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ABSTRACT

This study examines the literature and research for teaching young children how to sing. The review treats the following variables pertinent to early instruction in singing: task sequence, music stimulus, feedback mode, presentation mode, age at which training is begun, optimum number of repetitions, singing alone vs. singing with stimulus, and physical factors. Although research in music has a long history, the use of scientific experimentation is a recent phenomenon; consequently, little information can be accepted with a substantial degree of confidence. Generally accepted research includes the facts that the natural range of a child's voice is small but will expand up and down with the passage of time; range expansion can be hastened by training; pitch inaccuracy is more widespread in younger children than older children, although the problem lessens with age and training; no superior voice training method is known, although presentation and feedback modes have proved successful; and children are more likely to sing on pitch if a singing model is presented in their vocal range and they are given visual feedback. Also included is an annotated bibliography of background and research materials. (Author/DE)

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TEACHING THE YOUNG CHILD TO SING: A LITERATURE REVIEW WITH ANNOTATED BIBLIOGRAPHY

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TASK SEQUENCE

Two general approaches are in current use to help children learn to sing on pitch. One is the speech to song approach. The other is the song approach. The songs used are controlled in regards to range and tonal content. Many elementary teachers as well as writers of music series books tend to prefer and utilize the song approach. Teachers often times employ an eclectic combination of the two approaches.

SPEECH TO SONG APPROACH

This approach is illustrated by the work of A. Oren Gould. Gould conducted a three year study of singers in grades 1-6. Problem singers were defined as children who can't carry a tune. These singers were elassified as 1) the too-low singer, 2) the too-high singer, 3) the one note singer, 4) the singer with all three of the attributes, and 5) the psychologically inhibited singer. He sent a questionnaire to 605 elementary music educators. Table 1 shows the incidence of problem singers reported by responding to mailed questionnaire.

Gould found an 18% incidence of problem singers in all six grade levels combined. This 18% incidence was also noted in the 1931 Jersild and Bienstock and the 1961 Gaiser and Romaine studies.

Presumed determinants of these singing problems in order of frequency were:

1. Inattention to pitch and failure to notice pitch changes.

TABLE 1

INCIDENCE OF PROBLEM SINGERS AT END OF SCHOOL YEAR

Grade	% Problem Singers
1	34.6
2	24.2
3	17.8
4	12.9
5	11.8
6	11.0

2. Psychological inhibitions toward singing created by various environmental factors.

3. Inability to coordinate the vocal mechanism with pitches heard.

4. Low speaking voice.

5. Lack of interest in singing attributed to a variety of causes such as inability of teachers and unappealing materials.

6. Lack of practice in singing.

7. Lack of exposure to music at home.

The questionnaire respondents recommended use of the following remedial techniques to help the child learn to sing (p. 21).

1. Tone matching devices

2. Use of speech devices

3. Use of bodily movements

4. Use of song patterns

5. Use of mechanical devices such as piano, bells, recorders, etc.

6. Miscellaneous activities including humming, whistling, siren and other sound effects, listening experiences, group participation, placing beginning singer near a stronger singer, atmosphere-encouragement, imitation echo, pitching songs within speaking range of the child, individual attention.

On the basis of this information, Gould devised the following sequence to help children learn how to sing, emphasizing sequential concept formation and the development of accompany skills:

1) Speech activities. Learning to control the various levels of the voice in speech. Experiences range from common phrases such as "Good Morning" and "Hello" to poems, choric speaking and chanting of words of songs to be sung.

2) Speech to song activities. Learning to add musical tones to the speech activities. This was initially done at the pitch level the child could match. (It was discovered early in the study that all children could match some tones.) Materials used were the same as those used in the speech activities, except that musical stories were added that combined choric speaking and singing short phrases.

3) Experiencing unison in song. For many children this was simply low voice training in matching short melodic phrases and songs in the speaking range--or wherever they could.

4) Finding the true singing voice. This critical step could usually not be achieved until the child had considerable security in matching in his conversational range. It was achieved with very short echo patterns using the o͞o vowel. The first songs attempted called for only one or two tone responses with the o͞o sound in the new (usually higher) range.

As soon as consistent successful attempts were made in songs with one or two tone patterns, songs with longer patterns of the response with o͞o were used. From singing patterns of several tones to singing entire short songs with the o͞o sound was usually an easy and rapid transition. It was, however, found to be a very important step. Children who had progressed this far tended to regress if they did not keep singing on the o͞o vowel until they had achieved security and confidence in using the newly found voice.

5) Developing the singing vocabulary. The transition from using the o͞o sound in the child's newly found voice to singing songs with the words involved the sequential development of several aural and vocal skills. Prototype songs were selected for this purpose with the idea that the teacher would be able to find suitable songs in whatever series of music books the children were using.

Reflecting on his data, Gould proposed the following concepts and skills [sic] as being critical to learning to sing (Gould and Savage, p. 2).

Concept	Skill
1. Singing tone versus speaking tone	1. Ability to sustain a vocal sound
2. Definiteness of pitch	2. Ability to sustain a mental image of pitch
3. Highness and lowness of sound	3. Ability to move from high to low or low to high with the voice

4. Sameness of two pitches (unison)	4. Ability to recognize matching pitches and to match pitches with one's own voice
5. The sound and feeling of the act of singing	5. Ability to move from one tone to another with the voice
6. What a melody is	6. Ability to sense the organizational quality which makes a group of sounds a melody
7. What a melody does	7. Ability to reproduce organized melodic patterns with the singing voice
8. A vocabulary cf singing skills	8. Ability to reproduce melodic patterns and melodies repeatedly, at will and with accuracy.

Experimental and control groups encompassed grades 1-6 with at least two classrooms in each grade. Class size averaged 35 children. During the first two months of school, teachers in both experimental and control groups were asked to identify children who experienced difficulty. These children were given pretests using the Gould Test. Tape recordings were also made of songs sung individually.

Teachers of experimental groups were then instructed to utilize the sequence developed by Gould. They were asked to integrate the experimental activities into regular singing experiences by either 1) using them as warm-ups or 2) using them as techniques to learning new songs and improving old ones. The control teachers taught the same materials as the experimental teachers, minus the specially developed sequence.

After 18 weeks, both groups were again given the Gould test as a posttest and tape recordings were made of the same songs as sung on tape prior to instruction. Table 2 shows the results of the Gould Test before and after the 18 week training period.

Note that both groups tended to improve. However, the improvement for experimental groups was consistently greater than that of control groups. The tape recordings showed similar results. Unfortunately, Gould seems to have been unaware of the difficulties in the use of gain scores. Additionally, he fails to recognize the probable influence of gains due to regression to the mean.

SONG APPROACH

The work of Robert Smith exemplifies this approach (1961). Smith worked with three and four year old children, using a one-group repeated measures design. Children in Junior (three year old) and Senior (four year old) groups were asked to sing various intervals at different pitch levels in a song context. Smith then worked on the development of a vocal training improvement program that aimed at three vocal performance skills (p. 38):

1. After two semesters of group vocal training, the child should be able to match all tones in his lower singing range, (c'-a').
2. After two semesters of group vocal training, the child should be able to make the transition from lower to upper range and to sing higher tones accurately (a'-d").
3. After two semesters of group vocal training, the child should have explored his total singing range possibilities.

