The Identification of and the Training of the Vocal Range of Three-Year-Old Preschool Children.

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THE IDENTIFICATION OF AND THE TRAINING OF THE VOCAL RANGE OF THREE-YEAR-OLD PRESCHOOL CHILDREN.

THE LOUISIANA STATE UNIVERSITY AND AGRICULTURAL AND MECHANICAL COL., PH.D., 1978

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THE IDENTIFICATION OF AND THE TRAINING OF THE
VOCAL RANGE OF THREE-YEAR-OLD PRESCHOOL CHILDREN

A Dissertation

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Louisiana State University and
Agricultural and Mechanical College
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requirements for the degree of
Doctor of Philosophy

in
The School of Music

by
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ABSTRACT

The purpose of this study was to identify the vocal range of the three-year-old child and to determine the effects of training on range. Sixty children, thirty males and thirty females, from the Kiddie Korner Day Schools, Inc., Charlotte, North Carolina, were used as subjects. The subjects, whose mean age was three years and five months, represented a variety of socio-economic backgrounds.

Subjects were tested in five situations—two structured settings, in which the subjects were aware that they were being tested, and three unstructured settings, in which the subjects were unaware of either a testing situation or device. The reason for testing in these two types of environments was to examine whether the range might vary or be extended in situations in which the subjects did not know they were being tested.

The structured settings involved the subject singing his favorite songs (Test II) and reproducing songs which the examiner had taught (Test VI). In Test VI, the subjects were divided into three groups—
a control group (Group A) and two experimental groups (Groups B and C). Subjects in Group A were taught four songs, each in a different key and range for ten fifteen-minute sessions. Subjects in Groups B and C learned each of the songs in a standard range and key each period. Group B was taught in a high range, while Group C was taught in a low range. Then, the subjects were asked to sing these songs for the examiner at a later date.

The unstructured environments consisted of vocalizations made during free play. The first situation (Test III) involved responses that subjects made within a five-minute period while they were left alone in a room with several toys. The second situation (Test IV) was a replication of the first, except that there was a recording of a female vocalist, singing in a high range, played as a stimulus. The final setting (Test V) differed only in the fact that the stimulus was a male vocalist singing in a low range.

In order to determine differences in range among the various conditions, a two-factor analysis of variance (test number and sex) using an F ratio was employed. In addition to range, the examiner investigated tonal orientation, pitch and rhythmic accuracy, tempo, note values, and performance style. Some of the
most important findings were:

1. Three-year-old children are quite musical, and they learn new songs quickly. They are more accurate in estimating rhythm than pitch.

2. Sixty-five percent of the subjects sang in at least one of the unstructured settings, indicating that free play often involves singing.

3. Range in Test II, the practical range was lower than most previous research indicates ($b^b_g^{b1}$). The child's range is limited, and vocal quality is heavier than might be expected.

4. Even though there was a significant difference between the practical range (Test II) and the range in the unstructured situation (Test III), the range was not extended on the upper end ($b^b_g^{b1}$ versus $c^1_g^{b1}$).

5. The presence of a stimulus had no effect on range, but it did affect key choice.

6. Males had higher ranges in unstructured situations but lower ones in tests involving training.

7. Training was a significant factor. Subjects taught in either a higher or lower range responded accordingly.

By investigating and identifying vocal range, the examiner obtained results which will be helpful to the music educator in formulating a workable curriculum for three-year-old children.
CHAPTER I

INTRODUCTION

Today there is much interest in the guidance and welfare of preschool children. Physical care, which in the past may have been the primary concern, is no longer enough. "Education is currently understood as a process of interrelated cognitive and affective growth, and the pre-kindergarten is increasingly recognized as a crucial level in the process."¹

According to Piaget and Inhelder, intelligence proceeds through three main stages, each extending the preceding period, reconstructing it at a new level, and then surpassing it.² During the first four years of life, the individual's ability to learn grows as much as it will in the next thirteen years. Intelligence also develops after the age of seventeen but at a slow pace compared with the earlier growth period. If proper patterns of learning are not developed in the preschool years, future success


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in the remainder of the school career is questionable.  

Bruner states that in order to teach a particular subject to any person at any age, the teacher must represent the structural aspects of the subject in terms that the person will understand. It is therefore possible to teach any subject "effectively in some intellectually honest form to any child at any stage of development."  

Because the young child is capable of learning so much, he must experience a variety of stimuli, including music. Music is so important that, according to the Tanglewood Symposium, it is the responsibility of the educational system to provide musical training beginning in the preschool years and continuing through adult education courses. The overall curriculum must include music for, if we awaken the artist in man at a tender age, when he is receptive to all beauty, then his later life will be incomparably more fulfilled and enriched.  

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In addition to aesthetic reasons for beginning musical training during the early years, there is experimental evidence as shown in chapter II. Research indicates that the musical achievements of young children have been grossly underestimated and that the musical developmental stages according to age level have proven to be dubious. 8 "Children do respond to music and are capable of doing far more musically at a very early age than educators have previously suspected or admitted." 9 Adkins says "if children's musical experiences normally introduced at the kindergarten and first-grade level were begun at the preschool level, they might serve to broaden, deepen, and hasten the ultimate musical growth of children." 10

Findings in a study by Sergeant and Roche indicate that a child between the ages of three and four is more capable of reproducing a song in the original key in which he learned it than is a child between the ages of five and six. Younger children, then, tend to perceive absolute pitch levels more readily than do older ones. 11

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Investigations conducted at a Yamaha School also show evidence that the ear is very "susceptible to training during certain early years."12

Preschool children are able to discriminate aurally for musical characteristics other than pitch. Through the use of programmed instruction, Fullard shows that young children can be taught to identify several orchestral instruments by sound.13 With the learning of simple music discriminations, nursery school children also increase their amount of listening time to music which is associated with the initial discriminations. According to these findings, children are capable of dealing with musical tasks which are quite sophisticated.14

Experimental evidence indicates that young children benefit from group training. Smith concludes that the vocal development of three-and-four-year-old subjects occurs in various stages. Group training stimulates the onset of these stages and improves the skill of

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singing in tune. Boardman agrees that early training accelerates the musical growth process and that the purpose of this training is to stimulate the growth process rather than to teach for specific musical end-products.

Because of the value of early childhood training, it is important to investigate all areas of learning, including music. Statistics released by the Census Bureau reveal that in 1970, approximately one out of five children who are three-to-four-years-old engaged in some type of formal preschool education. Data indicate that the number rose to almost one out of three in 1975. With the increase in the need for day-care because of more women entering the job market, it appears to be essential that music educators experience a rebirth of interest in program development in the area of preschool music.


Statement of the Problem

"Despite almost unanimous agreement among educators as to the importance of music in the preschool education there remains a paucity of evaluative studies."\textsuperscript{19} Much of the research on preschool music consists of investigations conducted in the 1930s. These include experiments completed at the University of Iowa Child Welfare Centers, at Columbia University Teachers College, and at the Gesell Child Guidance Nursery at Yale University. Since then, studies dealing with all aspects of early childhood music continue to be scattered and to have contradictory results. Therefore, it is imperative that music educators reexamine and update these studies.

It seemed appropriate, then, to continue research into the musical abilities of the preschool child. Because of the physical limitations of the young child, the investigator chose to conduct an experiment with the basic instrument of the child--his voice. Doane said that it is the task of the music educator to develop this instrument before teaching others.\textsuperscript{20} Fridman acknowledged the importance of the voice by stating that

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"the first cry of the newborn is the generation not only of the spoken language and of musicality but also of movement and of musical rhythm." Biasini described the voice in the following manner:

The human voice is an extremely complex and versatile sound source. It is capable of producing a vast array of timbres, volumes and pitches. The child knows this instinctively, and in an atmosphere of freedom and acceptance he will explore his potential for producing a wide variety of vocal sounds. The exploration of his vocal mechanism soon begins to assume personal characteristics which lend themselves to higher levels of musical expression in both individual and group improvisation.

In order to train the voice to its maximum potential, it is necessary to identify one of the most important characteristics of the voice--vocal range. With young children, it is often difficult to measure accurately this phenomenon because the subjects are frequently inhibited when being tested, particularly when the test administrator is unknown to them.

Several authorities have assumed that a child's vocal range may be significantly different when evaluated in a structured situation as opposed to a spontaneous


Even though the topic appears to be of utmost importance, investigators "have rarely indicated in musical notation the musical patterns that emerge either spontaneously or by imitation."\(^2\)

Play or spontaneous activity is very natural to young children.\(^2\) When a three-year-old is absorbed in play, he often makes his own sound accompaniments spontaneously.\(^2\) These vocalizations are frequently creative and are quite different from the songs he sings within the structured setting. "Ideologically a human is most human, as defined by our culture, when at play."\(^2\) If this is the case, it is paramount that teachers realize and understand the significance of singing in child's play.

