a few seconds. Then take a very low, very slow deep breath.

6. Bend over at the waist and place your hands on the small of your back. Try to feel your hands move as you breathe in.

7. Stick out your tongue and pant like a dog - only a few times but do it very quickly. If this is done correctly the diaphragm and ribs will bounce slightly with each pant.

8. Breathe in slowly over the count of five, and then exhale slowly. As this is repeated increase the length of the inhalation. Be sure that each breath is very low and deep.

9. Exercises in relaxation may be helpful here also. (See Chapter III - postural exercises)

These exercises may be extremely helpful in establishing diaphragmatic breathing awareness, and they also can be helpful in strengthening this breathing habit if continued after awareness has been achieved.
Exhalation and Breath Management

The application of sufficient inhalation techniques provides the proper physiological setting for efficient exhalation. The key to proper exhalation and breath management is to pace the release of the air in such a manner as to have a small amount left over at the end of each phrase without sacrificing the quality of the voice or bodily alignment. As the exhalation process begins, a different set of muscles is engaged and several areas of the body must be kept stable. As the air is released the shoulders and chest must be kept in the position achieved after inhalation. The ribs at the sides must remain in the same outward position as long as possible with the muscles constantly at work to maintain this position. The area just below the sternum, the epigastrium, must become and remain firm with pressure being added as needed until the next inhalation. The lower abdomen is no longer flaccid as it is during inhalation, but also becomes firm; pressure is applied as needed for "support".

The objectives, verbal directives and exercises described below, although intended to develop a concept of "support" for alaryngeal speech, may prove important to the laryngectomee in achieving better physiological control of bodily functions impaired by the laryngectomy surgery (bowel control, coughing, lifting, etc.).
Target 1: to improve breath management.

Purpose: to keep the breath moving dynamically during speech which will later prove of great importance in the improvement of voice quality.

Directives: "when you speak, try to feel like you are holding a ping pong ball up on a fountain of air. Keep the breath steady and constant"

"connect all the words in a phrase like you would put beads on a string"

"all the breath that comes out of your mouth must be turned into energized sound"

"try to feel as though the breath is constantly moving"

"aim the breath towards the end of each phrase"

"if you begin to run out of breath, be sure to keep the chest high and the shoulders back"

Target 2: to create muscle awareness necessary for "support".

Purpose: to increase and improve breath support by strengthening the abdominal and intercostal muscles.

Directives: "feel as though you are holding up a large pair of pants with your ribs while you are speaking"

"resist the temptation to collapse the ribs"

"think about adding extra firmness to the area about three inches below your belly-button while you are speaking"

"pretend that you are holding two large buckets of cement, one in each hand, and speak as long as you can on one breath"
The following exercises may prove helpful in achieving breath management and breath support objectives.

1. Lift a small chair or other light-weight object very slowly over your head as you speak. Try to be aware of the action of the abdominal muscles.

2. Place your thumb over the lower part of your sternum, the xiphoid process, and press against your thumb as you speak.

3. Put your hands on your ribs (at your waist) and as you speak, push your ribs against your hands for as long as possible.

4. Speak as long as you can on one breath without collapsing your chest or pulling your shoulders forward.

5. Put your arms out to your sides, parallel to the floor. Keep the elbows bent and the palms out facing the walls. Act as though you are pushing the walls away from you, always keeping your elbows bent, and then speak as this is done.

In the following chapter on resonance, it will be easy to recognize the need for the basic understanding and physical mastery of the postural and breathing techniques. These steps are of great importance, and total command of these techniques is crucial before any improvement in voice quality can take place.
CHAPTER V

THE DEVELOPMENT OF EFFECTIVE RESONANCE FOR SPEECH

For various reasons, particularly emotional and psychological ones, the female laryngectomee is in great need of ways to restore the once-feminine quality to her voice which is now perceived as very low, "ugly" and therefore socially unacceptable. The lowness of pitch is a result of the change in the vibrating mass after surgery. Whatever is left over from the laryngectomy surgery (muscles, mucosa, etc.) creates the pharyngoesophageal segment (P-E segment) which "takes the place" of the vocal cords in the alaryngeal voice. The P-E segment generally extends from the third to the seventh cervical vertebrae (C-3 to C-7) and because of the increased vibrating mass and the flaccidness of the walls of the pharynx and esophagus, the pitch and intensity of the voice is perceptibly lower. The average fundamental frequency of a normal female (pre-surgery) is approximately 230 Hz. However, after the laryngectomy surgery, the average fundamental frequency, though somewhat erratic, is approximately 65 Hz. and impaired by aperiodic noise (Keith and Darley, 1979). This drastic change in voice quality causes various social and personal problems
especially for the female laryngectomee. In an attempt to restore a more feminine quality to the voice, singing resonance techniques will be introduced. These techniques also have practical application for improving the alaryngeal speaking voice.