TABLE 2

PRETEST AND POSTTEST MEAN RAW SCORES AND STANDARD DEVIATIONS

FOR PUBLIC SCHOOL EXPERIMENTAL AND CONTROL GROUPS

ALL CHILDREN

		Pretest Mean	Posttest Mean	Pretest S.D.	Posttest S.D.
Grade 1	Experimental	175.5	231.3	38.2	35.0
Grade 1	Control	172.5	189.3	30.5	34.8
Grade 2	Experimental	247.1	251.1	59.7	43.4
Grade 2	Control	201.4	241.6	46.8	47.3
Grade 3 A	Experimental	212.9	269.1	36.1	35.0
Grade 3 A	Control	227.7	255.6	43.1	40.4
Grade 3 B	Experimental	231.7	268.9	34.0	31.7
Grade 3 B	Control	175.8	209.8	21.8	24.1
Grade 4	Experimental	231.8	258.7	43.8	44.9
Grade 4	Control	229.7	237.4	43.3	45.4
Grade 5	Experimental	233.1	283.1	22.9	15.1
Grade 5	Control	260.0	261.2	43.5	41.9
Grade 6	Experimental	214.2	257.7	38.0	28.9
Grade 6	Control	244.0	240.3	27.8	24.9
All grades	Experimental	225.4	267.0	34.7	3.14
All grades	Control	212.9	257.7	36.7	36.9

The children were given a series of tests over a one year period to measure individual growth and improvement. The intervals were practiced and judged in a song context. Smith used many songs for his training, some for lower range, others for range expansion, still others for exploring total range possibility. Each song was presented in a similar manner. The teacher sang the song and played the melodic line on the piano. The children were instructed to listen for repeated me lic phrases and words. Both groups had extensive work in the lower singing range. However, more work was given to the Junior group in this range, because they had more inaccuracies on the initial test. Smith noted in his work as well as in earlier work that upper range development is partially a function of maturation. The younger the child the less control over the vocal mechanism. The Senior group received more training in the upper range because they were a year older and more capable of benefiting from the training. Attention to total range exploration was given mainly to the Senior Group during the second semester. Work was done in the form of creative free chants. Smith also did some training on the C major scale. The Junior group performed some free chants, but always in the vocal range where training had occurred.

Smith's entire test situation was tape recorded and judged by three independent raters. Children were scored on ability to sing specific intervals within a song context in the various ranges. Additionally, the four year olds were scored on ability to sing high and low chants plus a C major scale. Smith concluded that there was great improvement in singing accuracy as a function of training. Tables 3 and 4 show the results.

TABLE 3

PERCENTAGES OF
ACCURATE REPRODUCTION
ON THREE VOCAL TESTS
FOR JUNIOR GROUP (AGE 3)

Interval	October Test	February Test	May Test
Lower Range			
Minor Seconds	53.8	84.6	84.6
Major Seconds	69.2	61.2	84.6
Minor Thirds	46.2	76.2	84.6*
Major Thirds	46.2	76.2	84.6
Perfect Fourths	53.8	69.2	100.0
Perfect Fifths	46.2	69.2	92.3
Upper Range			
Major and Minor Thirds	23.0	53.8	46.2**

* Two Minor Thirds appeared on the final test. The score shown above represents performances on the Minor Third from E to G. On the Minor Third from D to F 100.0 percent of the children performed successfully.

** Two Major Thirds appeared on the final test. 53.8 percent of the children were able to perform successfully on the second Third, which was a descending interval (D^1 to B).

TABLE 4

PERCENTAGES OF
ACCURATE REPRODUCTION
ON THREE VOCAL TESTS
FOR SENIOR GROUP (AGE 4)

Interval	October Test	December Test	Final Test
Lower Range Intervals			
Minor Seconds	56.3	.....	93.7
Major Seconds	75.0	93.7	93.7
Minor Thirds	43.7	100.0	93.7
Major Thirds	50.0	.....	93.7
Perfect Fourths	43.7	87.5	93.7
Perfect Fifths	43.7	.....	93.7
Upper Range Intervals			
Major Seconds	.....	68.8	.....
Minor Thirds	6.3	62.5	93.7
Major Thirds	.....	.....	43.7

Smith recommended children receive the following experiences:

a. Learning and attempting to reproduce the easier intervals in the range d' to g' (always in the same tonality) and in a song content.

b. Attempting to sing new tones and intervals in a slightly wider range, c' to a'.

c. Attempting to reproduce a wider variety of both ascending and descending intervals within the increased range.

d. Hearing and attempting to sing familiar lower range songs which have been transposed to a new pitch level.

e. Attempting to sing songs which begin in the familiar lower range but move through the chest-head [illegible]tion to the upper range..

f. Attempting to sing new songs with phrases in both the lower and upper range but with a tonal gap between the ranges.

g. Experimenting with various physical ways of making the transition.

h. Listening to and attempting to imitate clear examples of successful vocal production in the upper range.

i. Hearing attractive material requiring upper range proficiency for successful performance.

j. Hearing and attempting to imitate vocal experimentation whenever other children made such attempts.

A third approach by Carl Orff emphasizes, "the development of a child's creative faculty which manifests itself in the ability to improvise." 1956, (p. iv). Orff begins training with rhythm, using speech patterns to develop understanding of tonal contrast, dynamics, note values, and phrasing. A variety of percussion instruments are used as well as clapping, stomping, etc. Melodic experiences begin with the falling minor third, then the pentatonic scale c'-a' and gradually major and minor scales are introduced. Melodic instruments are also played and echos and canons are often used. Phrase building is practiced

with [illegible] and rondo form being a favorite. This eventually leads the child to create his own rhythms and melodies.

TYPES OF MUSICAL STIMULUS

Musical stimuli can vary in complexity. The simplest element is a single tone. As new tones are added, the element becomes more complex, moving from intervals to patterns to whole compositions. Some research involves children's ability to sing all these different kinds of musical elements. In this section research related to each of these levels of stimulus complexity is discussed in order, beginning with single tones and ending with whole songs.

SINGLE TONES

Two types of research studies have been conducted. The studies are old but the data still appear valid. They are:

1. Studies designed to identify the child's natural singing range as a function of age.
2. Studies designed to improve children's abilities in matching pitches.

Studies to identify the child's natural range. An important study was done in 1931 by Jersild and Bienstock. Forty-eight children age 31-48 months were given an initial pitch test covering the range of c'-f". The pitches were sung by an experimenter and also played on a xylophone or pitch pipe. If the child had difficulty or remained silent, the pitch was repeated a maximum of eight times. Verbal encouragement was given by the experimenter. Table 5 shows the pitches the children were capable of reproducing.

TABLE 5

NUMBER OF CHILDREN CORRECTLY REPRODUCING THE VARIOUS NOTES BASED ON 3 REPETITIONS OF THE PITCH TEST, WITH ALLOWANCE OF ONLY ONE CREDIT FOR EACH NOTE SUNG DURING THE TEST SERIES

Pitch (48 cases)

Middle c'	d'	e'	f'	g'	a'	b'	c''	d''	e''	f''
19	28	30	27	29	22	13	12	11	6	5

Jersild and Bienstock note that children sing the notes d'-a' most readily. These results were surprising at the time because the then-recommended song literature emphasized a higher tessitura.

A second study was conducted in 1934 (Jersild and Bienstock). This study was more extensive and included 407 children age two to ten years. The experimenter sounded each pitch on the piano, sang the pitch and asked the child to reproduce it. The tones sung were those tones in the C major scale. When administering the test, the experimenter found a tone which the child could easily reproduce and worked up and down from this tone. If the child began to have difficulty, the experimenter encouraged the child and repeated the pitch up to a maximum of eight times. Often the experimenter would present tones quite beyond the range of anything the child had produced in an attempt to have the child shift to the head or chest voice. After this device was applied, the child often could reproduce additional tones. The results of this study can be seen in Table 6.