To investigate this problem, the vocal range of the three-year-old child in both a structured and an unstructured environment was studied. Comparisons were made among the findings. In addition, the effect of


\(^{24}\text{Greenberg, "Research," p. 12.}\)


\(^{26}\text{Ibid., p. 192.}\)

Significance of the Problem

This study is significant because it attempts to identify accurately both the practical and the extended vocal ranges of the three-year-old child. Such information will aid composers in writing for nursery school children, and it will help teachers in the selection of previously written songs for inclusion within the curriculum. In addition, it will provide the preschool instructor with background knowledge which will make it easier to ascertain a comfortable key for a particular song.

Music educators need a study of this type today because most of the current textbooks and songbooks for children include little information about the voice of the three-or-four-year-old. Among textbooks which deal specifically with the instruction of the nursery school child, few identify practical or extended range. Even Aronoff, Garretson, and Jones, all of whom wrote leading sources in the area of early childhood music education, fail to discuss the topic in specific terms. Other books which do consider the question are often

29 Garretson, *Music in Childhood Education*.
contradictory and tend to overgeneralize.

Although there are a few scattered studies dealing individually with vocal range either in a structured situation or in a spontaneous one, none has drawn a comparison between the two. Also, most of the research has used a rather small sample, and much of it was completed in the 1930s.

In addition to identifying vocal range, the study investigated whether group training alters and/or extends a child's practical range. Such information will be important to nursery school teachers as well as to music specialists within the field in helping them recognize specifically what can be taught. It will also aid teachers in planning their music curricula.

**Delimitations**

This study investigated the vocal range of sixty three-year-old children attending the Kiddie Korner Day Schools, Inc., in Charlotte, North Carolina. The subjects came from varied socio-economic backgrounds. Research included a description of the composite practical and extended vocal ranges of the children in both structured and unstructured environments and an analysis of the influence of training on the practical range.

**Definition of Terms**

The term "structured" environment indicates a
situation in which the subject knows that he is being tested. The terms "unstructured" and "spontaneous," which are used interchangeably, signify a situation in which the child has no knowledge of a testing situation or of a testing device. The child plays freely under unstructured conditions.

The term "practical" range refers to that part of the range which generally is used for singing any song. The subject chooses to sing within his practical range because he feels comfortable using these pitches. In contrast, the "extended" range encompasses all the pitches of the practical range but it includes other pitches as well. It involves all pitches which can be sung by the subject, many of which are used infrequently. The tonal quality of the higher and lower pitches of the extended range is usually poor.

**Method of Investigation**

This study was descriptive and experimental in design. It involved testing sixty three-year-old subjects, thirty males and thirty females, in six different situations. Before beginning the testing procedure, the examiner spent several days singing with the students as a group so that they would feel more relaxed.

The first test, a pretest which took place in a structured environment, measured the subject's ability
to match sounds and pitches. Each child was asked to imitate ten familiar sounds made by the examiner. Then, the test administrator sang a pitch on the syllable "la" and asked the student to repeat it. The examiner started with $c^1$, a tone which was within the practical range of the three-year-old according to Smith.\footnote{Smith, "Effect of Group Training," p. 138.} Then, each subject attempted to match the pitches of all of the natural diatonic pitches between and including $g$ and $c^2$. To make certain that the examiner's initial notes were accurate, a Master Key Chromatic Pitch Instrument was used.

The same procedure regarding recording and response criteria was used on both parts of this test. Responses were recorded on a Sony TC 788-4 reel-to-reel tape recorder and a Sony ECM 250 microphone for later evaluation. If a subject failed to make a response the first time, he was allowed two more chances. He was required to respond within five seconds each time.

The results of Test I were reported but were not used in a statistical comparison with the results of the other tests. Many three-year-old children are incapable of matching one or more pitches correctly, thus making the results of this test questionable. The function of this test was that of a practice test.
Test II occurred in a structured setting also. Using the same room and equipment, the administrator asked each subject to sing two of his favorite songs. If the subject could not think of a favorite tune, the examiner gave him as many as five suggestions of song titles which she knew he had learned during his nursery school experience. The test administrator recorded the subject's responses and analyzed them according to range, tonal orientation, tempo, pitch accuracy, rhythmic accuracy, and song title.

The procedure for testing in the unstructured environment involved placing the subject alone in a room which had a variety of toys. The examiner tested the child in this setting on three different occasions, each session lasting five minutes. The purpose of these tests was to analyze the free vocalizations in order to determine whether the vocal range was the same as in Test II or whether it was extended.

Tape recording equipment, which the child could not see, was placed in the room. The make and model numbers were the same as mentioned above in the report. For the first test in this situation, Test III, the child's oral responses were recorded while he engaged in free play. In Test IV, his responses were recorded while he played and listened to a recording of "Behold a Silly Tender Babe" by a lyric soprano. Test V was...
identical to Test IV except that the recording was of "Leaping and Dancing," which was sung by a basso cantante. Both songs were sung on the syllable "la" so that the music instead of the words was the stimulus.

The songs, which are contained in The Penguin Book of Christmas Carols, were chosen because they are remote melodies which the subjects probably had never heard. The songs were also selected because of their rhythmic drive.

In addition to identifying range within the unstructured situation, the examiner investigated tonal orientation, tempo, note values, intervallic content, performance style, and content of the vocalizations. Comparisons were drawn among the results.

Test VI, the final test, measured the effect of training on practical vocal range. The experimental design involved a control group and two experimental groups of twenty children each, consisting of the same children who were tested earlier. Each group, which was composed of an equal number of boys and girls, had ten fifteen-minute training sessions covering a period of two weeks. During the training sessions, the examiner taught the same four songs to each group. Children in the control group, Group A, sang the songs in a

different key each day, while subjects in the experimental groups sang the songs in only one key. Group B sang in a key which encompassed higher notes of the practical range, while Group C used lower notes. The examiner determined which keys to use from data obtained in Tests I and II.

Then, the subjects were tested individually. They were asked to sing each of the four songs, beginning on whatever pitch they chose. Their responses were recorded for later evaluation.

In a study by Sergeant and Roche, three-year-olds were found to be more capable of reproducing a song in the original key in which they learned it than were four-and-five-year-old children. It was assumed, then, that if these children were taught songs which were pitched on the outer limits of their practical range, they would try to imitate the original key, thus expanding their practical range.

The mean range of the child's voice in each of the five situations was reported and comparisons were drawn, using test number and sex as variables. A two-factor analysis of variance using an $F$ ratio was used to determine the significance. Distinctions were made among the ranges in the various environments.

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33Sergeant and Roche, "Perceptual Shifts," p. 45.
The following null hypotheses were tested at or beyond the .05 level of significance:

1. There will be no significant difference between the mean vocal range of the subjects in a structured situation (Test II) and in an unstructured situation with no musical stimulus (Test III)

2. There will be no significant difference between the mean vocal range of the subjects in a structured situation (Test II) and in an unstructured situation with a female vocal stimulus (Test IV)

3. There will be no significant difference between the mean vocal range of the subjects in a structured situation (Test II) and in an unstructured situation with a male vocal stimulus (Test V)

4. There will be no significant difference between the mean vocal range of the subjects in an unstructured situation with no musical stimulus (Test III) and in an unstructured situation with a female vocal stimulus (Test IV)

5. There will be no significant difference between the mean vocal range of the subjects in an unstructured situation with no musical stimulus (Test III) and in an unstructured situation with a male vocal stimulus (Test V)

6. There will be no significant difference between the mean vocal range of the subjects in an unstructured situation with a female vocal stimulus (Test IV) and in an unstructured situation with a male vocal stimulus (Test V)

7. There will be no significant difference between the mean vocal range of the subjects in a structured situation (Test II) and in the control group (Group A)

8. There will be no significant difference between the mean vocal range of the subjects in a structured situation (Test II) and in the experimental group I (Group B)

9. There will be no significant difference between the mean vocal range of the subjects in a structured situation (Test II) and in the experimental group II (Group C)
10. There will be no significant difference between the mean vocal range of the subjects in the control group (Group A) and in the experimental group I (Group B)

11. There will be no significant difference between the mean vocal range of the subjects in the control group (Group A) and in the experimental group II (Group C)

12. There will be no significant difference between the mean vocal range of the subjects in the experimental group I (Group A) and in the experimental group II (Group C)

Development of the Report

Chapter II contains a review of the literature regarding stages of musical development, research relative to singing, research relative to rhythm, and miscellaneous studies involving preschool music education. Procedures used in the research project are discussed in chapter III. A presentation and evaluation of the findings are presented in chapter IV, and a summary, conclusions, and recommendations are stated in chapter V.
CHAPTER II

REVIEW OF THE LITERATURE

Introduction

Research into the field of music education in early childhood remains a neglected area. Many of the most significant studies are from the 1930s and need to be updated because the modern child is quite different from one who grew up during the depression. Children of today live in an environment of mass media, being constantly bombarded with music in one form or another. It is important to assess existing research and to reevaluate and retest it in light of the contemporary world.