According to *Webster's New Collegiate Dictionary*, resonance is "a quality imparted to voiced sounds by the resonanace chamber action of mouth and pharynx configurations". Because human beings have a free resonating system consisting of cavities which can be manipulated, resonance is a controllable quality which, when skillfully managed by a singer, can contribute to the production of a quality that is "focused" yet "mellow" and "velvety". At this point these terms may be meaningful only to the singer. However, understanding of the term "focus", in particular, will be of extreme importance to the improvement of voice quality in laryngectomized women.

When describing a vocal quality, the term "focus" means to produce a more forward, out-of-the-throat sound. Because of bone conduction a "focused" sound may be felt by sensations or vibrations around the nose, cheeks and forehead. If this forward placement of the sound could be learned by pulmonary-assisted alaryngeal (p.a.a.) speakers, the voice quality could be clearer and therefore more acceptable, and the pitch and intensity of the speaking voice could be raised. For female laryngectomees whose voice at
best "could be made to sound like laryngitis" (Brodnitz, 1971), learning to apply forward placement techniques could be the beginning of restoration of a more feminine voice quality. However, as previously stated, before this quality can be developed, adequate postural techniques must be employed in order to establish the proper control over the breath which is essential if forward placement is to be achieved (see Chapters III and IV).

Once breath support techniques are employed, the p.a.a. speaker is then capable of more effectively energizing the air stream that is being sent into the esophagus. This air meets with resistance at the esophageal end of the Blom-Singer prosthesis as it forces its way through the one-way valve and then into the P-E segment. This vibrating air is then sent to the resonance cavities (the mouth and pharynx) to be modified by the tongue and other articulators to form words. Because the tongue is such a large organ, with the potential to dominate the space in the mouth, it can cause many speech and resonance changes by its shape and various positions. Other factors that may cause changes in speech and resonance are posture, the amount of breath support being utilized, the surface texture, size and shape of the pharynx, the height of the soft palate, and the way in which the jaw opens.

As discussed in Chapter III correct posture is essential if breath support techniques are to be utilized. Poor
posture also can directly affect the intensity of speech. If one speaks with a posture consisting of rounded shoulders and a collapsed chest, the effort to speak will be greatly increased because of the continuous need for more breaths. The fatigue caused by this posture will hinder the ability to speak with much volume. The intensity can be increased, however, by a more upright posture creating the conditions more conducive to steady and energized (or supported) breath flow (see Chapter IV). If the muscles needed for diaphragmatic-intercostal (or abdominal) breathing are utilized and strengthened, intensity can be increased with minimal effort.

The surface texture, size and shape of the pharynx greatly affect the quality of speech. The laryngectomee's physical ability to alter any of these conditions, however, will be determined by the extent of the surgery and the success of muscle reconstruction. Therefore, the "ideal" conditions for each client will vary widely and will be dealt with through the use of mental imagery in an effort to produce forward placement of the sound.

The height of the soft palate can aid in focusing or aiming the sound towards the nose, cheeks or forehead, by tightly closing the port between the oro- and nasopharynx. By doing so, all energized air producing sound will exit from the mouth and be utilized in producing clearly focused speech. If air is allowed to enter the nose because of a
low soft palate, the sound will diffuse, and forward placement and greater intensity cannot be achieved as easily.

The way in which the jaw opens not only determines the size and shape of the mouth opening, but also the size and shape of the pharyngeal cavity. The "ideal" conditions will vary according to each client's specific needs in regards to focus and intensity. For this reason, the way in which the jaw opens will be dealt with indirectly through the use of diction techniques (see Chapter VI).

The tongue is the largest organ in the mouth and therefore has the capacity to greatly alter intelligibility as well as the resonant production of speech. If the tongue is allowed to pull backward, away from the teeth, or rise to the roof of the mouth, the sound may be distorted because it is being trapped behind the tongue. Therefore, it is necessary to keep the tongue forward in the mouth, behind the lower front teeth, relaxed and essentially "out of the way" of speech production. By doing so, forward placement or focusing of the sound may be achieved more easily.

