

Student Work

---

7-1-1992

**An investigation of how vocal exercises affect the range, respiration, and pitch accuracy of junior high students.**

Monica Jones Cox

Follow this and additional works at: <https://digitalcommons.unomaha.edu/studentwork>  
Please take our feedback survey at: [https://unomaha.az1.qualtrics.com/jfe/form/SV\\_8cchtFmpDyGfBLE](https://unomaha.az1.qualtrics.com/jfe/form/SV_8cchtFmpDyGfBLE)

---

**Recommended Citation**

Cox, Monica Jones, "An investigation of how vocal exercises affect the range, respiration, and pitch accuracy of junior high students." (1992). *Student Work*. 2964.  
<https://digitalcommons.unomaha.edu/studentwork/2964>

This Thesis is brought to you for free and open access by DigitalCommons@UNO. It has been accepted for inclusion in Student Work by an authorized administrator of DigitalCommons@UNO. For more information, please contact [unodigitalcommons@unomaha.edu](mailto:unodigitalcommons@unomaha.edu).

AN INVESTIGATION OF HOW  
VOCAL EXERCISES AFFECT THE RANGE,  
RESPIRATION, AND PITCH ACCURACY  
OF JUNIOR HIGH STUDENTS

A Thesis

Presented to the

Department of Music

and the

Faculty of the Graduate College

University of Nebraska

In Partial Fulfillment

of the Requirements for the Degree

Master of Music

University of Nebraska at Omaha

by

Monica Jones Cox

July 1992

UMI Number: EP74426

All rights reserved

INFORMATION TO ALL USERS

The quality of this reproduction is dependent upon the quality of the copy submitted.

In the unlikely event that the author did not send a complete manuscript and there are missing pages, these will be noted. Also, if material had to be removed, a note will indicate the deletion.



UMI EP74426

Published by ProQuest LLC (2015). Copyright in the Dissertation held by the Author.

Microform Edition © ProQuest LLC.

All rights reserved. This work is protected against unauthorized copying under Title 17, United States Code

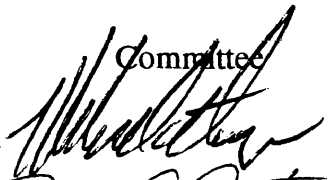
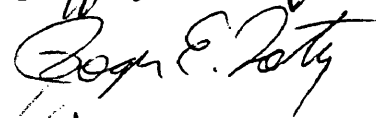

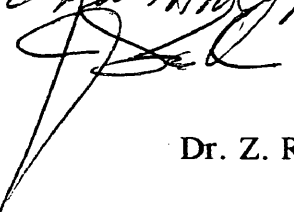


ProQuest LLC.  
789 East Eisenhower Parkway  
P.O. Box 1346  
Ann Arbor, MI 48106 - 1346

AN INVESTIGATION OF HOW VOCAL EXERCISES AFFECT THE RANGE,  
RESPIRATION, AND PITCH ACCURACY OF JUNIOR HIGH STUDENTS

Acceptance for the faculty of the Graduate College, University of Nebraska, in partial fulfillment of the requirements for the degree Masters of Music, University of Nebraska at Omaha.

Committee

Dr. Z. Randall Stroope		Music
Dr. Roger Foltz		Music
Mr. Tom Majeski		Art
Dr. James Saker		Music

Dr. Z. Randall Stroope, Chairman

June 1992

## DEDICATION

To Dr. Z. Randall Stroope, my mentor, for his unlimited time and dedication in making this project a success and for opening my eyes to all that music has to offer.

I thank you.

Monica Jones Cox

## ACKNOWLEDGMENT

I would like to thank Dr. Warren Prince and Dr. James Conroy for the for the time and effort they gave to this study.

## TABLE OF CONTENTS

TITLE PAGE . . . . .	i
ACCEPTANCE PAGE. . . . .	.ii
DEDICATION. . . . .	iii
ACKNOWLEDGMENT . . . . .	iv
TABLE OF CONTENTS. . . . .	v
ABSTRACT . . . . .	vii
I. INTRODUCTION . . . . .	1
II. PROBLEM . . . . .	2
Hypotheses . . . . .	3
Assumptions . . . . .	3
Delimitations . . . . .	4
Limitations . . . . .	4
Definition of Terms. . . . .	4
Significance of Study . . . . .	4
III. REVIEW OF RELATED LITERATURE . . . . .	5
IV. PROCEDURE OR METHOD . . . . .	6
Sampling Procedure . . . . .	7
Description of Treatment . . . . .	7
Variable Studies . . . . .	8

Measurement Procedures . . . . .	. . . . .	.8
Statistical Treatment In Experimental Research and Proposed Criteria For Making Historical and Philosophical Decisions	. . . . .	.8
V RESULTS . . . . .	. . . . .	.9
VI DISCUSSION. . . . .	. . . . .	.11
VII SUMMARY AND . . . . . CONCLUSIONS	. . . . .	.12
APPENDIX A - TO THE THESIS COMMITTEE	. . . . .	.14
APPENDIX B - EXPERIMENTAL TRAINING METHOD	. . . . .	.16
APPENDIX C - VOCAL RANGE MEASURE	. . . . .	25
APPENDIX D - PITCH ACCURACY MEASURE	. . . . .	27
APPENDIX E - VOCAL DURATION MEASURE	. . . . .	.31
APPENDIX F - VITAL CAPACITY AND PEAK EXPIRATORY FLOW RATE	. . . . .	.33
APPENDIX G - INDIVIDUAL SCORES	. . . . .	.35
REFERENCES . . . . .	. . . . .	.40
SELECTED READING. . . . .	. . . . .	43



## ABSTRACT

"The technique of warming up the voice should be a major part of any systematic vocal pedagogy. Every singer needs to have an established warm-up procedure". (Miller 22) "Often, the only place a young singer can receive frequent [vocal] instruction is in the school choral rehearsal, and without regular, supervised practice and guidance, the adolescent singer has little chance of developing a quality instrument". (Wilson 42) "Good vocal pedagogy is essential". (Allen 29) "A persistent problem in music education is that many never learn to use their singing voices confidently", states Dr. Kenneth Phillips. ("Training the Child Voice" 19)

The purpose of this investigation was to study the effects of vocal exercises on the range, respiration, and pitch accuracy of seventh-grade students. These exercises were practiced for the first ten minutes of every forty minute class, five times a week, for a period of fourteen weeks.