Presented in this chapter is a review of research pertaining to musical abilities and responses of preschool children. Several studies dealing with kindergarten and elementary subjects, which are of particular

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significance to the field, are included. In order to facilitate understanding, research in the area has been divided into the following categories: (1) stages of musical development, (2) research relative to singing, (3) research relative to rhythm, and (4) miscellaneous studies regarding musicality. Because some studies investigated more than one aspect of musicality, they appear under several headings.

**Stages of Musical Development**

Before beginning research into the vocal ability of the three-year-old, it is necessary to investigate the overall musical development of the child. Like other cognitive functions, musical ability develops sequentially. Each individual experiences a battery of movement and sound impressions. He then experiments to identify his capacity to reproduce these impressions, later organizing them into ideas. Some musical tasks he performs by accident, while others he imitates or originates.3

The point at which these sensory impressions begins is prenatal. According to Murooka, a fetus which is three months old is capable of reacting to sound stimuli.4 It


4Hajime Murooka, notes in a booklet *Lullaby from the Womb* for the record album of the same title (Capitol Records ST-11421, 1975).
"can respond with movements to the sound of a concert." Such findings are of great importance to the music educator in helping to assess when musical training should begin. Zoltán Kodály expressed his opinion by the following statement, "I used to think the ideal age for beginning a child's musical education was nine months before birth. Now I think it is nine months before his mother's birth."6

Musical development, then, proceeds in stages according to the age of the child. During the first six months of life, musical ability develops as the infant completes the task of learning to hear. At birth, a child reacts overtly to only one-third of the sounds he hears. Within four weeks, however, his reaction rate doubles, continuing to increase as he grows older. By the time the child has reached the age of two months, he will be completely still if someone plays an instrument or sings.7

The first months of life are important for all aspects of musical development. In addition to hearing a mass of sound, a one-month-old baby can recognize who is in the room with him by the timbre of the voice.8

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Within the next few months, the infant gradually learns to distinguish between various pitches and timbres. By the age of four or five months, the child can distinguish between two pitches at the interval of a fifth. In the sixth to seventh month, the auditory senses become even more acute, with the child being able to differentiate between two tones which are only a step-and-a-half apart.9

Besides developing auditory functions, the young child soon learns to manipulate his voice. Fridman, who presents a strong argument for early training in music, states that the genesis of musicality and of spoken language lies within the first cry of the newborn. This cry consists of five to twelve sounds which continually repeat themselves. As the child matures, his voice continues to develop so that by the age of two months, he can perform a trill.10 At this point, the infant is just beginning to integrate hearing and vocalization.11

Now that the child is sensitive to sound, he tries to imitate various acoustic phenomena.12 Between the ages of four and six months, the infant tries to sing


with his mother. He is unable to sing correctly for he cannot differentiate many pitches, and he does not have the vocal facility as of yet. During the next six months, however, the child sings his first distinguishable intervals. He discovers the impact of various pitches, and he experiments with them, preparing for the act of singing. Vocalization, at this point, remains limited because the child cannot reproduce intervals beyond a fifth. The most common interval is the falling major third.\(^{13}\)

Between the ages of one and two, the child experiments with movement, rhythm, and sound. Instead of merely listening, he now becomes an active initiator of sound, using whatever materials he can find within his physical environment. By exploring a variety of sound sources, he further learns to discriminate pitch and timbre.

During this period, language develops, giving the child a new medium to investigate. He finds pleasure in vocal sounds, both singing and speech, and he manipulates his voice to produce spontaneous singing or humming. It is also during this time that the child learns to walk. Because of his newfound motor ability, the young child is able to develop his sense of rhythm and movement to a larger degree.\(^{14}\)

\(^{13}\)Michel, "Optimum Development," p. 16.

Some authorities consider the time between ages two and three as a premusical stage. The child starts to differentiate between high and low and between loud and soft. He also begins to experience some form of musical appreciation. He likes to listen to music and to imitate tonal patterns and songs. Although he is conscious of melodic direction, he remains unable to reproduce exact pitches or intervals. Thus, he can only approximate direction in his singing. Now that the child has acquired a rather large vocabulary, he sings songs instead of merely vocalizing or babbling. The word sequences may not make sense, but they are essential as a functional part of music experience.15

Gesell says that, by the age of two-and-one-half, a child often knows an entire song or part of a song which he sings repeatedly. Even though he knows a song, he may be inhibited about singing it with other children. He continues to sing spontaneously, often using the minor third. He has a great interest in listening to instruments and likes to swing, gallop, and run to music. Unfortunately, there now is less individuality shown in his free rhythmic expression because he is more inhibited and

because he prefers to imitate others.\(^1\)

During the third year, the child develops significantly in the areas of singing, rhythm, and movement. In the area of singing, he continues to make up songs. The melody he invents is short, usually only two, three, or four notes,\(^2\) and is often just a series of tones relating to whatever activity he is experiencing at the time. At first the words and music have no relation, but later they somehow become connected. In creating an original song, the child may use a melody he already knows, replacing the words with his own. He may also choose only melodic phrases which he likes or which are easy and manipulate them to fit his words.\(^3\)

The three-year-old becomes more capable of maintaining a tonal center. He imitates melodies, trying to match pitches with appropriate melodic direction. He is not necessarily accurate, however, but he usually remains within a key which he establishes himself. At this point, he also begins to feel secure about singing with others, and he frequently allows other children to


\(^3\)Révész, *Introduction to Psychology*, p. 172.
join him. His range, however, is limited.  

The response to rhythm also begins to change during the third year. It becomes more organized, and the child of two evolves into the dancer of three. The child clum­sily responds to various types of music, trying to devise corresponding gestures and movements. He now perceives music on an emotional level, discovering the many moods which music affords. Through movement, the child often demonstrates his awareness of musical concepts. He is capable of keeping the beat through several types of movement, although he is better at keeping it with fast than with slow tempi. He can also use movement to help him discriminate between high and low. Other concepts such as duration, volume, and pitch remain rather difficult for him to grasp.

During the ages of four and five, the child's musical ability grows. He attempts to organize music within a tonal framework, and he acquires the ability to reproduce tones accurately. His range expands upward and downward, and he performs a number of movements rhythmically to music. After this period, "the 


21Andress, Music in Early Childhood, p. 20.

individual differences and environmental factors become so influential upon musical growth that any effort to make an objective parallel between chronological and musical age would be a vain effort."^23

**Research Relative to Singing**

Research shows that children learn to sing as well as speak by imitation. It is unfortunate that speech is necessary for communication but that singing is not. Even though singing is so easily learned by children, parents frequently do not encourage it. It is reassuring to know that most children who have had little exposure to music at home will learn to sing by being in contact with other students who do sing.^24

The developmental factors associated with speech and singing are very similar. However, some children sing more readily than they speak merely because singing does not have to involve verbiage. When surveying the literature, it is necessary to recognize that there is a wide range of ability in the singing response of the three-year-old just as there is in the verbal response.^25

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^23 Ibid., p. 9.


^25 Ibid., p. 175.
There are basically four classifications of singing ability at the preschool level. First, there are children who have a keen sense of pitch discrimination and who sing melodies rather easily after experiencing them a few times. Then, there are others who sing the melody but in one key only—their own. The third type of singer is one who cannot sing the melody on pitch but who does use a singing tone. The remaining type, which is often called the "out-of-tune" singer, has no sense of melodic direction or pitch. His singing may sound more like the recitation of a poem.

Many significant studies dealing with the singing of the three-year-old child date from the 1930s. Research began at that time because of the momentum in preschool education. At several universities throughout the country, educators established child development centers for the purpose of studying all aspects of the education of young children. Also, under the WPA program, the government created funds to sponsor federal nurseries. The Lanham Act, which was enacted during World War II, provided further subsidization for nursery schools.

One important center involving research was the Child Development Institute at the Teachers College of

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Columbia University. Jersild spearheaded a number of studies there. The first such investigation, which was completed in 1931, involved the use of forty-eight three-year-old subjects between thirty-one and forty-eight months old. Each member of the experimental group received forty ten-minute training sessions in pitch and interval reproduction over a six-month period. After all subjects were tested, the data showed that those who received training had higher performance scores than those who did not. Results did not indicate, however, whether early training remains an advantage in later years.

Findings also showed that the tones which were reproduced most readily—practical range—were from \( \text{c}_1 \) to \( \text{a}_1 \). indicating that the average three-year-old's voice placement was lower than previously believed. Subjects favored lower notes rather than higher ones. Also, children sang intervals of a second and a third more easily than of a fourth or fifth. They sang descending intervals more readily than ascending ones, and they reproduced the half-step quite readily. (Prior to this time, many educators believed that the chromatic interval should not be included in young children's songs.)