It is also possible for the larynsectomee to focus the sound by the use of pitch variation. Generally, the higher the pitch, the more forward the placement (Lauder, 1969). Because it may require a great deal of concentration, this exercise in focus may be exhausting, but will prove rewarding especially to the female larynsectomee
whose major concern is to raise the pitch of her speaking
voice in an effort to make the sound more feminine.

The following objectives and verbal directives are
suggested as ways of achieving a more focused sound.

Target 1: to achieve focus (or forward placement of
the sound) and greater intensity through the
use of breath support.

Purpose: to promote the use of energized, focused
and well-supported sound by activating the
necessary muscles for diaphragmatic support
through the use of mental imagery.

Directives: "as you speak, try to use enough
energized breath to blow out candles which
are across the room"

"drop the jaw loosely and add more energized
breath to the tone"

"add more weight to the sound as you speak"

"once you feel the forward placement of the
sound, you need to add more fullness to the
rest of the tone"

"spin the breath as you speak"

"try to make the sound richer as you speak"
Target 2: to focus the sound by aiming or pointing it.

Purpose: to create a "direction" for the term "focus", specifically towards the nose, cheeks and forehead. The use of mental imagery is very effective in creating forward placement in singing and should prove equally as effective in speech.

Directives: "pretend that you have a Pinocchio nose and you must try to direct the sound towards the very tip of your long nose as you speak"

"speak as if you have a head cold"

"point the sound just above your nose as you speak"

"think up as you speak"

"as you speak, try to send the sound across the street"

"come into your first word by way of your nose"

"try to make your lips and nose vibrate while you are talking"

"as you speak, make the sound go through your two front teeth"
Target 3: to focus the sound by keeping the soft palate high and the tongue "out of the way".

Purpose: to create the space necessary for clear and resonant speech by lowering the tongue, keeping it forward and out of the throat, and by raising the soft palate, closing the port between the oro- and nasopharynx. By eliminating possible "road blocks" in the mouth, the sound can be aimed or focused more easily towards the nose, cheeks or forehead.

Directives: "smile with your eyes while you speak"
"try to keep an inner smile while you speak"
"think of everything above the cheeks as moving upward and everything below, dropping freely"
"when you speak, look and try to feel as though you love the sound of your voice"
"pretend that you are about to sneeze just before you begin to speak"
"pretend that the inside of your mouth is a huge cave"
"speak as though you are the happiest person in the world"
"try to keep the tongue flat and touching the bottom front teeth when it is not needed for precise articulation"
"give the sound more room to move around in your mouth as you speak"
"just before you begin to speak, feel as though you have just taken a bite of hot mashed potatoes which are still on the back of your tongue"
Target 4: to raise the pitch and extend the range of the speaking voice.

Purpose: to create an awareness of the laryngectomized individual's ability to raise the pitch of the speaking voice through the use of mental imagery. Through practice this may enable the laryngectomized individual to increase the range of the speaking voice and may increase intensity as well.

Directives: "pretend that your head is hollow and you must put your speaking voice in that area"

"think treble or soprano as you speak"

"think feminine as you speak"

"as you raise the pitch, feel as though you are shooting the sound through halos on the top of your head"

"throw the sound as a cat would play with a ball of yarn"

"make the sound of your speech bouncy"

"stress the important words in each phrase"

"point the sound up towards your forehead as you raise the pitch"

"give the sound of your speaking voice more emotion"

"put more 'ping' or 'bite' into your speech"
In the event that verbal directives alone are not effective enough, the following exercises may be used in an attempt to raise the pitch and intensity of the speaking voice.

1. Sing as many notes of a scale as possible and then play with the pitch in your speech.

2. Play with emotionally laden words like "ouch", "stop that", "get out", etc. (Diedrich and Youngstrom, 1966).

3. Act as though you are a ghost on Halloween and you are trying to scare little children.

4. Try sliding from the lowest to the highest possible note and then back down again on an /o/ vowel.

5. Try to sound like a siren on a police car.

6. Try barking like a toy poodle.

7. Sit across the room from someone and carry on a conversation.

8. Play with sentences that require pitch variation. For example, "Are you going?", "Good afternoon", "Is it you?", "What time is it?", etc.