The experimental design provided for pretesting posttesting with an experimental and control group. A stratified random sample was drawn from seventh-grade chorus members of Kim Junior High School in Council Bluffs, Iowa. Each group contained 35 students. Students were pretested individually for their range, respiration, and pitch accuracy. Training consisted of a fourteen-week experimental treatment with testing at the beginning and again at the end of the fourteen weeks. The researcher conducted the exercises for the experimental group for ten minutes of each forty minute rehearsal. The control group did not rehearse vocal exercises. A test was given to both groups at the end of the fourteen weeks for vocal range to record changes. There was also a test given in respiration for breath control, as measured by a stopwatch for the amount of time a student can sustain an "s" sound, (Appendix B, page 2 #6) and breath capacity as measured by a multi-spirometer for the peak expiratory flow rate (PEF) and forced vital capacity (FVC). The third test was for pitch accuracy. Students were asked to sing "America" (Appendix D, page 2) and were judged for the accuracy of the forty-one pitches. A ordinal scale of "one" through "five" was used, with "five" being the ability to match all pitches accurately, and "one" as less than ten accurate pitches.

This study was designed to answer the following research question: Will vocal exercises, practiced 50 minutes a week for fourteen weeks, have an effect on the range, respiration, and pitch accuracy of seventh grade students?

To determine the effect of vocal exercises on the increased range, respiration, and pitch accuracy of seventh-grade students, the following null and alternative hypotheses were tested:

1. There will be no significant difference in the range of the control group and experimental group after fourteen weeks of vocal exercises.

1a. There will be a significant difference in the increased range of the experimental group as opposed to the control group.

2. There will be no significant difference in the breath capacity of the experimental and control group after fourteen weeks of vocal exercises.

2a. There will be a significant difference in the increased breath capacity of the experimental group as opposed to the control group.

3. There will be no significant difference in the breath control of the experimental and control group after fourteen weeks of vocal exercises.

3a. There will be a significant difference in the increased breath control of the experimental group as opposed to the control group.

4. There will be no significant difference in the pitch accuracy of the experimental and control group after fourteen weeks of vocal exercises.

4a. There will be a significant difference in the pitch accuracy of the experimental group as opposed to the control group.

As a result of this study the following conclusions were drawn: In the area of pitch accuracy there was not a significant difference between the experimental and control groups as a result of fourteen weeks of vocal exercises. There was a significant difference in the increased range, breath capacity and breath control of the experimental as opposed to the control group as a result of fourteen weeks of exercises.

These conclusions support the need for progressive, well-established vocal exercises to be used consistently at the seventh-grade level.

# AN INVESTIGATION OF HOW VOCAL EXERCISES AFFECT THE RANGE, RESPIRATION, AND PITCH ACCURACY OF JUNIOR HIGH STUDENTS

## I. INTRODUCTION

"The technique of warming up the voice should be a major part of any systematic vocal pedagogy. Every singer needs to have an established warm-up procedure". (Miller 22) "Often, the only place a young singer can receive frequent [vocal] instruction is in the school choral rehearsal, and without regular, supervised practice and guidance, the adolescent singer has little chance of developing a quality instrument". (Wilson 42) "Good vocal pedagogy is essential". (Allen 29)

"A persistent problem in music education is that many never learn to use their singing voices confidently", states Dr. Kenneth Phillips. ("Training the Child Voice" 19)

"The basic question of whether or not it is appropriate to train the child voice is a matter of disagreement among music educators". (Phillips, "The Effects of Group Breath Control Training on Selected Vocal Measures Related to the Singing Ability of Elementary Students in Grades 2, 3, and 4" 1) According to Pfautsch (1), "while singers have been using their vocal equipment for variable amounts of time prior to a choral rehearsal, it helps the vocal mechanism to 'vocalize' before engaging in the rigors of a rehearsal". Beall states "a survey of literature and opinions of music supervisors concerning vocal training at the junior high level found little uniformity of thought, and a general lack of direction in this area". (37) Every singer needs to have an established warm-up procedure". (Miller 22) "Warm-ups for students need to be provided in the areas of range, respiration (breath control and capacity), and pitch accuracy" states Larry Monson, choral professor at Doane College in Crete, Nebraska.

In the area of range, Allen states, "it is important to encourage the development and use of the widest range possible. One of the ways to encourage singing is to vocalize from the top to the bottom". (30) Allen goes on to say, "students need to understand that they are not either soprano, alto, tenor, or bass, they are singing the soprano, alto, tenor, or bass part". (31) Wilson believes "the student should learn that there is a head voice above and that if she or he continues singing with correct posture, relaxed jaw, and continuous breath flow, along with a lighter feeling and softer volume, a new voice or register will sound". (46)

"The most important foundations of singing is breath support and control. All great singing demands complete breath control". (Henderson 65) Henderson suggests that there are two factors which need to be used for increasing breath support and control - "the study and practice of breathing exercises. . . [and] actual physical exercises". (Henderson 65) "The process of breathing, as taught by a wide range of vocal teachers, appears to be generally consistent in emphasizing 'deep breathing' as the technique which most readily develops proper breath control for singing". (Phillips, "The Effects of Group Breath Control Training on Selected Vocal Measures Related to the Singing Ability of Elementary Students in Grades 2, 3, and 4" 107) Phillips goes on to say "if nothing else is done in the way of child vocal training, children should - and can - be taught to breath properly". ("Training the Child Voice" 22) Pfautsch states "the conductor must help the singers breathe, and the gesture employed must convey to the singers the following: the precise moment for the start of inhalation and the extent or capacity of the inhalation". (17) These sources suggest that the use of breathing exercises should be part of every singer's vocal experience.

With regard to pitch, "an important factor in the optimization of vocal fold adduction and hence average breath flow with respect to the desired pitch, loudness, and vocal quality is to allow the vocal folds freedom to execute their natural vibratory modes". (Titze, "Some Thoughts on Airflow in Singing" 32) Training in pitch accuracy may be done through exercises in resonant tone production and respiration. Titze states that "lack of support can reduce the pitch. Too much support, on the other hand, may drive the pitch upward". ("What Physical Factors are Involved in the Relationship Between Vocal Pitch and Breath Support" 37)

These writers justify the need for exercises in any vocal training program. The areas of range, respiration, and pitch accuracy are regarded by these researchers and others as important categories that should be included within every singer's vocal education.

## II. THE PROBLEM

The purpose of this investigation was to study the effects of vocal exercises on the range, respiration, and pitch accuracy of seventh-grade students. These exercises were practiced for the first ten minutes of every forty minute class.