In this same study, Jersild also investigated music phenomena during free play. The researchers observed each child who was in the experimental group for one hundred
minutes, following him closely and notating his spontaneous vocalizations. Results showed wide differences in performance. Even though the children favored lower pitches when being tested in a structured situation, they preferred higher ones in their free play. The tones which occurred most frequently were from $f_1$ to $d_2$.

Findings regarding intervals were the same as they were within the structured testing environment. In addition, the interval of the minor second occurred more than any other interval except the major second. A sequence of three or more notes indicating a chromatic scale appeared almost as much as did a diatonic sequence.

Further observations during free play revealed that children improvised their own melodies far more frequently than they sang songs which they already knew. These melodies sometimes contained repetitions of words or syllables, or sometimes they related to the child's current play or activity. The melodies, which were rarely more than three measures but which often were repetitive, were usually well-known children's tunes. The subjects sang more when they were alone than they did


29 Ibid., p. 286.
when they were with other children. 30

In another article, Jersild expounded on his findings from this study. He said that a few children could sing some high pitches and some low pitches but could not sing the pitches between. By encouraging a subject and providing him with an example, the teacher was able to get him to attempt tones within his extended range. With further training, a child was able to reproduce accurately a tone which previously had not been within his practical range. 31

Another study by Jersild measured a person's ability to reproduce certain pitches. Ninety percent of the subjects were between five and ten years old, but there were some children between two and five as well as some adults. Findings indicated that until the age of ten, there was an increase in the number of tones a subject could sing. Then, there was a decline. The capacity to sing a large number of tones was a rapid development, the improvement being greater between the ages of two and six than after age six. The researcher qualified this statement, however, by saying that boys obviously lose the ability to produce certain pitches after their

30Ibid., p. 289.

voices change.\textsuperscript{32} Jersild also reported that the median number of pitches sung by two-year-olds is four, by three-year-olds is six, and by four-and-five-year-olds is nine. The number increased until it reached sixteen tones at age ten. Twenty was the median for adults.\textsuperscript{33}

Williams conducted a study using children ages four and five. He taught the subjects nursery rhymes over the period of a year. Then, he tested the children to see if they could sing the songs on pitch with piano accompaniment. Results showed that the range the children used was usually lower than the key that was given,\textsuperscript{34} and the practical range usually fell between $c_1$ and $c_2$. Even though the range was large enough for the song, most children made errors in various intervals within the song, still returning to the keynote, however.

Williams also found that vocal control regarding pitch had a low correlation with intelligence during the preschool years.\textsuperscript{35}

Hissem is another researcher who investigated the

\textsuperscript{32}Jersild and Bienstock, "Study of Ability to Sing," pp. 485-89.

\textsuperscript{33}Ibid., p. 501.


\textsuperscript{35}Ibid., pp. 87-90.
effect of training on young children. In a study using twenty-seven subjects ages twenty-one to fifty-four months old, she found that children learn to sing through imitation and observation. Training improved the ability to match pitches, and six of the subjects developed almost perfect pitch.\textsuperscript{36}

Hattwick studied ninety-five children between the ages of four and one-half and eight. The younger children, a group of thirty-seven ages four and one-half to six, received training in learning one song. The teacher always practiced the song with the children in the same key. After twenty-eight and forty-eight practices respectively, the examiner tested each subject on his ability to reproduce the song, helping each child begin the song in the key in which he learned it. Results showed that after twenty-eight trials, three children were able to sing the song in the original key. When the starting pitch was lowered, seven subjects sang it correctly. The remainder sang it lower. After forty-eight practices the mean level of pitch was still significantly lower than the original key. This level was not significantly different from the level at which these same children chose to sing another song voluntarily. The mean range was also lower but was not significantly

less in number of semitones.

Hattwick also asked each of the subjects to sing his favorite song. The mean pitch level which the children used, b-g\textsuperscript{1}, was significantly lower than the levels used for these same songs printed in graded songbooks. The mean pitch range chosen by the kindergarten children was smaller than that of the children in grades one and two. Evidence indicated that the keys in which the children sang were significantly lower than those in the songbooks. Another interesting fact, which is important to the field of music education, was that ninety-three percent of the subjects chose a song which they had learned in school as their favorite song.\textsuperscript{37}

Updegraff, Heiliger, and Learned also studied the vocal ability of three-, four-, and five-year-old children. Research procedures involved dividing each age group into a control group and an experimental group with the experimental group receiving musical training. Findings showed that those children who participated in the training process improved their ability to match pitches, intervals, and phrases. Three-year-olds responded inconsistently, however, with a few of the youngest surpassing some of the oldest four-year-olds in vocal

\footnote{\textsuperscript{37}Melvin S. Hattwick, "The Role of Pitch Level and Pitch Range in the Singing of Preschool, First Grade, and Second Grade Children," \textit{Child Development} 4 (December 1933):283-90.}
ability.  

In addition, findings showed that the range of the three-year-old lay between $d$ and $g^2$, with fifty percent of the children able to sing $c^2$. Fifty percent also sang $g$. The authors of this study agreed with Jersild and Bienstock and with Hattwick that the vocal range of the child's voice is lower than had been assumed.  

Drexler conducted a study using twenty-three subjects between the ages of three and six. She taught two nursery rhymes of equal meter and length to each subject and then tested the subject's ability to reproduce the songs. She found that as children grow older, their ability to sing on pitch increases. The difference in this ability was most significant during the period from three to four and from five to six. The children sang descending intervals more readily than ascending ones, and there was a closer relationship between the ability of the child and of the mother to carry a melody than there was between the child and the father. Also, there were no significant differences in performance

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39 Ibid., pp. 120-21.
according to sex.  

In 1941 Moorhead and Pond, under the auspices of the Pillsbury Foundation for the Advancement of Music Education, began an extensive study of the spontaneous vocalizations of children ages one and one-half to eight and one-half. Upon analysis of the data, they found that two types of elementary chant were prevalent—one in which a pitch was repeated and then followed by a falling minor third and one in which the phrase was begun on a falling minor third and the final note was repeated. The change in pitch occurred immediately following the primary accent in a word which was accented. The minor third, then, proved to be the most important interval in chant.  

The normal reciting tone was $d^\#1$ with the pitch of the chant tending to rise as excitement increased.

The findings of this study showed that much of the spontaneous singing occurred during physical activity. Children sang while running, dancing, marching, building with blocks, using tools, and playing with clay. Another cause of spontaneous singing was a heightened emotional feeling such as seeing a favorite pet or 

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41 Moorhead and Pond, Music of Young Children, 1:3.

teasing another child. Children also frequently expressed their current thoughts through music.

Moorhead and Pond also analyzed the tonalities of the melodies. They found that the tonality was not necessarily diatonic, and the sequence of notes often did not indicate a tonal center. Intervals which were uncommon to Western tonality frequently appeared. Extended range and wide intervals were sometimes quite large. Songs were usually performed quietly and slowly, approximately fifty beats per minute.

Unfortunately, songs which are taught in school are largely unlike these spontaneous creations. The child has a concept of free rhythm, while songbook excerpts are generally measured rhythm. Most songs which children learn in school are either a major or minor tonality, and they function within a harmonic system based on the tonic and dominant. The words of the songs are often unimaginative as well. Music educators must not stifle the creativity of spontaneous songs.

Révész completed research which confirmed several of the results of the Moorhead and Pond study. He found that at age three, children use the falling motive, and at age three and one-fourth, they use a rising and falling pitch sequence. By the end of the fourth year, children had two or more peaks within their spontaneous vocaliza-

\[43\text{Ibid., 2:7-14.}\]
tions. The minor third remained the "source of music."

Révész also reported that the vocal range for the three-
to-five-year-old boys is $e^1$ to $a^1$ and for girls is $e^1$
to $b^1$. Vocal range expanded downward until the children
reached age six, then it moved upward.