9. Experiment with neck positions as you speak (Lauder, 1969).

10. Try wearing a neck band or tight beads while you are speaking (Lauder, 1969).

11. Apply digital pressure to your neck as you speak. Be careful that this does not become a crutch! (Lauder, 1969).

12. Try talking while wearing ear plugs (Boone, 1977).
The next set of exercises is suggested as ways of achieving forward placement or focus.

1. Hiss out all of your air. You should feel the air hitting the gums just behind the upper front teeth. Now practice speaking so that you are putting the sound right where you felt the air hitting your gums.

2. Put your thumb and forefinger on the bridge of your nose and pinch slightly. Now try to make your fingers vibrate as you speak.

3. Try singing "hung - ah" on one note. Hold the "ng" sound a little longer and feel the vibrations in the nose. Then as you go to the "ah", make sure that the tongue drops and the soft palate rises, and that you still feel the vibrations in the nose.

It is hoped that laryngectomized women will be able to learn to focus and raise the pitch and intensity of their speaking voices through the use of these exercises, objectives and verbal directives. This may be a long and tedious process, but the effort may be one way to begin reestablishing the femininity which these women may have felt was lost forever.
CHAPTER VI
THE DEVELOPMENT OF ARTICULATE SPEECH

Although the terms "diction" and "articulation" are synonymous, "diction" is used generally in reference to singing and "articulation" in reference to speech. Because this chapter deals with the application of singing diction techniques to alaryngeal speech, the terms will be used interchangeably to mean correctly pronounced or enunciated words which greatly increase the intelligibility of the spoken message.

Before articulatory improvement techniques can be discussed, it is necessary to touch upon the various speech or intelligibility problems encountered by the laryngectomee. As previously mentioned, the root connection of the tongue (the hyoid bone) generally is removed during the laryngectomy surgery. This could obviously cause problems with resonance and speech intelligibility because the ability to control the tongue may be lessened or perhaps lost. In addition, radiation therapy may contribute to resonance or articulation problems. If radiation therapy is employed after surgery, all of the laryngectomee's teeth may be removed which obviously would hinder clear pronunciation.
Continued radiation treatment may cause the skin to become leather-like. Therefore, forward placement or focusing of the sound may not be attained as easily due to the lack of a vibrating sensation in the front of the mouth. After radiation therapy many laryngectomees will be wearing dentures. It is important that poorly-fitted, freely-moving dentures be replaced in order not to further impair precise articulation (Diedrich and Youngstrom, 1966).

Some laryngectomees will be troubled by a watery, gurgly sound in their speech. This sound, which is caused by a pooling of secretions into a pouch at the base of the pharynx (Diedrich and Youngstrom, 1966), may be distracting during speech and therefore possibly interfere with intelligibility. There is no simple solution; however, swallowing and drinking hot liquids may remove the problem temporarily.

Another distracting sound sometimes present in pulmonary-assisted alaryngeal (p.a.a.) speakers, is that of an unnecessary stoma noise. This sound may occur during inhalation or, in the case of stoma valve users, upon exhalation at the initiation of the first word. The sound may be eliminated easily during inhalation if careful thought is given to breathing in slowly and evenly. Some practice will be needed, however, to control the sound just before the initiation of speech. It is necessary for the valve to close before voicing can be achieved, but this does not
mean that the valve must close quickly, the action of which causes the unnecessary stoma noise. The laryngectomyee must learn to use just enough breath to close the valve silently, without "over blowing", and only use the proper amount of energized breath for each speech task after the valve is closed.

Another problem, and one that is even more prevalent than the others just mentioned, is the lack of motivation. This problem may not only impair speech intelligibility, but may also hinder progress in any aspect of therapy. Attitudes after a laryngectomy may range from total despair and severe depression (Gardner, 1966), to complete happiness and joy over not having succumbed to cancer and being given another chance at life. Because of these varying attitudes, articulation therapy may seem the least necessary to those whose speech is adequately understandable. However, this document is designed to assist those p.a.a. speakers, specifically women, who desire vocal refinement. Because female laryngectomyees tend to pay more attention to the niceties of articulation in their preoperative speech, it is probable that they will continue to do so postoperatively (Lauder, 1969). Subsequent discussion in this document will include singing diction techniques as well as their practical application to alaryngeal speech.