TABLE 6

TONES SUNG BY FIFTY PER CENT OR MORE OF THE SUBJECTS AT EACH AGE LEVEL. THE FIGURES FOR THE ENTIRE GROUP, AS WELL AS SEPARATE FIGURES FOR BOYS AND GIRLS, ARE GIVEN AT THE AGE OF TEN YEARS. MIDDLE C IS UNDERLINED. A FEW TONES REPRODUCED BY SLIGHTLY LESS THAN FIFTY PER CENT OF THE CHILDREN ARE SHOWN IN PARENTHESES

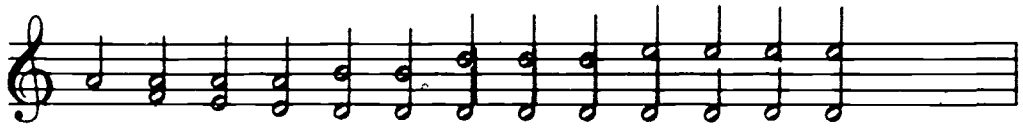
Age	Tones
2	d e f g a
3	c d e f g (a) [1]
4	b c d e f g a b c
5	a b c d e f g a b c d
6	a b c d e f g a b c d e f (g) [2]
7	a b c d e f g a b c d e f g
8	g a b c d e f g a b c d e f g
9	f g a b c d e f g a b c d e f g
10	[3] (f) g a b c d e f g a b c d e f g
Boys	f g a b c d e f g a b c d e f g
Girls	g a b c d e f g a b c d e f g a
Men	
	(d) [4] e f g a b c d e f g a b c d e f g a b c [5]
Women	c d e f g a b c d e f g a b c d e f g a

1 Sung by forty-nine per cent of the children.
2 Sung by forty-eight per cent of the children.
3 Sung by forty-eight per cent of the children.
4 Sung by forty-nine per cent of the men.
5 Includes the falsetto.

Révész (1954) reports a study of 300 school children ranging from 6-15 years old. He does not give the background or methods used in the study, but Table 7 reports his results.

TABLE 7

COMPASS OF BOYS' VOICES AT DIFFERENT AGES. GIRLS HAVE ONE WHOLE TONE MORE AT TOP

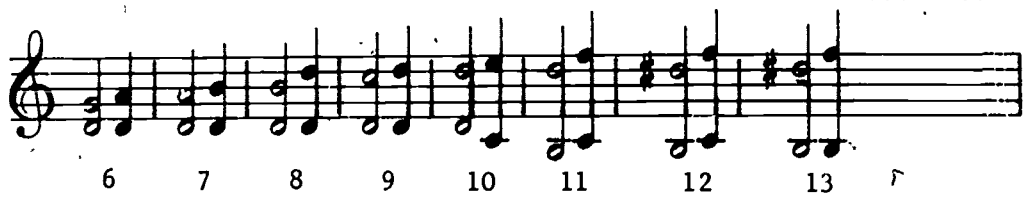


Infant 1-2 3-5 6 7 8 9 10 11 12 13 14 15

In close agreement with the Révész findings, are those in a study done in 1895 at Niel State School in Germary (Paulsen). Subjects included 4,944 children age six to fourteen. Paulsen was trying to determine those pitches which could be reproduced with ease. Table 8 shows his findings.

TABLE 8

RANGE LIMITS WITHIN WHICH AT LEAST 75% OF THE SUBJECTS TESTED COULD SING. HALF NOTES REPRESENT RANGES OF BOYS, QUARTER NOTES REPRESENT RANGES OF GIRLS.



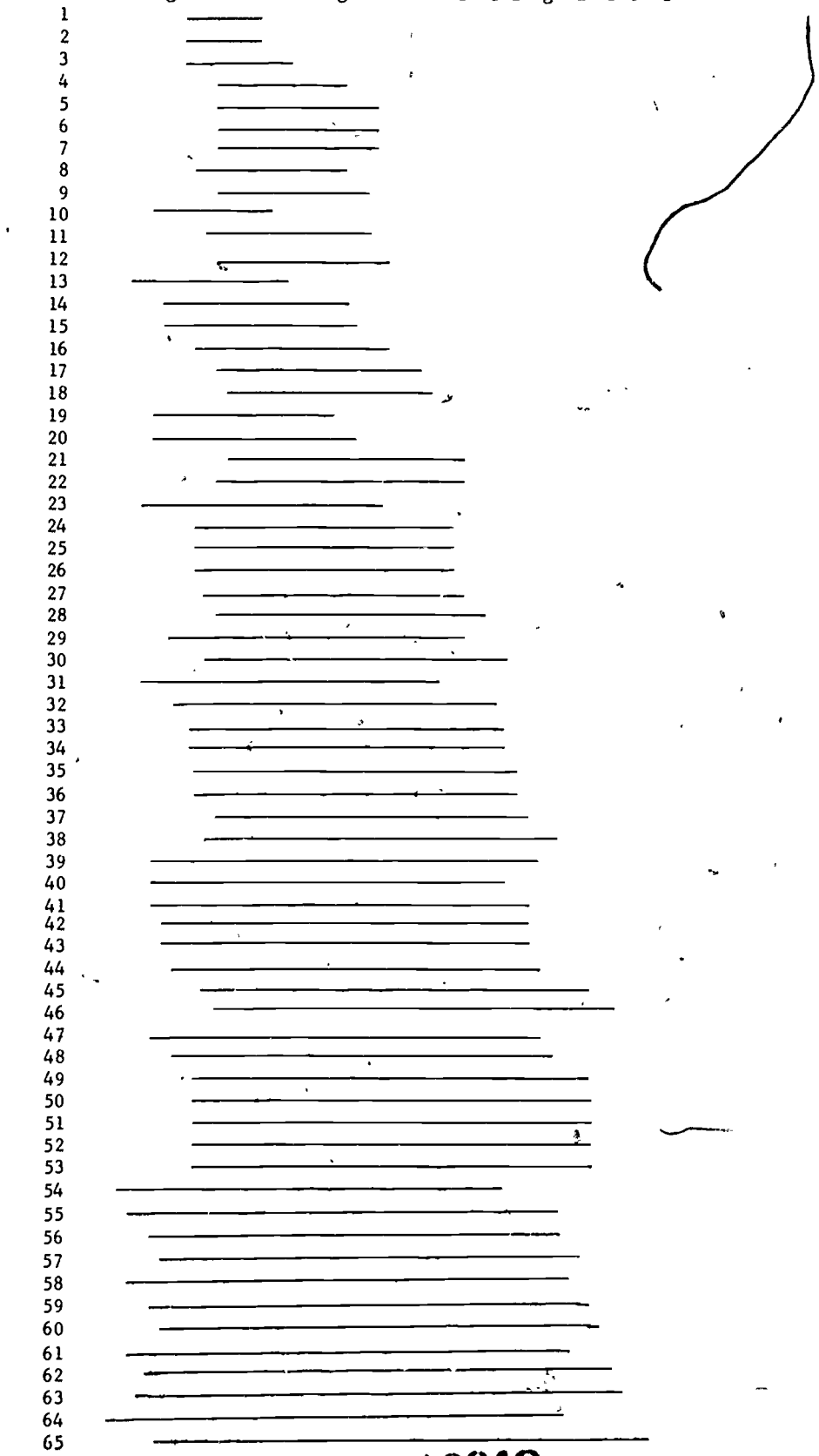
6 7 8 9 10 11 12 13

As in the Révész study, there was no mention of the exact method of test presentation.