The purpose of a study by Smith was to develop a
skill-center music program for use with nursery school
children. The experimental groups, which were composed
of thirteen three-year-olds and sixteen four-year-olds,
received vocal training for two fifteen-to-twenty-minute
sessions each day for two sixteen-week periods. The
examiner taught folk songs which were in either the
range of $c^1$ to $a^1$ or of $a^1$ to $e^2$. He then tested the
children in a group setting, having the group sing a
phrase of the song and then having one subject perform
the same phrase with melodic accompaniment. Results of
the testing showed that twelve out of thirteen three-
year-olds learned to sing in tune from $c^1$ to $a^1$. They
tended to slide into the intervals, however. Most all
of the four-year-olds improved in "tunefulness" in
both the upper and lower ranges. They responded quicker
to training in the lower range than did the three-year-
olds. This study showed that group training--as opposed
to other studies which measured individual training--is

44 Révész, Introduction to Psychology, pp. 172-73.

45 Ibid., p. 43.
significant in teaching young children vocal production.\textsuperscript{46}

Boardman extended Smith's study, investigating the relationship between vocal accuracy and maturation. She also studied the importance of preschool training, finding that training may hasten the ability to sing in tune but will not significantly affect it otherwise. Results showed that nursery school children often maintain melodic contour even though they are incorrect in approximating intervallic relationships. This characteristic appeared regardless of training.\textsuperscript{47}

Alford completed one of the most important and thorough dissertations in the area of early childhood music. He investigated imitative abilities, spontaneous performances, sensitivity to music, range, and the ability to sing simple songs.\textsuperscript{48} He used seven pairs of female twins and five pairs of male twins, ages twenty-two-through-forty-four months, matching them with singletons of the same age and sex. He observed the subjects a total of four times over a period of two years with each observation lasting forty-five minutes. Observations took place in


\textsuperscript{47}Boardman, "Investigation of Preschool Training," pp. 4, 82.

\textsuperscript{48}Alford, "Emergence and Development," p. 5.
the children's homes.\textsuperscript{49}

Results showed the following:

1. Age level influenced the development and emergence of responses

2. Response to a male vocal stimulus was sometimes greater than to a female one

3. Composite range of spontaneous singing was $a^b$ through $d^2$

4. Ability to sing was about equal in twins and singletons, with older subjects singing more songs than younger ones

5. Vocal range of performed songs was $a^b$ through $d^b$\textsuperscript{50}

Sergeant and Roche conducted a very important investigation into the development of absolute pitch. Thirty-six subjects, ages three through six, participated in six training sessions over a three-week period in which they learned to sing three melodies. The examiners presented the songs at an invariant pitch level each time. When the subjects were asked to sing these songs within a testing situation, they showed that there was a significant correlation between age and absolute pitch reproduction. The number of three-and-four-year-old subjects who could sing the songs in the original key was at least two and one-half times greater than the five-year-olds and from three and one-half to eight

\textsuperscript{49}Ibid., pp. 32-39.

\textsuperscript{50}Ibid., pp. 175-77.
times greater than the six-year-olds. While results showed that the tendency toward absolute pitch decreased with age, conceptual development increased.51

Several of the studies reviewed dealt with kindergarten children. Research done by Kirkpatrick indicates that the vocal range of five-year-old singers is from f to e\textsuperscript{2}. Seventy-eight percent of the tones that the children sang were between b and g\textsuperscript{1}. Kirkpatrick pointed out a definite need for the revision of songbooks for this age level by showing that the music book series adopted by California presented the songs a diminished fifth higher than the children chose to sing them.52

Other sources give more contradictory information on range. Adkins says that the range for the four- and-five-year-old disadvantaged child is d\textsuperscript{1} to c\textsuperscript{2},53 while Garretson places the range for the kindergarten child at d\textsuperscript{1} to d\textsuperscript{2}.54 Further confusing the matter, another source, The New Nursery School, describes the range for nursery school and kindergarten children as

54 Garretson, Music in Childhood, p. 41.
$c^1$ to $d^2$ or $e^2$ $^{55}$ Andress states that the young child has a range from $d^1$ to $a^1$ $^{56}$ and Nye says that it is from $c^1$ to $b^1$. $^{57}$

<table>
<thead>
<tr>
<th>Researcher(s)</th>
<th>Age of Subjects</th>
<th>Range</th>
<th>Terminology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jersild and Bienstock</td>
<td>3</td>
<td>$c^1-a^1$</td>
<td>Tones sung most readily</td>
</tr>
<tr>
<td>Williams</td>
<td>4-5</td>
<td>$c^1-c^2$</td>
<td>Mean range</td>
</tr>
<tr>
<td>Hattwick</td>
<td>Preschool</td>
<td>$b-g^1$</td>
<td>Mean range</td>
</tr>
<tr>
<td>Updegraff et al</td>
<td>3</td>
<td>$g-c^2$</td>
<td>Tones sung by 50% of subjects</td>
</tr>
<tr>
<td>Révézéz</td>
<td>3-5 (boys)</td>
<td>$e^1-a^1$</td>
<td>Mean range</td>
</tr>
<tr>
<td></td>
<td>3-5 (girls)</td>
<td>$e^1-b^1$</td>
<td>Mean range</td>
</tr>
<tr>
<td>Smith</td>
<td>3</td>
<td>$c^1-a^1$</td>
<td>Tuneful range</td>
</tr>
<tr>
<td>Kirkpatrick</td>
<td>5</td>
<td>$f-e^2$</td>
<td>Range for &quot;singers&quot;</td>
</tr>
<tr>
<td>Adkins et al</td>
<td>4-5 (disadvantaged)</td>
<td>$d^1-c^2$</td>
<td>Best range</td>
</tr>
</tbody>
</table>


$^{57}$Nye, *Young Children*, pp. 92-93.
TABLE 1—Continued

<table>
<thead>
<tr>
<th>Researcher(s)</th>
<th>Age of Subjects</th>
<th>Range</th>
<th>Terminology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garretson</td>
<td>Kindergarten</td>
<td>$d^1-d^2$</td>
<td>Best range</td>
</tr>
<tr>
<td>Nimicht et al</td>
<td>Nursery and kindergarten</td>
<td>$c^1-d$ or $e^2$</td>
<td>Best range</td>
</tr>
<tr>
<td>Andress</td>
<td>Young child</td>
<td>$d^1-a^1$</td>
<td>Best range</td>
</tr>
<tr>
<td>Nye</td>
<td>Young child</td>
<td>$c^1-b^1$</td>
<td>Best range</td>
</tr>
</tbody>
</table>

TABLE 2
SUMMARY OF DATA ON EXTENDED VOCAL RANGE OF YOUNG CHILDREN

<table>
<thead>
<tr>
<th>Researcher(s)</th>
<th>Age of Subjects</th>
<th>Range</th>
<th>Terminology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Updegraff et al</td>
<td>3</td>
<td>$d-g^2$</td>
<td>Composite</td>
</tr>
<tr>
<td>Alford</td>
<td>2-5</td>
<td>$a^b-db^2$</td>
<td>Composite</td>
</tr>
<tr>
<td></td>
<td>2-5</td>
<td>$a^b-d^2$</td>
<td>Composite during free play</td>
</tr>
<tr>
<td>Jersild</td>
<td>3</td>
<td>$f^1-d^2$</td>
<td>Most frequent tones during play</td>
</tr>
</tbody>
</table>

The literature reviewed thusfar is of the utmost importance to this study, but research dealing specifically with the three-year-old's ability to sing remains sparse. The number of investigations into the problem...
of the vocal range of the three-year-old is even fewer. Those studies which have been completed are often contradictory, and they frequently generalize results into the category of early childhood instead of identifying responses at various age levels. They also use a variety of terms in describing vocal range.

Research Relative to Rhythm

"Rhythm is the most characteristic element of music; it is the movement of music."\(^5\) It is a physical phenomenon which is related to muscular coordination. Every person has a rhythmic instinct which aids him in his movement. The same instinct does not relate to music, however. Musical rhythm is a result of conditionings during the learning process.\(^5\)

Williams outlines four stages in the development of rhythm. The first one involves the ability to maintain a recurring pattern such as clapping the hands or tapping the foot. The next stage occurs when the child is able to adjust his balance so that he can manipulate a swing or a rocking chair. Stage three consists of the child's facility in responding to the beat of a sound stimulus, while the final stage happens when the child can "vary pace over a fairly wide range


of tempos; this often appears at the preschool age.⁶⁰

One of the earliest studies using subjects ages three through five was by Heinlein. He tested a child's imitative response to music by having him march to music played by a player piano. Data showed that the subjects were able to keep time better to faster music than to slower music. Various meters or musical patterns made little difference to the accuracy of the response. A high correlation existed between rhythmic ability and singing ability.⁶¹

Vance and Grandprey conducted a study using thirty-one nursery school children. They asked each child to imitate a rhythmic pattern on a triangle after hearing the teacher play it. Findings showed that the subjects were able to reproduce patterns in which quarter notes preceded half notes better than in patterns in the reverse order. Correlation between rhythm and age was at the .37 level of significance for preschool children.⁶²

Hissem's experiment involved subjects ages twenty-one through fifty-four months. After teaching the

⁶⁰Harold M. Williams, Bulletin of the State University of Iowa, Child Welfare Pamphlets, no. 29 (Iowa City, Iowa: University of Iowa, 1933), p. 8.


children for ten to twenty sessions, depending on age. Hissem found that both pitch and rhythmic accuracy improved.  