Singing deals fundamentally with the resonant production of vowels; consonant production is emphasized in so
far as it aids in the supported production of the vowels. The combination of properly produced consonants and vowels increases the intelligibility of the words of a song. A speaker on the other hand, generally pays little attention to the way the vowels are produced, but deals primarily with the clear pronunciation of the consonants for maximum intelligibility. Because the ratios between the vowel formants are the same before and after laryngectomy surgery, the vowels will remain perceptible (Weinberg and Bennett, 1972). Therefore, the treatment of vowels will be dealt with indirectly through the application of singing techniques dealing specifically with consonants.

CONSONANTS

Consonants can either help or hinder the resonant production of the vowels. In helping the resonant production, the consonants, if properly produced, can serve as a stimulus to activate the diaphragm, thus supplying the proper breath support needed for energized speech. Correctly produced consonants also can serve as a guide to aim the sound in the appropriate direction for the desired focus or forward placement. On the other hand, wrongly produced consonants will hinder rather than help the resonant production of speech. If wrongly produced, the consonants may close off the needed space in the mouth or pharynx, impeding the flow of breath as well as the forward placement of the
sound. Therefore, the vowels must be produced without interference from the tongue, soft palate, etc., and should be assisted by precisely articulated, well-supported consonants which enhance rather than interfere with the resonant production of the vowels.

The following verbal directives are suggested as ways of achieving articulate speech.

**Target:** to focus the consonants and vowels.

**Purpose:** to increase intelligibility by aiming the consonants and vowels towards the front of the mouth. By doing so, it is hoped that the tongue, soft palate, etc., will function without interfering with speech production.

**Directives:** "if you keep the consonants right out in front of the mouth, the focus will be right out in front, too"

"articulate more as you speak"

"make the consonants feel as though they are happening in front of your lips"

"don't swallow your consonants and try to think that you are creating the vowels on the roof of your mouth"

"just drop your jaw and let the tongue take care of the vowels"

After the laryngectomy surgery, it may become necessary to regain control of the tongue. The following tongue exercises are taken from *Speech Correction of the Contract Plan* by Ruth B. Manser. These are suggested as ways to increase and strengthen the muscular control of the tongue. For all the exercises, the client must be sure to open her
mouth so that there is a distance of two fingers' space between the teeth.

1. Run the tongue out of the mouth and point it, then draw it back into the mouth. Repeat.

2. Run the tongue down towards the chin and point it, then draw it back into the mouth. Repeat.

3. Run the tongue up towards the nose and point it, then draw it back into the mouth. Repeat.

4. Place the tongue in the right-hand corner of the mouth, then draw it back into the mouth. Next place the tongue in the left-hand corner of the mouth, then draw it back into the mouth. Repeat.

More tongue exercises as well as tongue twisters can be found in Ruth Manser's book under the heading "Correction of Careless Speech". These exercises may provide hours of much needed practice. The Voice and Articulation Drillbook by Fairbanks is also suggested specifically for female laryngectomees even after therapy has ended (Lauder, 1969). Both of these books would be worth purchasing if continued vocal refinement is desired. Because women may tend to pay more attention to the niceties of speech, it is hoped that these exercises, objectives, verbal directives and suggested books will offer some ways in which to make this “articulation” task much easier.
CHAPTER VII
CONCLUSION

The techniques presented in this document are not intended to replace post-laryngectomy rehabilitation therapy with a speech clinician; rather they are offered as suggestions which the clinician may find helpful in developing specialized therapy programs for laryngectomized women. The effectiveness of these techniques has been proven again and again with singers by vocal instructors around the world.

Pulmonary-assisted alaryngeal (p.a.a.) speakers must consciously strive to achieve those things which normal laryngeal speakers take for granted. One rarely stops to consider how much breath should be taken in before speaking, what shape the mouth should take to produce a certain "sound", or what words should receive a rising or falling tone to achieve natural intonation. The p.a.a. speaker may have to consider all of these each time speech is initiated. This conscious effort to produce an acceptable voice quality bears a striking resemblance to the efforts of the performing vocalist. For this reason, it seems likely that the many techniques for altering the quality
of the singing voice could be used to assist the female laryngectomee in approaching an acceptable speaking voice quality. Because laryngectomized women may suffer greater loss of self-esteem due to the unfeminine quality of the post-laryngectomy voice, this document has been designed to help restore a measure of femininity which some may have felt was lost forever.
LIST OF REFERENCES

Books and Articles


**Unpublished Materials**