Lobbato (1960) tested 65 first grade children. The voice test began with the child's selection of the beginning pitch. The children were tested individually, and the test was approached as a game "to see how high and low we can sing." The syllable "lah" was used in lower registers and "oo" in upper registers for easier tone production. Results of the September 1957 test can be seen in Table 9.

TABLE 9

COMPARISON OF VOICE RANGES FOR SIXTY-FIVE FIRST GRADE CHILDREN



Lobatto noted not only the differences in the amount of notes these children could sing, but also the differences in range placement.

Studies designed to improve children's abilities to match pitches. Jersild's study (1931) has previously been discussed. Subjects were 48 children age 31-48 months. After the initial pretest was given, the experimenters trained 18 experimental children. The training consisted of singing eight songs. The subjects received 40 ten-minute training sessions. The control groups received no training. Both groups were tested five times over the period of December to May. The results of the final tests showed that training greatly improved the child's ability to sing more pitches. Table 10 shows the notes the 18 experimental children were capable of reproducing.

TABLE 10

RESULTS OF FINAL PITCH TEST GIVEN TO 18 EXPERIMENTAL CHILDREN

g	a	b	c'	d'	e'	f'	g'	a'	b'	c"	d"	e"	f"	g"	a"	b"	c"
5	15	17	18	18	18	18	18	18	18	17	18	17	15	15	14	13	9

Table 11 shows a comparison of both control and experimental groups (pitch only). Jersild and Bienstock concluded that for very young children ability to match pitches improves with training.

Another study designed to study the effects of training on the child's ability to reproduce pitches was done by Wolner and Pyle (1933). The subjects were seven children from the 5th, 6th, and 7th grade who were considered by their teachers to be "non-singers" and also were unable to

TABLE 11

COMPARISON BETWEEN AVERAGE SCORES OF EXPERIMENTAL AND CONTROL CHILDREN ON PITCH TEST GIVEN AT BEGINNING AND END OF STUDY OF EFFECTS OF TRAINING

	EXPERIMENTAL		CONTROL	
	$\bar{X}$	SD	$\bar{X}$	SD
Average age in months	38.18	± 3.69	40.11	± 3.93
Average number notes correctly sung on first test (Test A, 11 notes).	4.22	± 2.44	4.22	± 2.71
Average number notes correctly sung on repetition of (Test A) at end of training	10.72	± .11	6.44	± 2.89
Average notes correctly sung on extended test (Test B, 18 notes) at end of training	15.50	± 1.78	8.00	± 3.22

discriminate pitches. The training began with the definition of pitch, and high and low as distinguished from intensity, duration, and timbre. The imagery of ladders, steps, etc. was used. The children were taught to reproduce the piano pitch c' vocally. Then work began to try to reproduce d', etc. This work of pitch reproduction continued until the subject could reproduce the notes of the major scale. In each case, the child was told to stop, think of the pitch, and then try to reproduce it. Progress was extremely slow and rate of progress differed for each child. Then interval training began, matching c'-e'; e'-g'; c'-g'; c'-c". Matching was done on the neutral syllable "la," with discrimination tasks of other intervals interspersed. When the child's response was incorrect, he was asked the direction of his error, and tried to reproduce vocally the correct response. There was immediate feedback.

The results of the study showed that the seven children, who were considered almost hopeless by their teachers, all improved in pitch discrimination and in their singing ability. All learned to discriminate perfectly the intervals of octave, fifths, thirds, whole and half tones within and outside their singing range. One pupil sang the words and music of several songs with no trace of pitch deficiency. He also sang major and minor scales, chromatics, intervals, and tones picked at random. A second child sang scales and intervals and the music of a song without words. Two pupils sang scales and intervals. The other three pupils sang imperfectly in pitch but with great improvement over their initial efforts.

A study by Wyatt (1945) used 16 college students. Eight were well trained musically, the others were untrained. Both groups considered themselves pitch deficient. Training involved the use of a visual feedback device known as a Conn chromatic stroboscope which gave the student visual feedback. The student heard a pitch sounded on the oscillator and then attempted to reproduce this pitch singing into a microphone. There are 12 windows on the Stroboscope corresponding to the 12 chromatic tones of the octave. These 12 tones can be displayed for each of seven octaves. For example, if the student tried to sing 440 cps, a stationary pattern would be seen in the "A" window. If the student were not on the correct pitch he could see the direction and also estimate the amount of his error. If he were higher, the patterns would drift to the right. If he were lower, the pattern would drift to the left. Each tone was sounded three times. If the student still

failed, the same task was attempted at a lower pitch level. If he failed still, the task was modified to have the student sing while the stimulus was still being sounded. If he still failed, the stimulus was played on a piano. Finally, the stimulus was sung by the experimenter. Training included trying to reproduce whole and half tones above and below the initial stimulus. Time and training varied for each of the subjects depending on his need.

Wyatt reports results only for pitch discrimination. The pitch matching practice was used as a means of improving pitch discrimination. Improvement in pitch discrimination as a function of training in pitch matching was highly significant. Tables 12 and 13 show amount of improvement in the subjects' performance on the Seashore and Wyatt pitch discrimination tests.

In the Lobbato study (1960), the children were tested five times: September 1957, April 1958, September 1958, February 1959, and May 1959. Forty-nine children took all five tests. The children received musical training four times a week from a music specialist. A song approach was used. There was no control group so it is difficult to sort out the effects of training from the effects of maturation.

Data from the September 1957 test shows a variation in range from five to 32 semitones. The pitches that all children could reproduce were c', c#' and d'. The pitch range of 75% of the children extended from a#-a'. Data of the May, 1959 test show a variation in range from 24 semi-tones to 54 semi-tones. Amount of growth varies from nothing to 19 semi-tones. The lower limits of the range extended from B^{o} to f#.

TABLE 12

MEAN PRETRAINING AND POSTTRAINING SCORES IN THE SEASHORE PITCH TEST, SERIES B

	Ss	Pretraining Mean	Posttraining Mean
Music	DA	33.8	42.5
	FM	29.0	43.0
	GM	34.0	45.5
	ID	36.5	43.0
	PE	37.0	40.0
	RD	44.0	41.5
	SL	29.3	37.0
	UM	30.5	43.5
	Average	34.25	42.00
Non-music	BH	36.5	38.0
	DL	31.0	41.5
	EV	31.5	32.0
	GK	31.5	32.5
	SM	34.0	35.5
	SJ	32.5	42.0
	SJo	30.5	38.5
	TJ	36.5	40.0
	Average	33.0	37.50

The upper limits extended from e^2 to f^4. Pitches that all children were able to reproduce extended from f# to e^2. Pitches that 75% of the subjects were able to reproduce were e to b^2. Table 14 shows the improvement of pitch range.