Jersild and Bienstock completed an investigation using children ages two through five. They measured the ability of the subjects to clap or walk to the beat. According to the findings, rhythmic response to a pulse was a function of maturity.  

Jersild also did research on tempo. He found that children's scores varied a great deal depending upon tempo. Subjects scored lowest on their ability to keep time to music when the tempo was M.M. 76 and highest when the tempo was M.M. 186. Even though varying meters were used (3/4, 2/4, and 4/4), the children responded as well to one as to another.  

Another study by Leibold involved physical response of children ages three to six to the metronome. Results indicated that the three-year-old responded with gross body movement to the beat of a metronome, making

little effort to adapt his motor response to the rhythm. Ability to respond increased with age.66

Christianson also completed a study on movement. In a two-year experiment involving children ages two through six, she measured physical response in the areas of dance and dramatic expression, emotional and social response to a musical stimulus, and rhythmic synchronization with a piece of music. Subjects made higher scores in all of these categories as they grew older.67

Moorhead and Pond analyzed rhythmic patterns of children's chants. They found that in most spontaneous singing of the simplest chants the notes were of equal duration. As the child grew older, he developed certain rhythmic patterns which he repeated frequently. The rhythmic sequence identified as the most characteristic of children's chant was \( \overline{\underline{\text{J}} \underline{\text{J}} \underline{\text{J}} \underline{\text{J}}} \). Research also indicated that when a subject accompanied his own singing with an instrument, he played in one tempo and sang in another.68

Alford verified several of these findings. He


found that the majority of rhythmic patterns expressed during the free play of preschool children was of notes of equal duration, and that older subjects performed more complex rhythms than did younger ones. Results showed that the median tempo of patterns involving notes of unequal duration was less than in patterns involving equal note values. In the majority of cases, these vocalizations were legato, lacking a strong accent. 69

McDowell developed a test for measuring the rhythmic ability of four-year-olds. His research showed the following results:

1. A training period of one month did not significantly aid subjects in improving their test scores. Longer sessions might show different results.

2. Sex was not a factor in test performance.

3. Subjects could better identify a difference in tempi if the slower tempo was presented first.

4. The faster the metronome marking between M.M. 60 and M.M. 132, the easier it was for a child to reproduce accurately a stimulus pattern.

5. There was little significant difference between performance and age within the four-year-old group or between children ages four and five. 70

Miscellaneous Studies

There are a few other studies dealing with various


70 McDowell, "Development and Implementation," pp. 89-93.
aspects of the musical education of preschool children. Several involve the process of aural discrimination. One experiment shows that three-year-olds are quite capable of learning to recognize and distinguish compositions quickly by the aural process. They can deal with rather sophisticated musical concepts at an early age; therefore, they probably do not need a readiness program. Children who are taught music discriminations increase their attention spans and listening times to these selections. The "amount of teacher approval received by a music student determines the extent of the student's free operant listening to the music taught."\(^\text{71}\)

Fullard also investigated aural discrimination. Through the use of operant conditioning, he found that preschool children can be taught to identify and recognize the sounds of various orchestral instruments.\(^\text{72}\) Another experiment concluded that listening to classical music aids in the overall development of auditory skills.\(^\text{73}\)

Several studies involved the development of a music

\(^{71}\) Greer, Dorrow, and Hanser, "Music Discrimination Training," pp. 31, 42.

\(^{72}\) Fullard, "Operant Training," p. 209.


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curriculum. Adkins\textsuperscript{74} and Greenberg\textsuperscript{75} structured programs for disadvantaged preschool children. Their research identified much about the singing process of young children. Thomas developed a method manual for use with babies and for children through age five.\textsuperscript{76} The Manhattanville Music Curriculum Program also produced a thorough curriculum guide giving numerous lesson plans which could prove invaluable.\textsuperscript{77}

Other researchers completed experiments dealing with home environment and musicality. Kirkpatrick found that there was a strong relationship between home musical environment and singing ability of prekindergarten children.\textsuperscript{78} Jenkins also found that musical background was of the utmost importance in investigating the relationship between the musical development of two-and-three-year-old girls and the maternal parents'

\textsuperscript{74}Adkins et al., Music for Preschool.


\textsuperscript{77}Biasini, Thomas, and Pogonowski, MMCP Interaction.

\textsuperscript{78}Kirkpatrick, "Home Musical Environment," p. 886.
musical experiences.  

Moore conducted a study using five-year-old children. She found the following phenomena:

1. Both rhythm and pitch responses correlate with environmental variables. These include family participation in musical activities, going to concerts, playing instruments, and having parents who sing with their children.

2. Sex has little significant relationship to performance within the areas.

3. Socio-economic status is an indication of range and pitch accuracy.

Sergeant and Thatcher completed an intensive study on the relationship of background, intelligence, and musicality. Results showed the following:

Music, as a form of behaviour, appears to be more characteristic of higher socio/cultural and economic groups than of groups lower on these scales. Inevitably, therefore, the home musical environment enjoyed by a child is allied to the socio-economic circumstances in which he was raised. The child from the favoured background (both socio-economically and musically) is thus more likely to develop high levels of musical ability. ... Intelligence also has direct associations with the socio-economic background of the home. ... It may be concluded

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that musical abilities are the result of interplay between an intelligently developing organism with appropriate environmental stimulation.\textsuperscript{81}

Another area involving musicality in preschool children deals with the development of concepts. Several recent studies are of great importance. These include those by Hickman, Sergeant, Young, and Zimmerman.\textsuperscript{82}

Several other significant investigations related to the field of preschool music were perused. In 1935, Colby completed research on teaching three-and-four-year-old children to reproduce melodies by playing a tin fife. Results indicated that there were some possibilities for instrumental training at this age.\textsuperscript{83}

Van Zee conducted an experiment on the responses of five-year-olds to musical terminology and stimuli. Findings showed that verbal expression does not always develop simultaneously with perception and understanding.


\textsuperscript{83}Martha Guernsey Colby, "Instrumental Reproduction of Melody by Pre-School Children," \textit{Journal of Genetic Psychology} 47 (December 1935):414, 429.
Therefore, subjects were better in demonstrating comprehension of duration of pitches and of rhythmic patterns than they were in describing them verbally.  

Schuckert and McDonald attempted to modify musical preferences of children ages four through six. They found that repeated exposure to music which a subject did not like would not significantly affect a change in his preference. Although shifts were not significant, almost one-half of the children expressed a preference change in the expected direction. Girls shifted twice as fast as boys.

An interesting study completed by Hawn involves the implications of Piaget's theory of play for the preschool music curriculum. During the ages of three through five, the primary source of musical activity is symbolic play. Hawn demonstrates how Piaget's play theory can become the foundation for a preschool music program. He says that "music education can be more profitably undertaken during the preschool years if the normal play habits of the preschool years form the basis for the child's musical encounters."  

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Two other studies which are vital to the field of early childhood music are those by Greenberg and Zimmerman. Both present a summary of research done in the area. Zimmerman's is more succinct while Greenberg's includes more details and recommendations for further study.

87 Greenberg, "Research."

CHAPTER III

PROCEDURES USED IN THE STUDY

The subjects used in this experiment were sixty three-year-old children who attended the Kiddie Korner Day Schools, Inc., in Charlotte, North Carolina, during January through March, 1978. There were thirty boys and thirty girls, ten of each sex in each of three groups—Groups A, B, and C. Criteria for selection were age and sex. Forty-nine subjects were white while eleven were black. Socio-economic backgrounds were cross-cultural. The examiner checked medical records to verify that none of the children had hearing defects and contacted the parents of each child for written permission for their child to participate in the project (see appendix I). In addition, the Louisiana State University Committee on the Use of Humans and Animals as Research Subjects required the parents to sign another permission form (see appendix II). This committee also approved the prospectus for this investigation. A copy of the approval sheet is found in appendix III.

Before the experiment began, the subjects in each classroom were observed for three one-hour sessions. This time was utilized as a period for the children to
become acquainted with the examiner, helping them to feel comfortable with a new person in the classroom. This process was employed as a necessary prelude to working with young children.

Then, each group was taught three songs over a period of a week. These songs were "The Old Brass Wagon,"¹ "Ten Green Bottles,"² and "Head and Shoulders."³ The examiner felt that it was paramount to sing with the students prior to testing them.

Each subject subsequently experienced six testing situations, each conducted on an individual basis between the examiner and the subject. Within each situation, the order in which the subjects were tested was random. Three tests occurred during morning hours, 9 A.M. to 11 A.M., and three occurred during the afternoon hours between 1 P.M. and 3 P.M.

Test I, which was conducted on January 26-27, 1978, was a preliminary test involving the child's ability to reproduce various sounds and pitches. The examiner recorded each child's responses for later evaluation on

a Sony TC-788-4 reel-to-reel tape recorder using a Sony ECM 250 microphone. The subjects were unaware of the presence of the testing devices.