## HYPOTHESES

This study was designed to answer the following research question: Will vocal exercises, practiced 50 minutes a week for fourteen weeks, have an effect on the range, respiration, and pitch accuracy of seventh-grade students?

To determine the effect of vocal exercises on the increased range, respiration, and pitch accuracy of seventh grade students, the following null and alternative hypotheses were tested:

1. There will be no significant difference in the range of the control group and experimental group after fourteen weeks of vocal exercises.
  - 1a. There will be a significant difference in the increased range of the experimental group as opposed to the control group.
2. There will be no significant difference in the breath capacity of the experimental and control group after fourteen weeks of vocal exercises.
  - 2a. There will be a significant difference in the increased breath capacity of the experimental group as opposed to the control group.
3. There will be no significant difference in the breath control of the experimental and control group after fourteen weeks of vocal exercises.
  - 3a. There will be a significant difference in the increased breath control of the experimental group as opposed to the control group.
4. There will be no significant difference in the pitch accuracy of the experimental and control group after fourteen weeks of vocal exercises.
  - 4a. There will be a significant difference in the pitch accuracy of the experimental group as opposed to the control group.

## ASSUMPTIONS

This study assumed that Phillips (1983) dissertation is an accurate and comprehensive study. This study also assumed that the panel of judges (all of whom have Master of Music degrees) are competent to analyze the students' performance.

## DELIMITATIONS

The delimitations of this study were: The sample was 64 seventh-grade students in an urban community at Kirn Jr. High (public school) in Council Bluffs, Iowa. The students represented a range of low to high socio economic level according to the Chamber of Commerce. The experimental group contained 35 students and the control group contained 29 students. Both male and female students were in each group.

## LIMITATIONS

This study was limited to 1) fourteen weeks of 50 minutes per week of vocal exercises, 2) seventh-grade students, 3) the vocal exercises cited in Dr. Phillips' study, and 4) exercises in the areas of range, respiration and pitch accuracy.

## DEFINITION OF TERMS

- Range:** "The span of pitches between the highest and lowest of an instrument, voice or part." (The New Harvard Dictionary of Music, 680)
- Respiration:** This area is divided into breath support and breath control. "Breath support is, the alternate contraction and relaxation of the opposing muscles in muscular antagonism . . . Breath control is when the opposition of the muscles and muscle groups are coordinated". (Lindsley 19-20)
- Pitch Accuracy:** The student's ability to accurately match a pitch with their voice.

## SIGNIFICANCE OF STUDY

This is one of the few studies which deals with how vocal exercises affect the range, respiration and pitch accuracy of seventh-grade students. In combination with the Phillips (1983) dissertation, this study hopes to provide music educators with valuable data that deals with the elementary and junior high voice.

### III. REVIEW OF RELATED LITERATURE

A review of related literature indicates that vocal exercises are a strong factor in the development of voices. Although no studies were found that dealt with seventh-grade students (as was the sample group used in this study), there is a general consensus that vocal exercises do increase the abilities to match pitch, and increase breath control and range.

In the area of range, Donald Proctor says, "the natural range of the voice is determined by the individual's glottic dimensions. Through vocal exercises in the upper and lower register, a student's range can reach his or her fullest potential". (30) Leon Thurman believes, "in less skilled singers of any age, upper voice usually sounds 'weaker' and is often rejected as ineffective, because the muscles involved in producing it are 'under-exercised'. With appropriate use over time, the upper voice can develop considerable 'strength' and can be 'blended' with lower voice". (29)

"The two aspects of breathing that concern the singer are breath support and breath control". (McRae 136) In the area of breath control, Dr. James Conroy, a respiratory specialist in Council Bluffs, Iowa, states that the growth of the spine determines the peak expiratory flow rate and the forced vital capacity of each person. This means that as a person grows so does the percent of their breath capacity. Dr. Conroy goes on to say that "breath capacity has to do with how the lungs grow in proportion to the body. Breath control deals with training the body to ration the air it takes in". Gary Wilson says, "directors can hone students' vocal skills through an awareness of what it feels like to sing correctly". (42) Dr. Phillips' research states that in grades 2, 3, and 4, vocal warm-ups increase a student's breath control. Donald Proctor believes singers must be trained to use their "breath as a power source for the voice". (28) "The singer must feel that the breath is always 'hooked up' to the sound". (Wilson 43) Wilson goes on to say "therein lies the only control mechanism that singers should depend upon - the feeling of air in constant motion, either out of or into the body". (43)

In the area of pitch accuracy, Charles Elliot, in "Effect of Vocalization on the Sense of Pitch of Beginning Band Students," states when band students vocalized their exercises first and then played them, they were able to match pitch more accurately". (41) This suggests that vocal warm-ups are important for students in their ability to accurately match pitch. Dr. Phillips' believes "developing proper breathing and phonation leads to resonant tone production". ("Training the Child Voice" 57) The

experimental design provided for pretesting and posttesting with an experimental and control group. A stratified random sample was drawn from seventh-grade chorus members of Kirn Junior High School in Council Bluffs, Iowa. Each group contained 35 students. Students were pretested individually for range, respiration, and pitch accuracy. Training consisted of a fourteen-week experimental treatment with testing at the beginning and again at the end of the fourteen weeks. The researcher conducted the exercises for the experimental group for ten minutes of each forty minute rehearsal. The control group did not rehearse vocal exercises. A test was given to both groups at the end of the fourteen weeks for vocal range to record changes. There was also a test given in respiration for breath control, as measured by a stopwatch for the amount of time a student could sustain an "s" sound, (Appendix B, page 2, #6) and breath capacity as measured by a multi-spirometer for the peak expiratory flow rate (PEF) and forced vital capacity (FVC). The third test was for pitch accuracy. Students were asked to sing "America" (Appendix D, page 2) and were judged for the accuracy of the forty-one pitches. An ordinal scale of "one" through "five" was used, with "five" being the ability to match all pitches accurately, and "one" as less than ten accurate pitches.

Henderson states "it is imperative, however, that warm-ups be done before any choral singing, to ensure that choir members will not be straining their voices and so they will feel the breath and the tone going together". (175) This suggests that when warm-ups are emphasized the more vocally adept the singer will be in relationship to the music he or she encounters. This not only includes the quality of tone, but also the range, respiration, and pitch accuracy of the singer. This related research supports the hypotheses that vocal training increases the abilities of seventh grade students in the areas of range, respiration, and pitch accuracy.