Two parts of a study conducted by Merilyn Jones (1967) deal with pitch matching. Jones selected eight subjects (four boys and four girls) from the second and third grade who were chosen by their teachers

TABLE 13

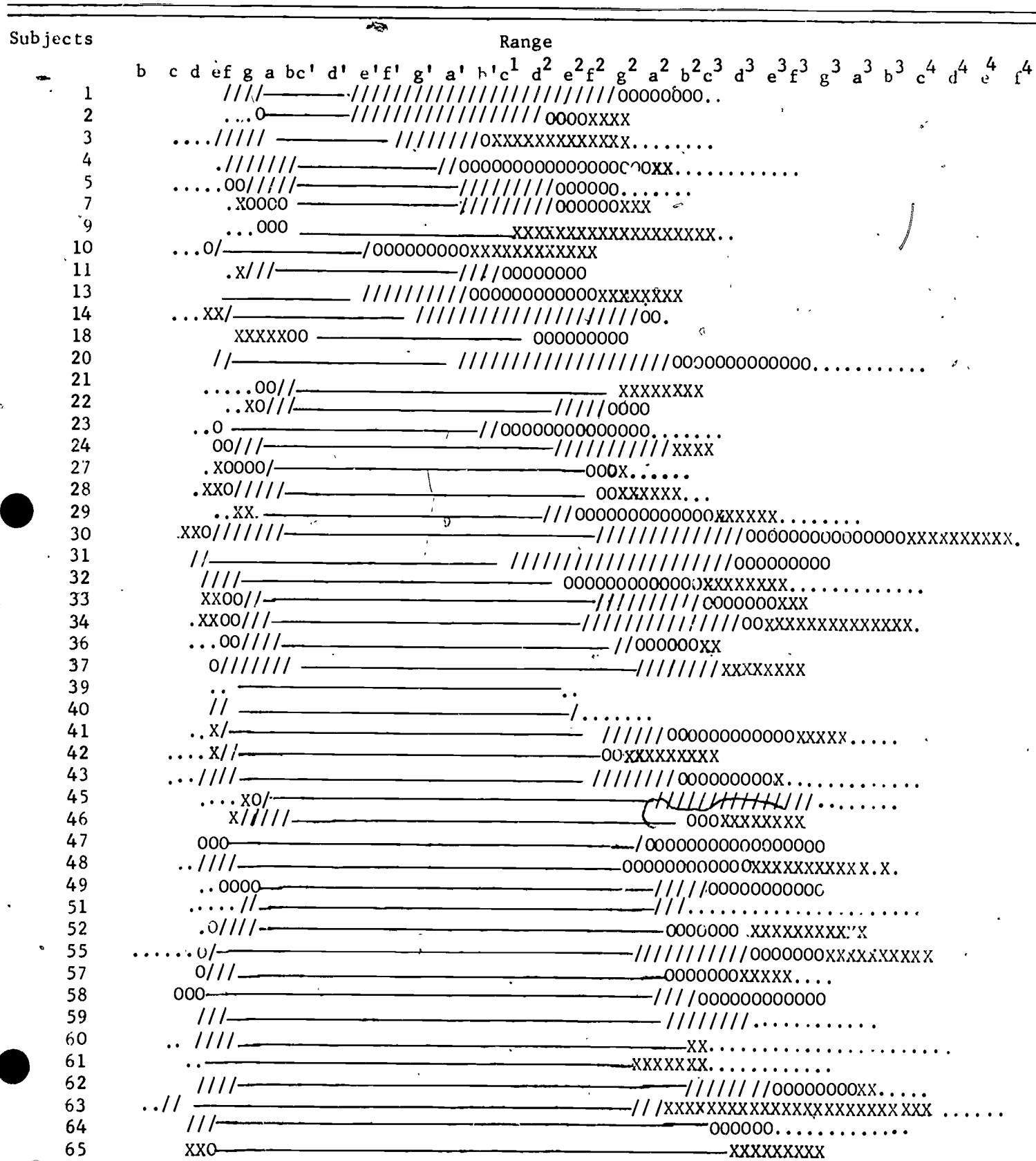
MEAN PRETRAINING AND POSTTRAINING SCORES IN THE WYATT TEST

	Ss	Pretraining Mean	Posttraining Mean
Music	DA	77.5	85.5
	FM	76.0	89.0
	GM	68.5	91.0
	ID	76.0	86.0
	PE	89.0	96.5
	RD	73.5	89.0
	SL	80.5	93.0
	UM	84.0	93.0
	Average	78.13	90.38
Non-music	BH	72.0	85.0
	DL	79.5	92.5
	EV	61.0	73.3
	GK	70.0	74.0
	SM	75.5	86.0
	SJ	77.0	84.3
	SJo	43.0	85.0
	TJ	69.5	87.0
	Average	68.44	83.39

because they had singing difficulties. These children could match fewer than five of the twenty pitch examples included on a screening test.

TABLE 14

COMPARATIVE GROWTH OF VOICE RANGES FOR FORTY-NINE CHILDREN AS SHOWN IN FIVE VOICE TESTS.



Test one is recorded with ————, the extension of the range for test two is recorded with /////, in test three ooooo, in test four xxxxx, in test five .....

A test was administered individually and responses were tape recorded. Section I of the test required children to match pitches in the range of a to g'. Section III extended the range to d". Each pitch was played three times in succession on a Magnus organ and the child was asked to reproduce the pitch vocally.

Each child received four hours of instruction, divided into sixteen 15-minute sessions. Training lasted four weeks and was done on a vertical keyboard which had the range of c to c"'. Pitches in the child's range were labeled with identifying colors and letter names were also fixed on keys. Keys below c' were labeled with large letters, c'- b' were labeled with small letters and keys above c" were labeled with double letters. A light was installed beneath the keyboard which could be made visible to the child by means of an electrical contact manipulated by instructor as a means of feedback.

Jones began by training the children to discriminate "high" and "low." She noted that the concepts were often confused with "loud" and "soft." She had the child reach for the highest note on the keyboard, then the lowest note. Practice continued until the child could discriminate highest and lowest note of the major and minor second.

Pitch matching began with a pitch that was easiest for the child to match. The child was instructed to play the pitch three times, hold the third sound longer, and then attempt to sing with the instrument. If the tone matched, the light went on and the child moved to another pitch--up or down. Later the child was told to judge his own

performance by turning on the light when his response was correct. Table 15 shows each subject's improvement.

TABLE 15

VOCAL SKILLS PITCH MATCHING RESULTS

	Section I		Section III		Total	
Subject	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest
2G1	1	9	3	8	4	17
2G2	0	8	0	10	0	18
2G1	0	9	0	6	0	15
2G2	2	4	1	2	3	6
3G1	2	9	1	8	3	17
3G2	0	5	1	8	3	13
3B1	0	10	0	9	0	19
3G2	1	9	2	9	3	18
Average	1	8	1	7.5	2	15

MELODIC INTERVALS

Melodic intervals may vary in several ways; in terms of size, direction, rhythm, location on the staff, in relation to tonality, whether or not they occur in a larger musical context, and whether they are sung with text or sung on a neutral syllable. Any of these factors may affect a person's ability to sing an interval. Few of these variations have been investigated in a controlled fashion. Some descriptive studies have attempted to assess children's abilities to reproduce intervals prior to training. Other studies have investigated the possibility of teaching students to sing given intervals.

Studies which aim at child's ability to sing intervals prior to training. The Jersild and Bienstock (1931) study discussed earlier used an interval test as well as a pitch test. The same 48 three year

old children were used. The interval test included twelve intervals: ascending and descending major and minor 2nds, 3rds, Perfect 4ths and Perfect 5ths. The authors do not indicate where on the staff the intervals were located. The experimenter sounded the interval on a pitchpipe, then sang the interval and asked the child to reproduce it. Table 16 (p. 278) shows the results of the initial interval test. The authors report that the closer intervals were reproduced more readily than the wider intervals. Ascending and descending were reproduced equally well.

TABLE 16

NUMBER OF CHILDREN CORRECTLY REPRODUCING THE VARIOUS INTERVALS ON THE INITIAL TEST, BASED ON 2 REPETITIONS OF THE INTERVAL TEST, WITH ALLOWANCE OF ONLY ONE CREDIT FOR EACH INTERVAL SUNG DURING THE TEST SERIES

Interval (47 cases)

Ascending						Descending					
Major second	Minor second	Major third	Minor third	Perfect fourth	Perfect fifth	Major second	Minor second	Major third	Minor third	Perfect fourth	Perfect fifth
24	18	17	13	12	13	26	11	22	23	16	8

Studies which aim at teaching children to sing given intervals.