Testing took place in a quiet, small observation room in each of three Kiddie Korner Schools. The examiner and the child each sat in a small chair, facing each other, approximately three feet apart. The examiner tried to make the subject feel comfortable and maintained eye contact with the subject as much as possible.

First, the examiner asked each subject to make a series of sounds in order to make the child feel at ease with vocal responses. The particular sounds were chosen by the examiner because they were familiar sounds, which could be accompanied by facial expression, and because of their various qualities. Three sounds were composed of the interval of the minor third, and three were spoken with vocal inflections. Two involved repeated notes (one being high while the other was low), and two others were glissandos (one ascending and one descending). (See results for specification of sounds.) The sounds, which included tones within the extended range as well as within the practical range, were: fire engine, drum, rooster, donkey, ghost, kitten, cuckoo, Indian, cow, and door bell.

The examiner asked the child to make the sound
immediately following her initial sound saying, "I am
going to make some sounds, and I want you to try to
sound just like me." The examiner then produced the
sound, using the pitch pipe, and the subject imitated it.
After listening to the tape of the responses at a later
date, the examiner rated the subject's ability to reproduce
accurately the sounds.

Then the second phase of Test I, Pitch Matching,
was begun. Once again, each subject was told to listen
to a sound and to try to make another sound just like it.
First, $c^1$ was sounded on a pitch pipe, the Master Key
Chromatic Pitch Instrument. Then, the tone was sung on
the syllable la by the examiner, and the subject was
expected to reproduce it immediately. (The syllables
do, re, mi were not used because some children had dif-

culty pronouncing them when they were used in singing
situations prior to the testing period.)

The same process continued using all the tones of
the C scale from $c^1$ to $c^2$. After these tones were com-
pleted, the examiner returned once more to $c^1$ and
reproduced $c^1$, $b$, $a$, and $g$. The starting point was $c^1$
because it was found to be the lowest note of the practical
range by the majority of research surveyed in chapter II.

Each child was given five seconds to respond to a
sound or to a pitch. If he responded the first time, he
was given the second sound immediately, without any
verbalization. If he did not respond, he was given up to two more chances per tone, using the same method of presentation as on the first tone. If, after three chances, he did not respond, he was given a score of 0 and was presented with the next stimulus. These data were recorded for later evaluation.

Test I was utilized as a means of acquainting the subjects with testing procedures and of aiding them in feeling comfortable using their voices. It was not viewed by the examiner as an accurate assessment of range because some children at age three are incapable of matching pitches. Although the findings are not paramount to this study, they do provide additional helpful information.

Test II was given on February 6-7, 1978. Each subject was asked to sing one song which he liked best out of all the songs he knew. He was told that he would be recorded and that he could hear himself afterward, if he liked.

The test administrator gave the subject one minute to think of a song. If, at that time, he was unable to think of one, he received several suggestions from the examiner. The examiner talked with the children's teachers to identify songs which the children knew from classroom experience. Suggested songs came from this repertoire as well as from other well-known children's
After the child sang his first song, the examiner requested that he sing another. Once again, he was free to choose any song he liked. If the subject failed to make a decision, the examiner gave suggestions until a suitable song was found. If, after five suggestions, the student did not respond, the examiner recorded a score of 0. At no time did the subject receive any help other than suggested titles and words of encouragement.

All subjects were tested in the same observation room with the same equipment. The following points were investigated:

1. Range
2. Tonal orientation
3. Tempo
4. Pitch accuracy
5. Rhythmic accuracy
6. Song titles

Test III was conducted on January 30-31, 1978. Each subject was placed once again in the same room used in the other tests. This room was used because it had a window—a useful tool so that the examiner could be sure that the subject did not get hurt. This type of room was also beneficial in helping the administrator make additional observations regarding behavior.
The subject was told that the examiner would leave the room and that he could do whatever he wanted whether it was play, talk, or make sounds. It was felt that it was necessary to clarify to the subject that he did not have to remain quiet because of behavior rules set up by the nursery. Toys, building blocks, and plastic people and animals were placed in the room beforehand. These specific toys were selected because the classroom teachers indicated them to be among the children's favorites. The subject then was left alone in the room for five minutes with a tape recorder which could not be seen.

The purpose of this test was to identify sounds that children make during unstructured play, particularly musical sounds. The examiner subsequently analyzed these vocalizations according to the following:

1. Range
2. Tonal orientation
3. Tempo
4. Note values
5. Intervallic content
6. Performance style
7. Content of vocalizations
8. Mean range compared with that of Test II

Test IV occurred on February 1-2, 1973. It was an exact replication of Test III except that there was a recording by a lyric soprano played while the subject was
in the room. The subject was unable to see the source of the sound—another Sony tape recorder. The recording, which was sung by a college voice major, was of "Behold a Silly Tender Babe."^4

Fig. 1. "Behold a Silly Tender Babe." Used by permission of Penguin Books.

The vocalist sang the song repeatedly for five minutes on the syllable la. The examiner felt that the use of syllables rather than words was necessary so that music—not words—would be the stimulus. One reason that this song was chosen was because it is in duple meter. In a book on music for the young child, Nye stressed that duple meter, whether single or compound, is relatively easy for children to imitate.5

^5Nye, Young Children, p. 61.
The examiner transposed this song from its original key of G to B\textsuperscript{b}. The key of B\textsuperscript{b} was chosen because it placed the range of the song from f\textsuperscript{1} to f\textsuperscript{2}. The purpose of using a stimulus which was performed in a key so that most of the notes fell outside the practical range of the three-year-old was to investigate whether the subject would attempt to imitate higher sounds and to compare these sounds with those made in Test III. (Practical range was based on data in chapter II.)

All data were recorded for later evaluation. The following points were investigated:

1. Range
2. Tonal orientation
3. Performance style
4. Content of vocalizations
5. Note values
6. Mean range compared with those of Tests II and III

Test V took place on February 8-9, 1978. It was a replication of Test IV, except that the vocal stimulus was different. This time the recording was part of a song entitled "Leaping and Dancing"\textsuperscript{6} (see fig. 2 on next page). It was performed by a basso cantante who was a college music major. The purpose of using different songs was so that the subject would not become familiar with the song during Test IV and, therefore,

\textsuperscript{6}Poston, Penguin Book, pp. 66-67.
respond to it more readily in Test V. The examiner matched the songs as closely as possible regarding tonality, length, range, meter, tempo, relative note values, rhythm, and melodic contour. This song was transposed to the key of $B^b$ and was sung on the syllable $la$.

![Musical notation]

Fig. 2. "Leaping and Dancing." Used by permission of Penguin Books.

The purpose of using the male vocal stimulus was to investigate whether the subjects would try to imitate lower sounds, thus extending their practical range. The examiner used the key of $B^b$ for this song, placing the range from $B^b$ to $b^b$. The same setting for testing and the same methods of evaluation were used in both Tests II and IV, measuring identical phenomena. The findings regarding range were compared with the results
of the previous tests.

Test VI involved the training of three groups of children, each composed of ten girls and ten boys. Group A was the control group while Groups B and C were the experimental groups. The examiner taught each group four songs, spending a total of fifteen minutes a day for two weeks. The dates for these training sessions were February 13-17 and February 20-24, 1978. The four songs were "Johnny's Jeans," "The Old Gray Horse," "The Cat Who Wore a Hat," and "Susan Brown."


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Fed my horse in a poplar trough, Fed my horse in a

Fed my horse in a poplar trough, Fed my horse in a poplar trough, And

there he caught the whooping cough. Koy ma-lin-go


Fig. 4. Song 2. "The Old Gray Horse." This Is Music, kindergarten ed. (Boston: Allyn & Bacon, 1965), p. 21. Melody and words are in public domain.

Oh, once there was a cat, Who always wore a hat. He always wore a hat. Can you im-age

that?

Choose your part-ner as we go round.

Choose your part-ner as we go round,

Choose your part-ner as we go round,

I'll take Su-san Brown.


These songs embodied several characteristics which were important to the study. First of all, they were unknown to the subjects, and they presented numerous possibilities for enhancement through other activities. All of the songs were in simple duple meter. Most of the melodic movement was step-wise or used the interval of the third. The range was narrow, Songs 1 and 3 having a range of a minor seventh, Song 4 having a range of a minor sixth, and Song 2 having a range of a major sixth. The rhythm was uncomplicated. It was

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felt that the subjects could easily learn these songs given exposure to them for ten training sessions.

In order to keep the interest of the children, the examiner varied the order and method of presentation of the songs each day. Learning activities alternated between large group singing and small group or individual singing. Rhythm instruments, finger plays, and movement were included to help the subjects remember the songs. All singing was a cappella with the examiner, who is a soprano, singing with the children until they were able to sing alone.