#### IV. PROCEDURE OR METHOD

There were 64 students in the sample. The students were assigned to one of two music classes by the guidance counselor without regard to previous music experience or music aptitude. Of the students in the study, none were involved in other school musical ensembles. There was a broad range of abilities in each group. The experimental group contained 35 students, with 7 males and 28 females and the control group contained 29 students, with 7 males and 22



females. This sample was taken from a population of seventh-grade students in an urban community at Kirn Jr. High public school in Council Bluffs, Iowa.

### SAMPLING PROCEDURE

This was a stratified random sample because it was not taken from the entire seventh grade population, but instead seventh-graders who registered for vocal music. However, the two classes that were chosen met for the same number of minutes each week, and the two classes were arbitrarily assigned as the control and experimental group. The control group met from 1:48-2:27 PM and the experimental group met from 12:23-1:02 PM.

### DESCRIPTION OF TREATMENT

Each student in the experimental and control group was pretested and posttested by a panel of judges in the following areas:

(1) Phonation (Range) - Each student sang the pitches played on a piano and/or sang by a judge's voice on the syllable "ah". The student sang the syllable "ah" to the high and low extremes of his or her voice. When the note sounded strained in either the high or low register, it was disqualified. Three trials were given for this test and the scores were averaged.

(2a) Respiration (Breath capacity) - Each student's breath control was monitored by a multi-spirometer which measures the forced vital capacity and peak expiratory flow rate. Three trials were given for this test and the scores were averaged.

(2b) Respiration (Breath control) - Each student was asked to take a deep breath and was monitored by a stopwatch for the amount of time he or she could sustain an "s" sound. Three trials were given for this test and the scores were averaged.

(3) Resonance (Pitch Accuracy) - Each student sang "America" in the key of F in whatever octave was suitable for them. If the student sang the entire song (forty-one pitches) without any pitch errors, he or she received a "5". A "4" was given for forty through thirty-one correct pitches; a "3" was given for thirty through twenty-one correct pitches; a "2" was given for twenty

through ten correct pitches; and a "1" was given for less than ten correct pitches. Three trials were given for this test and the scores were averaged.

### VARIABLE STUDIES

The independent variables in this research were the student's performing or not performing vocal warm-ups in range, respiration, and pitch accuracy. Dependent variables included the measurements in phonation, respiration, and resonance.

### MEASUREMENT PROCEDURES

The equipment used in the measurement procedures was a piano, a stopwatch and a multi-spirometer. There were three trials given for each pretest and posttest, with fourteen weeks between each test.

### STATISTICAL TREATMENT IN EXPERIMENTAL RESEARCH AND PROPOSED CRITERIA FOR MAKING HISTORICAL AND PHILOSOPHICAL DECISIONS

The experimental design that was used in this study is the pretest-posttest control group design as outlined in figure 1.

Figure 1

Group	Pretest	Vocal Exercises	Posttest
1R	O	X	O
2R	O		O

"In this type of test, each group is pre and posttested. The two groups that are used in this study are similar in every way except for what happens between the pre and posttest. One group is exposed to experimental treatment and the other

group is not". (Huck, Cormier, Bounds 245)

Score A will be the difference between the pretest score and the posttest score. These scores will be examined and the percentages of plus and minus plotted. The level of significance is set at the 0.5 level. A t-test will be used for the pre and post- test.

## V. RESULTS

The information that follows is the result of the four tests that were given to prove the different hypotheses. In the area of range there were 29 subjects in the control and experimental groups. A t-test was given with a significance level of .05. The gains score was 3.917 in the experimental group. This supports the hypothesis that there was a significant difference in the increased range of the experimental group as opposed to the control group after fourteen weeks of vocal exercises. The exercises that were used in this study are in Appendix B-III. The individual scores are listed in Appendix G. Figure one shows the results of the test.

Figure 1 Comparison of vocal ranges

Group	N	Pretest	Posttest	Gains
Experimental	29	23.686	27.603	3.917
Control	29	23.286	24.207	.921

In the area of pitch accuracy there were 31 subjects in the experimental group and 28 subjects in the control group. A t-test was given with a significant level of .05. The gains score of the experimental group was -.087 which was not a significant difference. This supports the hypothesis that there is not a significant difference in the experimental group after fourteen weeks of vocal exercises. The exercises used in this study are in Appendix B-IV. The individual scores are listed in Appendix G. Figure two shows the results of the test.

Figure 2 Comparison of Pitch Accuracy

Group	N	Pretest	Posttest	Gains
Experimental	31	4.587	4.5	-.087
Control	29	3.421	4.066	.64

In the area of breath capacity, as it relates to the forced vital capacity, there were 28 subjects in the experimental group and 17 subjects in the control group. A t-test was given with a significance level of .05. The gains score was 11.88 in the experimental group, which was significant at the established level of confidence. This supports the hypothesis that there was a significant difference in the breath capacity (FVC) of the experimental group as opposed to the control group after fourteen weeks of vocal exercises. The individual scores are listed in Appendix G. Figure three shows the results of the test.

Figure 3 Comparison of Breath Capacity (FVC)

<u>Group</u>	<u>N</u>	<u>Pretest</u>	<u>Posttest</u>	<u>Gains</u>
Experimental	28	86.368	98.250	11.88
Control	17	82.529	80.076	-2.453

In the area of breath capacity, as it relates to the peak expiratory flow rate, there were 28 subjects in the experimental group and 17 in the control group. A t-test was given with a significance level of .05. The gains score was 13.393 in the experimental group, which was significant at the established level of confidence. This supports the hypothesis that there was a significant difference in the breath capacity (PEF) of the experimental group as opposed to the control group after fourteen weeks of vocal exercises. The individual scores are listed in Appendix G. Figure Four shows the results of the test.

Figure 4 Comparison of Breath Capacity (PEF)

<u>Group</u>	<u>N</u>	<u>Pretest</u>	<u>Posttest</u>	<u>Gains</u>
Experimental	28	95.286	108.679	13.393
Control	17	100.606	99.947	-.659

In the area of breath control there were 31 subjects in the experimental group and 28 in the control group. A t-test was given with a significance level of .05. The gains score was 58.371 in the experimental group, which was significant at the established level of confidence. This supports the hypothesis that there was a

significant difference in the increased breath control of the experimental group as opposed to the control group after fourteen weeks of vocal exercises. The exercises used in this study are located in Appendix B-II. The individual scores are listed in Appendix G. Figure Five shows the results of the test.