In the 1931 Jersild and Bienstock study, training was given to eighteen of the experimental children. The control group received no training. The training was the same as that for the pitch test. The children

sang eight songs. Table 17 shows the differences between control and experimental children before and after training.

TABLE 17

COMPARISON BETWEEN AVERAGE SCORES OF EXPERIMENTAL AND CONTROL CHILDREN ON INTERVAL TEST GIVEN AT BEGINNING AND END OF STUDY OF EFFECTS OF TRAINING

	Experimental		Control	
	$\bar{X}$	SD	$\bar{X}$	SD
Average age in months	38.75	± 2.94	40.56	± 3.69
Average number of intervals correctly sung on initial test (Test A, 12 intervals)	4.25	± 3.03	4.31	± 2.89
Average number of intervals correctly sung on repetition of Test A at end of training period	11.50	± .67	8.00	± 2.50
Average number of intervals correctly sung on extended test (Test B, 22 intervals) at end of training.	17.0	± 4.25	10.18	± 4.26

In the Wolner and Pyle study (1933) previously discussed, seven children were also asked to reproduce intervals of half tones, whole tones, thirds, fifths, and octaves when an experimenter played them on the piano in the child's singing octave and also above and below the child's singing octave. When substantial progress was made using the piano, training began using Whipple forks. The training was used as a mode to improve pitch discrimination, which it did. The children also improved in their ability to vocally reproduce the various intervals.

Smith (1961) judged children's abilities to sing various intervals in a song context. Training was done in a song context, The child was never given isolated intervals. Results of the accurate intervals reproduction can be found in Tables 3 and 4.

The Jones study (1967) discussed under pitch training also investigated interval and pattern training. Section V of her test contained intervals and patterns of 2 or 3 notes. Intervals included ascending major seconds, and ascending and descending major and minor thirds. Patterns were based on basic scale and chord patterns such as 1-2-3 and 1-3-5 with a pitch range from c' to c". Section VII of her test included ascending intervals of the fourth, fifth, and octave and patterns of 1-2-3, 3-2-1, and 5-3-1. The range was c'-c". The training of the eight subjects was on a vertical keyboard. The training began on those pitches the child could easily reproduce. The instructor sang the pattern. The child listened and played the pattern sung by the instructor. Then the approach was reversed. The child sang the pattern played by the instructor. When learning new material the instructor pointed to the keys the child should play. Songs were later introduced using learned intervals and patterns. Emphasis was placed on listening and singing. Attention was given to steps and skips. Results of the test are shown in Table 18.

Jones did note that scores on the pretest were higher on patterns and intervals than on pitch matching, which may indicate it is easier for a child to match a pattern or interval than an isolated pitch. Posttest scores did not show as wide a margin of difference on these two skills.

PATTERNS

Patterns, like intervals, can vary in several ways: range, tessitura, length, type of movement (conjunct vs. disjunct), direction of movement,

TABLE 18

VOCAL SKILLS PATTERNS AND INTERVALS TEST RESULTS

Subject	Section V		Section VII		Total	
	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest
2G1	5	9	2	8	7	17
2G2	0	9	0	5	0	14
2B1	0	9	1	7	1	16
2B2	1	5	0	2	1	7
3G1	4	8	3	7	7	15
3G2	3	10	4	8	7	18
3B1	0	8	0	10	0	18
3B2	4	7	4	9	8	16
Average	2	8	2	7	4	15

tonality, text, tempo, and degree of stereotype. Though each variation could presumably affect pitch accuracy in singing, their relative effects have not been systematically investigated. However, with respect to some of these variables, music educators conventionally act upon the following assumptions:

1. Range should be adjusted to remain within the child's physiological capabilities at each age level. Systematic attempts should be made to extend the range so as to include both chest and head registers.
2. Tessitura for most patterns should remain in child's mid-range.
3. It is easier to learn to sing common stereotyped patterns than more original ones. Common patterns refer to patterns such as sol-sol-mi-la-sol-mi or mi-re-do.

Clegg investigated a child's abilities to match a single tone, two-tone patterns, three-tone patterns, four-tone patterns, and five-tone patterns. She presented these patterns to 796 first, second and third grade children. The test was divided into two parts, Test A and Test B. See Appendix A for a copy of the tests.

The child was instructed to listen to pre-recorded tapes and then to try to vocally reproduce the figures heard. The sessions were tape recorded and judged with a 1-4 rating from no response to correct response. The following ratings were given: 1) no response, 2) incorrect response, 3) partially correct response, 4) correct response. Table 19 shows the percentage of partially correct responses.

TABLE 19

GRADATED PERCENTAGE COMPARISON
OF PARTIALLY CORRECT RESPONSES

Test Unit	% of 399 Students	No. of Responses	Test Unit	% of 397 Students	No. of Responses
A-2	40.10	160	B-2	32.24	128
A-7	33.83	135	B-8	28.97	115
A-8	31.33	125	B-3	20.15	80
A-4	12.53	50	B-4	16.88	67
A-6	12.53	50	B-6	15.87	63
A-3	8.52	34	B-7	14.11	56

Clegg concluded:

1. Children are consistently able to reproduce the single tone c', the descending minor third (sol-mi), and the single tone e' better than other test units.
2. The lowest mean scores for the test units was the ascending chromatic tones fa-fi-sol and tonal pattern ti-sol-mi-do.
3. The mean score for the total performance of each grade level shows an increase in tone matching ability from grade one to grade two and from grade two to grade three.

If you wish to help a child learn to sing, do you have him match a single pitch, intervals, patterns or songs? Music educators are not in agreement, and there is not a sufficient amount of reliable data to satisfactorily answer the question. Lacking any better resolution, many music educators use a combination of the above elements.

SONGS

Gould (1968) defines three types of songs moving from easy to difficult. The easiest (Type A) songs begin on the low tonic and proceed by scale step up and down the major or minor scale in a short range of five or six tones.

Songs of middle difficulty (Type B) begin on the third or fifth, and provide practice in singing a song which does not begin on the tonic. These songs usually contain falling minor thirds, which Gould feels is the easiest interval for the problem singer.

Type C songs contain one or more skips to the high tonic. This skill requires both mental and physical preparation. Gould recommends using the vowel o͞o when first practicing these skips.

As the child finds his new singing voice in these types of song, he often needs help with tone quality. The use of neutral words such as yah, mah and nah can be used to help free the tone.

To help the child sing tunefully in his lower range, Smith (1961) chose two general song types. The first emphasized exact repetition of short vocal phrases. The songs had varied overall ranges. The second type had a more limited overall range but usually contained less exact phrase repetition.

To help the child expand his range, Smith utilized three song types. The first contained the range of f' to c" or d". The second type begins in the lower range and gradually moves upward through the higher range. The third type has tones in both vocal ranges, but the tessitura is generally low. Smith also recommended the use of a skip up to the high note.

To explore the total range, Smith employed creative chants composed by the children. He would transpose these chants to high and low levels.

Nye and Nye (1964) five common patterns prevalent in song literature:

1. The falling minor third
2. Sol-sol-mi-la-sol-mi

3. Mi-re-do.

4. The ascending fourth or V-I resolution

5. Pentatonic songs

FEEDBACK

Two types of feedback have been used. The first and most common is verbal. The teacher tells the student to sing higher or lower. She may also use hand signals and body movement. Comments such as "sing up to the ceiling," "throw your voice," and "sing at the top of your head" are used.