Figure 5 Comparison of Breath Control

Group	N	Pretest	Posttest	Gains
Experimental	31	16.410	74.781	58.371
Control	29	15.479	17.828	2.34

## VI. DISCUSSION

The results indicated that there was a significant difference in the increased range, breath control, and breath capacity (FVC and PEF) of the experimental group as opposed to the control group after fourteen weeks of vocal exercises. In 1983, Dr. Phillips ran the same tests for his dissertation only with students in grades 2, 3, and 4. His analysis of results also indicated that there was a significant difference in the increased range, breath control and breath capacity (FVC and PEF) of the students. In area of pitch accuracy the analysis of results indicated that there was not a significant difference in the experimental group as opposed to the control group after fourteen weeks of vocal exercises. In 1983, Dr. Phillips ran the same tests for his dissertation with students in grades 2, 3, and 4. His testing accepted the alternative hypothesis which states that there was a significant difference in the pitch accuracy of the students.

There are several implications from this study. First of all, there is a lack of research in the areas of range, respiration, and pitch accuracy with regard to the effects of vocal warm-ups. Most research is in the improvement of tone quality. It is the opinion of this researcher that most vocal music teachers believe that vocal exercises are important, however, they are tossed aside because of time restraints in the learning of music literature.

There are some factors that may have influenced the outcome of the study. Many junior high students go through a voice change, and this may have affected the pitch accuracy of some of the students. This was not a true sample group

because the students had shown an interest in vocal music as exhibited by their enrollment in the program. This may or may not have influenced the study.

The recommendations that the researcher has for further research is to chart the progress of students for twelve years (Grades 1-12) in the areas of range, respiration, and pitch accuracy. Secondly, I would also like to run the same study using a true sample group which should be drawn from the entire seventh-grade class.

## VII. SUMMARY AND CONCLUSIONS

The purpose of this investigation was to study the effects of vocal exercises on the range, respiration, and pitch accuracy of seventh-grade students. These exercises were practiced for the first ten minutes of every forty minute class, five times a week, for a period of fourteen weeks.

A stratified random sample was drawn from seventh-grade chorus members of Kirn Junior High School in Council Bluffs, Iowa. Each group contained 35 students. The experimental design provided for pretesting and posttesting with an experimental and control group. Students were pretested individually, for their range, respiration, and pitch accuracy.

Training consisted of a fourteen-week experimental treatment with testing at the beginning and again at the end of the fourteen weeks. The researcher conducted the exercises for the experimental group who performed vocal exercises for ten minutes of each forty minute rehearsal. The control group did not rehearse vocal exercises. A test was given to both groups at the end of the fourteen weeks for vocal range, to record changes. There was also a test given in respiration for breath control, as measured by a stopwatch for the amount of time a student could sustain an "s" sound, (Appendix B, page 2, #6) and breath capacity as measured by a multi-spirometer for the peak expiratory flow rate (PEF) and forced vital capacity (FVC). The third test was for pitch accuracy . Students were asked to sing "America" (Appendix D, page 2) and were judged for the amount of the forty-one pitches. An ordinal scale of "one" through "five" was used, with "five" being the ability to match all pitches accurately, and "one" as less than ten accurate pitches.

This study was designed to answer the following research question: Will vocal exercises, practiced 50 minutes a week, for fourteen weeks, have an effect on the range, respiration, and pitch accuracy of seventh grade students?

As a result of this study the following conclusions were drawn:: In the area of pitch accuracy there was not a significant difference between the experimental and control groups as a result of fourteen weeks of vocal exercises. There was a significant difference in the increased range, breath capacity and breath control of the experimental as opposed to the control group as a result of fourteen weeks of exercises.

These conclusions support the need for progressive, well-established vocal exercises to be used consistently at the seventh-grade level.

**APPENDIX A**  
**TO THE THESIS COMMITTEE**



## APPENDIX A

### To the Thesis Committee

After consultation with Dr. Stroope, the areas of range, respiration, and pitch accuracy were determined to be the most beneficial to this study. The decision was based upon the need to confine the project to a study that was comprehensive, concise, and had the ability to be tested with strong accuracy.

**APPENDIX B**  
**EXPERIMENTAL TRAINING METHOD**

## Appendix B

### EXPERIMENTAL TRAINING METHOD

#### 1. PHYSICAL CONDITIONING

**Purpose:** To establish that the human body is the singer's instrument, the whole of which must be exercised and considered as a part of the singing experience.

##### A. MUSCLE MOVERS

1. Shoulder Rolls
2. Head Rolls
3. Side Bends
4. Arm Shakes
5. Cheek-Chin Massage
6. Shoulder/Back Massage

##### B. SINGING POSTURE

1. Standing Posture Model
  - a. Back Stack - spinal stretch
  - b. Shoulder Roll - down and back
  - c. Arm Extension - chest elevation before breath
  - d. Knees slightly bent, one foot slightly ahead of the other with the weight forward on the balls of the feet.

- e. Arms held loosely at the sides of the body
- f. Head tilted slightly downward

## 2. Sitting Posture Model

- a. Use front of seat only when singing
- b. Backs away from seats when singing, but no sway-back
- c. Feet flat on the floor and positioned as above
- d. Back, shoulders, chest and head as above

## II. BREATHING EXERCISES

### A. BREATH SUPPORT AND CONTROL

**Purpose:** To establish the correct expansion and contraction of the torso for proper breath support and control for singing.

1. **Breath Observation and Explanation**
  - a. Clavicular breath - wrong!
  - b. Diaphragm breath - correct! Demonstrate in a lying down position, on backs, if possible.
2. **Abdominal Roll - to encourage abdominal contraction and expansion**
  - a. Roll abdominal muscles in and out without breathing.
  - b. Contract abdominal muscles in and up upon exhalation and hold for a count of five; relax the abdominal muscles and inhale through the nose.
3. **Eagle Spread - to encourage chest expansion before inhalation and**

3. Eagle Spread - to encourage chest expansion before inhalation and correct abdominal movement
  - a. Position hands behind head with elbows forward.
  - b. Draw arms back until elbows are in line with shoulders - note chest elevation and expansion.
  - c. Inhale through nose noting abdominal and rib expansion; may also sip in air through mouth.
  - d. Exhale while bending over at the waist.
  - e. Stand erect again with arms back and open; repeat inhalation procedure.
  - f. Exhale without bending a waist; contract abdominal area.
4. Staccato Bump - to encourage controlled abdominal contraction
  - a. Blow breath out on five short aspirate "h" abdominal contractions - keep chest up.
  - b. Imitate a silent laugh with short abdominal contractions on "ha".
5. Marcato Thrust - to encourage power in the abdominal contraction
  - a. Imitate blowing out a candle with swift expulsion of air and strong abdominal contraction.
  - b. Hard exhalation into fist with abdominal contraction
6. Slow Exhalation - to encourage measured use of air
  - a. Soft hiss to a measured count

- b. Controlled contraction of abdominal muscles and lower rib line with chest remaining high
7. Pant - to encourage a continuous breathing motion, both consciously and unconsciously
- a. Pant with short abdominal expansion and contraction movements moving a small amount of air and as silent as possible.
  - b. Slow and regulated
    - (1) count of slow 1-2
    - (2) imitate "train" on exhalation "ssh"
  - c. Fast and reflexive
    - (1) begin slowly and build speed
    - (2) pant quickly at own pace

### III. VOCAL HOOK-UPS

#### A. PHONATION EXERCISES

**Purpose:** To establish a clear understanding of the upper and lower adjustments and the coordination of the two, through the proper breath support and control.