A second type of feedback is visual. Wyatt's (1945) use of the stroboscope has already been discussed. Unfortunately this study was limited to training of pitch discrimination. No results were reported for pitch matching effects.

Seashore and Jenner (1910) used the tonoscope to determine if this device could improve the student's ability to sing intervals. The intervals of the M3, P5 and P8 were used. Six subjects were tested over a 12 day period. They were given preliminary practice. This preliminary practice consisted of sounding a tone of 100 vibrations and the subject was required to sing the standard pitch and the interval following. Preliminary practice included the use of the tonoscope as well as unaided practice. Seashore did not state the extent of preliminary practice. The first five days the subjects sang without a visual aid. The next five days the subjects used the tonoscope. On the 11th day a record was taken without the use of the visual aid. On the 12th day another record was taken with the subjects using the tonoscope. Table 20 shows the results.

TABLE 20

ACCURACY OF THE VOICE WITH AND WITHOUT AID OF THE TONOSCOPE

Days 1-5 Unaided	Days 6-10 Aided	11 Unaided	12 Aided
	Major Third		
Average	Average	Average	Average
2.8	1.4 vibrations	2.9	1.2
	Fifth		
3.5	1.7	4.8	1.7
	Octave		
4.7	1.9	4.2	2.2

Seashore and Jenner conclude:

1. The aid enhances the ability to sing a tone which has been heard. The superiority of the aided series over the unaided series amounts to 42 per cent.
2. The aid enhances the ability to sing an interval. The superiority of the aided series over the unaided series comes to 50 per cent for the major third, 50 per cent for the fifth, and 60 per cent for the octave.
3. Improvements in the ability to sing an interval are more pronounced and rapid in the aided than in the unaided series.

In an experiment by C. J. Knock (1922) the tonoscope was used to check the accuracy of subjects' abilities to sing the standard tone, then intervals of the major 3rd, 5th, and octave. There were three parts to the experiment, an unaided series, an aided series, and a final unaided series. In the first session the subject sang without aid, but was given immediate verbal feedback to allow him to know how flat or sharp he was singing (in number of vibrations). Results of Knock's experiment can be seen in Table 21.

In both Knock's and Seashore's experiments, immediate feedback substantially aided the subject in singing intervals when using the tonoscope. There appeared to be some carry-over of this skill in Knock's Series III. In Seashore and Jenner, however, this carry-over was not evident.

PRESENTATION MODE

The Clegg experiment (1966), previously discussed, dealt with the question of which presentation mode was easiest for the child to vocally

TABLE 21

SUMMARY SHOWING GAIN IN SERIES II AND NET GAIN IN SERIES III

	Men				
	Series I	Series II		Series III	
	Average error	Average error	Gain	Average error	Net gain
Standard	1.9 vib.	.5 vib.	77%	1.1 vib.	42%
Third	2.4	.9	62%	1.8	25%
Fifth	3.1	1.1	64%	2.4	21%
Octave	2.3	1.2	47%	1.9	22%
	Women				
	Series I	Series II		Series III	
	Average error	Average error	Gain	Average error	Net gain
Standard	4.2 vib.	1.8 vib.	57%	2.3 vib.	45%
Third	5.2	1.9	63%	3.8	27%
Fifth	5.9	2.3	61%	4.2	30%
Octave	6.0	3.4	43%	3.5	44%

reproduce. Clegg's study involved 796 1st, 2nd, and 3rd grade children. There were eight modes of presentation: piano, female voice, recorder, song bells, pitch pipe, autoharp, male voice and flutophone.

Table 22 shows results of the test. Clegg found the female voice to be easiest for the child to match followed by the piano, autoharp, and pitch pipe. The male voice, recorder, flutophone and song bells were more difficult, perhaps because these instruments are in a different range than the child's singing voice.

TABLE 22

GRADATED MEAN COMPARISON OF
INSTRUMENTS AND VOICES REPRESENTING 796 CHILDREN

Instrument or Voice	Group A	Group B	Groups A and B
Female Voice	3.32	3.19	3.26
Piano	3.25	2.95	3.10
Autoharp	3.13	2.86	3.00
Pitch Pipe	3.10	2.79	2.94
Male Voice	3.05	2.69	2.87
Recorder	2.83	2.57	2.70
Flutophone	2.82	2.57	2.70
Song Bells	2.71	2.48	2.60
Average:	3.03	2.76	2.90

AGE OF TRAINING

Smith's (1961) study showed that children are able to benefit from early musical study. Boardman (1964) utilized Smith's subjects, comparing those children who had had early musical training with a control group of children who had not experienced an early preschool training program. She found that the control children in fact did catch up. Boardman attributed this result to maturation. She feels that age five is an optimum time to begin training.

In 1934 Jersild and Bienstock noted that improvement from age two to six years is decidedly greater than improvement from six to maturity. Comparisons of isolated reproduced tones are shown in Table 23. The experimenters conclude that a person develops a large portion of his

potential pitch range while he is still in the first three grades of elementary school.

COMPARISONS OF INDIVIDUALS AT DIFFERENT AGE LEVELS

Age in months	24-41	42-59	60-77	78-95	96-113	114-131	Adults
Number of cases	49	69	78	78	67	66	65
Average number of tones sung.	6.1	8.6	10.9	14.2	15.2	15.7	19.7
Median number of tones sung	5.0	8.0	10.5	14.0	16.0	16.0	20.0

Age in years	2-3	4-5	6-7	8-9	10	Adults
Number of cases	73	97	104	89	44	65
Average number of tones sung.	6.3	9.9	13.8	15.4	15.8	19.7
Median number of tones sung	5.0	9.0	13.0	16.0	16.0	20

Age in years	2-4	5-7	8-10	Adults
Number of cases	118	156	133	65
Average number of tones sung.	7.6	12.5	15.4	19.7
Median number of tones sung	6.0	12.0	16.0	20

NUMBER OF REPETITIONS

No studies have been done to probe the optimal number of repetitions necessary to learn a song. Nevertheless, many music educators emphasize that repetition is an important factor in successful singing. Children begin by reproducing a vague general contour of the melody. Repeated exposure and practice is necessary before children sing the details of the rhythm and melody accurately. Smith (1961) states that this repetition need not be dull, but can evoke creative discoveries by the children (inventing new texts, substituting names, recognizing high and low contours, similar phrases, etc.).

SINGING WITH THE CHILD

There have been no systematic studies to determine whether it is easier for the child to match pitches if he sings with the teacher than if he repeats her singing. Conventional practice suggests that singing with the child makes it easier for him, before he is moved toward vocal independence.

In the Wyatt (1945) study, if the student had trouble matching a pitch, Wyatt would sound the tone and keep the tone sounding while the student attempted to sing with the stimulus. However, the effects of this technique were not separately investigated.

PHYSICAL FACTORS

There is general agreement that formal training in voice should be delayed until the child has reached puberty. However, the teacher should try to emphasize vocal habits which will allow the children to sing with ease and with a free tone. These habits consist of such suggestions as correct posture, level shoulders, relaxed jaw, relaxed facial expression a comfortable volume (not too loud or too soft), and a general emphasis on conveying the mood of the song.

SUMMARY AND CONCLUSIONS

Historical research in music and music education has a long history. This is not so, however, with other types of research. The use of experimentation is a recent phenomenon. Controls have been generally loose. The resulting amount of dependable information is small. The following paragraphs represent the only information that can be accepted with a substantial degree of confidence.