1. Military Cadence - to encourage glottal closure via firm diaphragm/abdominal interaction.
  - a. Speak in rhythm: "Hup, two, three, four"
  - b. Aim for a clean glottal "stroke" on "Hup"
  - c. Speak in rhythm: "Hup one, hup two, hup three" etc.
  - d. Replace with "Up one, up two, up three," etc.

2. **Marcato Thrust** - to encourage glottal closure via a firm diaphragm/abdominal interaction.
  - a. Shout (but not excessively) "Hey, Ha Ho" in a firm middle to low voice with a strong abdominal contraction.
  - b. Listen for a clear glottal closure with carrying power.
  - c. Use this exercise sparingly
3. **Staccato Bump** - to encourage the on and off glottal closure via on and off abdominal contractions
  - a. Speak "ha, ha, ha, ha" on one breath with short abdominal contractions.
  - b. Listen for clean closure of the glottis.
  - c. Imitate a belly laugh.
4. **Animal Imitation** - to encourage glottal closure via a firm supporting action of the abdominal area.
  - a. "Moo" like a cow drawing abdomen up and in.
  - b. Bark like a dog with short abdominal contractions.
5. **Sirens** - to encourage extended glottal closure via a firm supporting action.
  - a. Imitate the sound for a fire siren with strong abdominal contraction.
  - b. Use both upper and lower adjustments (chest voice and head voice).
  - c. Use both ascending and descending slides.

## IV. VOCALISES

### A. RESONATION EXERCISES

Purpose: To establish a clear, ringing, resonant tone through breath support and control.

#### 1. Staccato Bump

- This exercise uses the mini-contractions of the abdominal muscles, but the tone is now added.
- Bump the first four tones lightly from the abdominal muscles, sustain the fifth tone, breathe, bump the next four descending tones and hold the final tone for a full count.
- Vary the syllables using "ha" and "koo".
- Modulate up and down a third by half-steps.

Lightly

HA HA HA HA HA - - HA HA HA HA HA - -  
KOO KOO KOO KOO KOO - - KOO KOO KOO KOO KOO - -

#### 2. Marcato Thrust

- This exercise is similar to #1, but involves a swift, powerful thrust of the abdominal muscles, and a breath between each thrust. Breathe on the notated quarter rests.
- Modulate up and down by half-steps.



## Firmly

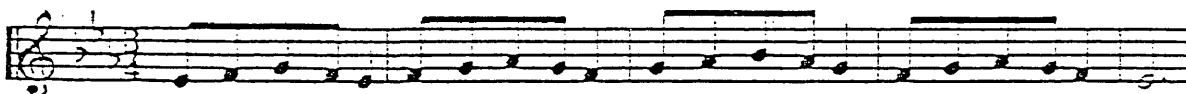


HA HA HA HA HA - - - HA HA HA HA  
 KOO KOO KOO KOO KOO - - KOO KOO KOO KOO

## 3. Legato Movement

- This exercise is to be done on one breath, with even pressure from the abdominal muscles.
- Use different vowel sounds on repetitions.
- Modulate up by half-steps.
- Use chordal accompaniment.

## Smoothly



LOO - - - - OO - - - - OO - - - - OO - - - - OO-

## 4. Sustained Tone

- This exercise is to be done on one breath, with the smooth application of abdominal support.
- Use different vowel on repetitions.
- Modulate up and down by half-steps.
- Use chordal accompaniment.
- Vary the tempo tones slow as possible.

- f. Vary this exercise by holding single tones for maximum comfortable duration; time in seconds.

Slowly



### 5. Descending Scale

- This exercise is to be done one breath to a phrase, with support application of abdominal support.
- Use different vowels on repetitions.
- Modulate up by half-steps.
- Use chordal accompaniment.

Smoothly



### 6. Octave Lift

- This exercise is to be done with a firm lifting action of the abdominal muscles using the aspirate "h" to propel the upper pitch.
- Modulate up by half-steps.

Firmly



**APPENDIX C**  
**VOCAL RANGE MEASURE**

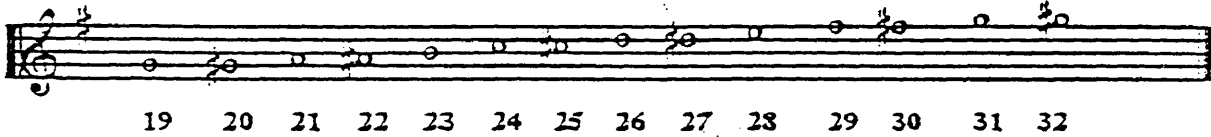
### Appendix C

#### VOCAL RANGE MEASURE

Subject : \_\_\_\_\_ Grade: \_\_\_\_\_

Date of Testing: \_\_\_\_\_

Numbers Assigned To Pitches For Vocal Range Evaluation:



Highest Pitch

Lowest Pitch

Pitches in Range

(minus)

Trial #1 \_\_\_\_\_ - \_\_\_\_\_ +1= \_\_\_\_\_

Trial #2 \_\_\_\_\_ - \_\_\_\_\_ +1= \_\_\_\_\_

Trial #3 \_\_\_\_\_ - \_\_\_\_\_ +1= \_\_\_\_\_

Total= \_\_\_\_\_

Mean Score= \_\_\_\_\_

**APPENDIX D**  
**PITCH ACCURACY MEASURE**

## Appendix D

### PITCH ACCURACY MEASURE

Subject: \_\_\_\_\_ Grade: \_\_\_\_\_

Date of Testing \_\_\_\_\_ Judge: \_\_\_\_\_

**RATING SCALE 5 - SUPERIOR ACCURACY:** Subject can sing the musical phrase correctly with direction and accurately match 41 pitches

**4 - HIGH ACCURACY:** Subject can sing the musical phrase correctly with direction and accurately match at least 30 pitches

**3 - MEDIUM ACCURACY:** Subject can sing the musical phrase with general direction and accurately match at least 20 pitches.