The initial natural range of the child voice is small. On the average it does not exceed an interval of an M6 and centers around c' or d'. This natural range expands across time. Expansion occurs in both directions, up and down. Since the child tends to sing naturally in a lower voice, possibilities for range expansion are greater at the upper end than at the lower. Range expansion can be hastened by training.

Pitch inaccuracy in singing is more wi. spread in younger children than in older children. The problem tends to disappear with age. By the sixth grade the incidence of inaccurate singing is much reduced over what it was in kindergarten. Boys who have begun their pubertal voice change are an exception. The problem of inaccurate singing can be reduced at any age through appropriate training.

No superior voice training method is known. Suggestions for helping the inaccurate singer are uniformly vague. The effects of the various recommended manipulations are not well known. Two exceptions are presentation mode and feedback mode. Children are more likely to sing on pitch if the singing model is presented in their own vocal range. They are also more likely to sing on pitch if they are given visual feedback.

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39. Mursell, James L. Education for Musical Growth. New York: Ginn and Company, 1948.

A study of what the concept of musical growth means and how it provides the key to many of the practical problems of music education.

40. Myers, Louise Kifer. Teaching Children Music in the Elementary School. 3rd. ed. Englewood Cliffs: Prentice-Hall, Inc., 1961.

A guide for the teacher who teaches music in elementary grades.

41. Neiswender, Charles. "Is it too Late to Teach All Children to Sing?" Music Educator's Journal. Sept.-Oct., 1954. pp. 33-34.

This article argues for recognition of the low singing voice in children and the fact that not all low singers are "bad" singers.

42. Nettl, Bruno. An Introduction to Folk Music in the United States. Detroit 2: Wayne State University Press, 1965.

This book introduces the layman to the great varieties of forms and cultures represented in the folk music of the United States.

43. Newman, Elizabeth. How to Teach Music to Children. New York: Carl Fischer, Inc., 1925.

A creative plan of awakening and leading children into music with a graded system of lessons and illustrated materials.

44. Nordholm, Harriet. Singing in the Elementary Schools. Foundation of Music Education Series. Edited by Allen P. Britton. New Jersey: Prentice-Hall, Inc., 1966.

Presents practical and proven techniques of successful teaching in compact and readable form.

45. Nordholm, Harriet and Thompson, Carl O. Keys to Teaching Elementary School Music. Minneapolis: Paul A. Schmidt Music Company, 1949.

The chief aim is the improvement of musical opportunities for all children with the hope that it will stimulate, suggest and guide teachers in building programs of music education.

46. Nye, Robert Evans and Nye, Vernice Trousdale. Music in the Elementary School, 2d. ed. Englewood Cliffs: Prentice-Hall, Inc., 1964.

An activities approach to music methods and materials.

47. Orff, Carl and Kettman, Gunild. Music for Children. Book One Pentatonic. Mainz Germany: Schott's Böhne, 1956.

This book includes pentatonic songs which illustrate the Orff method.

48. Paulsen, Edmund. "Über die Singstimme der Kinder." Plüger's Arch. Vol. LXI, 1895. pp. 407-476. Cited in Lobbato, Dorothy, "A Study of Individual Voice Ranges and Singing Procedure in First Grade Children." Masters thesis, University of Oregon, 1960.

This study was done to show voice ranges and their relationship to age and maturation.

49. Raebeck, Lois and Wheeler, Lawrence. New Approaches to Music in the Elementary School. 2d. ed. Dubuque: Wm. C. Brown Company Publishers, 1969.

Attempts to help the future classroom teacher to explore the field of elementary school music and to participate in activities which will help in finding some possible answers to some of her questions.

50. Reuter, Georgia. "Remedial Treatment of Inaccurate Singers." Educational Music Magazine, March-April, 1956. pp. 41-45.

This article suggests song types for specific vocal problems.

51. Révész, G. Introduction to the Psychology of Music. Norman University of Oklahoma Press, 1954.

The book deals with the physical and physiological bases of the sensations of tones. It discusses various elements of the psychology of music and reports research findings on the nature of tones and intervals.

52. Schneider, Erwin H. "Music Education." Encyclopedia of Educational Research, 4th ed., London: McMillan Co., 1969. pp. 895-907.

This article summarizes the history and background of the field.

53. Seashore, C.E. and Jenner, E.A. "Training the Voice by Aid of the Eye in Singing." Journal of Educational Psychology. Vol. 1, 1910. pp. 311-312.

This study trained subjects in interval singing with an instrument called the tonoscope which gave aural and visual feedback.

54. Seeger, Ruth Crawford. American Folk Songs for Children in Home, School and Nursery School. Garden City: Doubleday & Company, Inc., 1948.

Folk songs for children.

55. Sheehy, Emma D. Children Discover Music and Dance. Early Childhood Education Series, edited by Kenneth D. Wann. New York: Teachers College Press, 1968.

Attempts to explore the fundamentals of music and dance and discussed these from the point of view of a classroom teacher.

56. Shull, Carl N. "A Study of Children's Vocal Literature Written by Selected Distinguished Composers." Doctoral dissertation, Florida State University, 1961.

This study analyzed the appropriateness of children's song literature.

57. Smith, Robert. "A Study of the Effect of Large-Group Vocal Training on the Singing Ability of Nursery School Children." Unpublished doctoral dissertation, University of Illinois, Urbana, Illinois, 1961.

This study was used to create objectives for a nursery school music program.

58. Smith, Robert. Music in the Child's Education. New York: The Ronald Press Company, 1970.

This book is designed to provide college students preparing to teach at the elementary school or preschool level with a practical approach to presenting an effective and comprehensive music program.

59. Swanson, Bessie R. Music in the Education of Children. 3rd. ed. Belmont: Wadsworth Publishing Company, Inc., 1969.

Designed to serve as a textbook for teachers in training and as a practical guide and source of musical information for the teacher in the classroom.

60. White, Ernest G. Science and Singing. 2d. ed. Boston: Crescendo Publishing Company, 1950.

A consideration of the capabilities of the vocal cords and their work in the art of tone production.

61. Wiseman, Herbert. The Singing Class. London: Pergamon Press, 1967.

The text gives examples and suggestions to help children learn to sing.

62. Wolner and Pyle. "An Experiment in Individual Training of Pitch Deficient Children." Journal of Educational Psychology. Vol. 24, 1933. pp. 602-608.

The experimenters successfully trained nine pitch-deficient children to sing on pitch. Discusses methods and criteria.

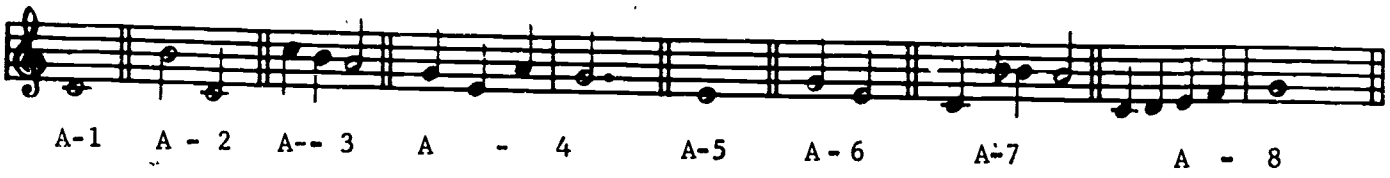
63. Wyatt, Ruth F. "Improvability of Pitch Discrimination." Psychological Monographs. Vol. 58, No. 2, 1945. pp. 1-58.

This experimenter used visual feedback to improve pitch discrimination of sixteen pitch-deficient college students.

APPENDIX A

CLEGG TEST ITEMS

Subtest A



Subtest B