**2 - LOW ACCURACY:** Subject can sing the musical phrase with correctly with direction and accurately match at least 10 pitches

**1 - NO ACCURACY:** Subject cannot sing the phrase with direction or accurately match pitch, or - no response.

Section #1: Trial #1 - \_\_\_\_\_

Trial #2 - \_\_\_\_\_

Trial #3 - \_\_\_\_\_

Total - \_\_\_\_\_

Mean Score - \_\_\_\_\_

Section #2: Trial #1 - \_\_\_\_\_  
Trial #2 - \_\_\_\_\_  
Trial #3 - \_\_\_\_\_  
Total - \_\_\_\_\_  
Mean Score - \_\_\_\_\_

## AMERICA

Samuel F. Smith, 1808-1895

Anonymous

My coun - try 'tis of thee, Sweet land of lib - er - ty,  
Of thee I sing: Land where my fa - thers died, Land of the  
pil - grims' pride, From ev - ry moun - tain-side Let free - dom ring!

The image shows a musical score for the song "America". It consists of three staves of music in treble clef, 3/4 time, with a key signature of one flat (B-flat). The lyrics are written below the notes. The first staff contains the first line of the song, the second staff contains the second line, and the third staff contains the third line. The lyrics are: "My coun - try 'tis of thee, Sweet land of lib - er - ty, Of thee I sing: Land where my fa - thers died, Land of the pil - grims' pride, From ev - ry moun - tain-side Let free - dom ring!"



APPENDIX E  
VOCAL DURATION MEASURE

## Appendix E

## VOCAL DURATION MEASURE

Subject : \_\_\_\_\_ Grade : \_\_\_\_\_

Date of Testing : \_\_\_\_\_

## Sustaining Time in Seconds

Trial #1 - \_\_\_\_\_

Trial #2 - \_\_\_\_\_

Trial #3 - \_\_\_\_\_

Total = \_\_\_\_\_

Mean Score = \_\_\_\_\_

**APPENDIX F**

**VITAL CAPACITY AND PEAK EXPIRATORY FLOW RATE**

## Appendix F

## VITAL CAPACITY AND PEAK EXPIRATORY FLOW RATE MEASURE

Subject: \_\_\_\_\_ Grade : \_\_\_\_\_

Date of Testing: \_\_\_\_\_ Height: \_\_\_\_\_

	EXPIRATORY	ACTUAL	PRED.	%PRED.
FVC				
Mean Score	_____	_____	_____	_____
PEF				
Mean Score	_____	_____	_____	_____

FVC (Forced Vital Capacity)

PEF (Peak Expiratory Flow Rate)

\* The reason for only giving the mean score is because the multi-spirometer automatically averages each trial together. Three trials will be given for this test.

**APPENDIX G**  
**INDIVIDUAL SCORES**

Table I  
 VOCAL RANGE MEASURE  
 29 subjects in each group

EXPERIMENTAL- PRE TEST	EXPERIMENTAL- POST TEST	CONTROL- PRE TEST	CONTROL- POST TEST
30	32.6	32.3	35
28.6	32.6	31.6	34.3
28	32.3	31.3	34.3
27.6	32	31	32
27.3	32	30.6	31.3
27	31.6	30.6	30.3
26.6	30.6	29.3	30
26.3	30	29	29.6
26.3	29.6	28.6	29.3
26	29.6	28	28.6
25.6	29.6	27	27.6
25.3	29.3	26.6	27.6
25	28.6	26	27.3
24.6	28.6	25.3	27.3
24.6	28.3	25	27
24.3	28.3	25	27
23.6	28	24	26
23.6	27.6	23.1	25
23.3	27.6	23	23.3
23.3	27.3	22.3	23
22	27	21.6	23
21.6	25	19.6	21
20	24.3	18.3	17
19.6	24	13.6	15
19.6	23.3	13.6	15
19.6	22.6	13	12.3
19	21	11.6	10.3
14.6	18.6	9.2	8
14	18.6	5.2	4.6

Table II  
 PITCH ACCURACY MEASURE  
 31 subjects in the experimental group and 28 in the control group

EXPERIMENTAL- PRE TEST	EXPERIMENTAL- POST TEST	CONTROL- PRE TEST	CONTROL- POST TEST
5	5	5	5
5	5	5	5
5	5	5	5
5	5	5	5
5	5	5	5
5	5	5	5
5	5	5	5
5	5	5	5
5	5	5	5
5	5	5	5
5	5	5	5
5	5	5	5
5	5	4.6	5
5	5	4	5
5	5	4	5
5	5	4	5
5	5	4	5
5	5	4	5
5	5	4	5
5	5	3.6	4.6
5	5	3.3	4.6
5	5	3	4.6
5	5	2.6	3.6
4.6	5	2.3	3.6
4.6	5	1.6	3.3
4.6	5	1.6	3.3
4.6	5	1.3	3
4.6	4.6	1.3	2.3
4	4	1	2
4	3.6	1	1
4	3	1	1
3.6	2.3	1	1
2.6	1		
1	1		

**Table III**  
**FORCED VITAL CAPACITY AND PEAK EXPIRATORY**  
**FLOW RATE MEASURE**

28 subjects in the experimental group and 17 subjects in the control group

PRE- EXPERI MENTA L - FVC%	PRE- EXPERI MENTA L- PEF%	PRE- CONTR OL- FVC%	PRE- CONTR OL- PEF%	POST EXPERI MENTA L- FVC%	POST EXPERI MENTA L - PEF%	POST CONTR OL- FVC%	POST CONTR OL- PEF%
119.1	144.2	123.6	136.5	128.9	196.3	108.6	121.1
111.5	132.6	106.0	127.8	123.2	149.1	99.6	118.0
104.0	123.4	95.0	117.7	123.1	145.5	93.9	115.1
94.9	121.6	94.0	115.1	115.7	138.7	92.8	113.4
93.7	117.2	92.0	115.1	111.3	132.5	91.8	109.5
93.7	115.7	90.3	106.0	109.8	124.5	89.6	107.7
93.6	112.9	88.5	104.1	108.1	124.1	88.0	102.3
93.1	112.6	86.3	103.2	107.2	119.8	83.6	101.2
91.0	107.7	84.2	101.6	105.6	119.5	81.7	100.5
90.2	104.2	78.8	101.3	105.4	119.4	81.4	99.9
90.1	103.2	75.9	99.3	101.0	117.1	74.7	96.9
88.9	100.6	70.8	95.8	100.7	116.4	72.3	93.2
88.3	100.3	68.8	89.2	99.7	111.7	69.4	88.8
88.3	100.3	67.5	86.7	96.3	109.6	69.4	86.8
88.2	97.3	64.6	72.4	94.6	107.2	60.5	85.9
87.4	95.2	58.7	70.6	94.1	106.0	54.5	80.9
85.2	92.8	58.0	67.9	93.8	100.9	49.5	77.9
84.8	89.4			92.8	100.3		
83.9	86.4			92.3	99.8		
83.6	84.6			91.3	95.2		
82.4	80.6			91.2	93.3		
77.6	78.8			90.9	91.5		
76.9	74.2			84.9	86.7		
75.6	72.0			84.7	79.6		
75.5	70.3			78.7	67.4		
74.2	64.0			76.9	66.8		
73.6	58.5			76.6	65.4		
72.4	57.4			72.2	58.7		



TABLE IV  
BREATH CONTROL MEASURE  
31 subjects in the experimental group and 28 in the control group

EXPERIMENTAL PRE TEST	EXPERIMENTAL POST TEST	CONTROL PRE TEST	CONTROL POST TEST
46.3	37.3	27	35.6
25.3	27	23.6	29.3
24.6	26.3	23.6	26.6
21	25	21.3	23.6
20.3	25	20	23
18	24.6	18.6	22.6
18	24.6	18	22.3
17.6	23.3	17	21.6
17.3	23	17	21.6
17	22.6	17	20.6
17	22	17	20.3
17	21.6	16.6	19.3
16.6	21	16	19.3
16.6	21	15.3	19
16	20.3	15.3	16.6
15	20	15	16
14.3	20	15	16
14.3	19	13.6	15.3
14.3	19	13.6	15
14	17.3	13	15
13.6	17.3	12.6	13
12.6	17.3	12.3	13
12.6	17.3	12	12.3
12.3	17	11.6	12.3
12.3	16.6	11.3	11.3
12	16.6	11	10.3
11.6	16.6	9.3	9.6
11.6	14.3	9	9
11.3	14.3	6.3	7.6
10	13		
8.3	12.3		

## REFERENCES

## REFERENCES

- Allen, Sue. "The Potential of the Junior High Voice". Music Educators Journal, November, 1986, p. 29-30.
- Beall, L. M. Elementary and Junior High School Voice Training. (Doctoral dissertation, American University, 1958). Dissertation Abstracts, 1958, 19,469. (University Microfilms No. 58-2804), p. 37.
- Conroy, James. Telephone interview. 27 February 1992.
- Elliot, Charles. "Effect of Vocalization on the Sense of Pitch of Beginning Band Students". Journal of Research in Music Education, 22(2), 1974, p. 120-128.
- Harvard Dictionary. London: Belknap Press of Harvard University Press, 1986, p. 680.
- Henderson, Larra Browning. "How to Train Singers". West Nyack, New York: Parker Publishing Company, 1979, p. 65-175.
- Lindsley, Charles. "Fundamentals of Singing for Voice Classes". Belmont, California. Wadsworth Publishing Company, 1985, p. 19-20.
- Miller, Richard. "Warming Up the Voice". NATS Bulletin. May/June, 1990, p. 22-23.
- Monson, Larry. Personal interview. 20 February 1992.
- McRae, Shirley. "Directing the Children's Choir". New York: Macmillan, Inc. 1991, p. 136.
- Pfautsch, Lloyd. "Mental Warmups for the Choral Director". Lawson-Gould Music Publishers, Inc., 1969, p. 1-17.
- Phillips, Kenneth H. The Effects of Group Breath Control Training on Selected Vocal Measures Related to the Singing Ability of Elementary Students in Grades 2,3, and 4. (Doctoral dissertation , Kent State University, 1983, p. 107). (University Microfilms International)

- Phillips, Kenneth H. "Training the Child Voice". Music Educators Journal, December, 1985, p. 19-58.
- Proctor, Donald. "Breath, the Power Source for the Voice". NATS Bulletin, Nov/Dec, 1980, p. 26-30.
- Thurman, Leon. "Voice Health and Choral Singing: When Voice Classifications Limit Singing Ability". The Choral Journal, May, 1988, p. 25-33.
- Titze, Ingo. "Some Thoughts on Airflow in Singing". NATS Bulletin, Nov/Dec, 1982, p. 32.
- Titze, Ingo. "What Physical Factors are Involved in the Relationship Between Vocal Pitch and Breath Support"? NATS Bulletin, 1981, p. 37.
- Wilson, Gary. "Three Rs for Vocal Skill Development in the Choral Rehearsal". Music Educators Journal, March 1991, p. 42-46.

**SELECTED READINGS**

## SELECTED READINGS

- Boyd, Jack. "Rehearsal Guide for the Choral Director". Champaign, Ill: Mark Foster Music Company, 1977.
- Burgin, John Carroll. "Teaching Singing". Metuchen, N.J.: Scarecrow, 1973.
- Cain, Noble. "Choral Music and Its Practice". New York: M. Witmark & Sons, 1942.
- Darrow, Gerald F. "Four Decades of Choral Training". Metuchen, N.J.: Scarecrow, 1975.
- Ehret, Walter. "The Choral Conductor's Handbook". New York: Edward B. Marks Music Corp., 1959.
- Fields, Victor A. "Training the Singing Voice". New York: King's Crown Press, Columbia University, 1947.
- Huls, Helen Steen. "The Adolscent Voice: A Study". New York: Vantage Press, 1957.
- Jacobs, Ruth K. "The Children's Choir". Philadelphia: Fortress Press, 1957.
- Kagen, Sergius. "On Studying Singing". New York: Holt, Rinehart & Winston, 1950.
- Krone, Max T. "The Chorus and Its Conductor. San Diego: Neil A Kjos Music Co., 1945.
- Murray, Lyn. "Choral Technique Handbook". New York: The Staff Music Publishing Co., 1956.
- Roe, Paul. "Choral Music Education". Englewood Cliffs, N.J.: Prentice-Hall, 1983.
- Sunderman, Lloyd F. "Some Techniques of Choral Success". Rockville Centre, New York: Belwin, Inc., 1952.

Westerman, Kenneth N. "Emergent Voice". Ann Arbor, Michigan: Privately published, 1955.

Wilson, Harry. "Artistic Choral Singing". New York: G. Schirmer, Inc., 1959.