The only variable was the key in which the songs were presented. The examiner, using a pitch pipe, pitched the songs for Group A in a different major key each day. The ten keys, which were chosen by a random process, were A, A\textsuperscript{b}, B, B\textsuperscript{b}, C, D, E\textsuperscript{b}, E, F, and G\textsuperscript{b}.

In contrast, Group B learned the four songs in the same four keys each day. In order to ascertain what key was appropriate for each song, the examiner consulted results of previous tests regarding practical range. The songs for Group B were pitched to make use of notes which were in the upper part of the practical range, f\textsuperscript{1}, g\textsuperscript{1}, and a\textsuperscript{1}, and which extended beyond it somewhat--b\textsuperscript{1}, c\textsuperscript{2}, and d\textsuperscript{2}. Group B learned the songs in the following keys: Song 1 in F, Song 2 in D, Song 3 in E\textsuperscript{b}, and Song 4 in F.

Group C, however, learned all the songs in B\textsuperscript{b}, a lower key. The examiner chose this key to utilize the
lower tones. These included $a$, $b\ ^b$, and $b$. The examiner realized that it was more difficult to expect a subject to explore his lower range because all of these songs either start on the tonic or make frequent use of it. Therefore, if the child were uncomfortable with lower tones, he would merely begin the song on a higher tone.

After the training sessions were completed, the examiner tested each subject individually. Each child was asked to sing the four songs, choosing his own starting tone and key. The purpose of this test was to investigate whether training the children in either a high or a low key would influence their responses—thus, whether range could be affected by training.

The examiner taped the testing for future evaluation. The following points were investigated:

1. Range
2. Tonal orientation
3. Pitch accuracy
4. Rhythmic accuracy
5. Mean range of the songs in each group compared with that of Test II
6. Mean range comparisons among Groups A, B, and C

In order to validate the judgments of the examiner, two other musicians were asked to listen to ten percent of the data recorded for each test. These musicians were requested to evaluate the data independently of the investigator, using the same method of scoring. Findings
regarding percent of agreement among the evaluators are presented in chapter IV.

Twelve null hypotheses were tested for level of significance. Acceptable scores included those which were significant at or beyond the .05 level. The examiner employed a two-factor analysis of variance (test number and sex) using an $F$ ratio to evaluate all of the following hypotheses:

1. There will be no significant difference between the mean vocal range of the subjects in a structured situation (Test II) and in an unstructured situation with no musical stimulus (Test III)

2. There will be no significant difference between the mean vocal range of the subjects in a structured situation (Test II) and in an unstructured situation with a female vocal stimulus (Test IV)

3. There will be no significant difference between the mean vocal range of the subjects in a structured situation (Test II) and in an unstructured situation with a male vocal stimulus (Test V)

4. There will be no significant difference between the mean vocal range of the subjects in an unstructured situation with no musical stimulus (Test III) and in an unstructured situation with a female vocal stimulus (Test IV)

5. There will be no significant difference between the mean vocal range of the subjects in an unstructured situation with no musical stimulus (Test III) and in an unstructured situation with a male vocal stimulus (Test V)

6. There will be no significant difference between the mean vocal range of the subjects in an unstructured situation with a female vocal stimulus (Test IV) and in an unstructured situation with a male vocal stimulus (Test V)
7. There will be no significant difference between the mean vocal range of the subjects in a structured situation (Test II) and in the control group (Group A).

8. There will be no significant difference between the mean vocal range of the subjects in a structured situation (Test II) and in the experimental group I (Group B).

9. There will be no significant difference between the mean vocal range of the subjects in a structured situation (Test II) and in the experimental group II (Group C).

10. There will be no significant difference between the mean vocal range of the subjects in the control group (Group A) and in the experimental group I (Group B).

11. There will be no significant difference between the mean vocal range of the subjects in the control group (Group A) and in the experimental group II (Group C).

12. There will be no significant difference between the mean vocal range of the subjects in the experimental group I (Group A) and in the experimental group II (Group C).

Findings of all the tests are included in the following chapter.
CHAPTER IV

PRESENTATION AND EVALUATION OF THE DATA

System of Scoring

In order to understand the data, it is necessary to define several terms and to investigate the system of scoring used for each test. Prior to each table of results, the examiner presents observations and comments which will facilitate comprehension of the findings.

Throughout the research, individual subjects are designated by two letters and one number. The first letter is either A, B, or C, classifying the subject into one of three groups. The second letter is either M or F, signifying sex. The number is a constant number between one and ten, indicating a means of identification within each group and sex. Each subject has the same classification for each test (e.g., BF2).

Mean range was determined by finding the average low note and the average high note. The spread between the low and the high was considered the range. Analysis of variance using the $F$ value was employed, and both test number and sex were used as variables. The degree of interaction between the factors was also recorded.
When referring to mean scores for range or key, a plus sign (+) after the letter indicated that the mean was more than halfway between one note and the next (e.g., b\(^+\) indicates that the mean score was more than halfway between b and c\(^1\)).

When evaluating the data, only the scores of the subjects who responded were computed. If a subject did not respond, he was given a score of zero. Zero scores were not included in the mean computations, however, because they did not give an accurate reflection of mean responses. In the tests involving spontaneous vocalizations, inclusion of zero response scores in the means would have yielded very low scores.

Because most evaluations were aural, the examiner asked two other qualified musicians to listen to ten percent of the responses on each test. All evaluators used the same piano, which was tuned to A 440, as their reference. The scores compiled by the judges were correlated with that of the examiner using the t-distribution. The correlation between the examiner and Judge I was .77 and between the examiner and Judge II was .98. Both scores were significant at or beyond the .05 level of significance.

**General Results**

All sixty subjects were three years old. The mean age was three years and five months.
TABLE 3
MEAN AGE OF SUBJECTS

<table>
<thead>
<tr>
<th>Population</th>
<th>Years</th>
<th>Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Females</td>
<td>3</td>
<td>4.6</td>
</tr>
<tr>
<td>Males</td>
<td>3</td>
<td>5.9</td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>5.3</td>
</tr>
</tbody>
</table>

Test I--Matching Sounds

Test I, which measured a subject's ability to match various sounds and pitches, was administered as a means of acquainting the subject with testing procedures and of helping him feel comfortable utilizing his vocal capabilities. Even though the results are presented here, they are not conclusive. The examiner asked each subject to reproduce various sounds on pitch. Because some three-year-olds are unable to match pitches, the test does not provide an accurate account of pitch or range. The findings are presented here, however, because they do provide some interesting observations.

The first part of Test I involved matching ten sounds which were chosen by the examiner. The sounds were: fire engine, drum, rooster, donkey, ghost, kitten, cuckoo, Indian, cow, and doorbell. Sounds that were reproduced most accurately were the doorbell and the donkey, both of which were the interval of a minor
third. The Indian sound had the lowest mean, probably because the subject had to use his hand, an activity involving coordination, to help make the sound. There were fewer responses to the fire engine sound than to the others, presumably because it was the first task given.

The system of scoring was as follows:

0—The subject made no response
1—The subject tried to reproduce the sound but was grossly inaccurate regarding range and/or melodic direction
2—The subject made a fair approximation of the sound
3—The subject matched the sound accurately

<table>
<thead>
<tr>
<th>Name of Sound</th>
<th>No. of Responses</th>
<th>Mean Score</th>
<th>Type of Sound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire engine</td>
<td>47</td>
<td>1.9</td>
<td>Descending glissando beginning on $f_2^\uparrow$, on nyur</td>
</tr>
<tr>
<td>Drum</td>
<td>53</td>
<td>2.0</td>
<td>Repeated note, $d_1^\uparrow$, on bum</td>
</tr>
<tr>
<td>Rooster</td>
<td>48</td>
<td>2.0</td>
<td>Cock-a-doodle-doo, spoken with vocal inflection</td>
</tr>
<tr>
<td>Donkey</td>
<td>55</td>
<td>2.1</td>
<td>Hee-haw on minor 3rd, $f_1^\uparrow-d_1^\uparrow$</td>
</tr>
<tr>
<td>Ghost</td>
<td>54</td>
<td>1.9</td>
<td>Ascending glissando on oo, beginning on $c_1^\uparrow$</td>
</tr>
<tr>
<td>Kitten</td>
<td>56</td>
<td>2.0</td>
<td>Meow, spoken with vocal inflection</td>
</tr>
</tbody>
</table>
### TABLE 4—Continued

<table>
<thead>
<tr>
<th>Name of Sound</th>
<th>No. of Responses</th>
<th>Mean Score</th>
<th>Type of Sound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cuckoo</td>
<td>56</td>
<td>2.0</td>
<td>Cuckoo on minor 3rd, g₁-e₁</td>
</tr>
<tr>
<td>Indian</td>
<td>51</td>
<td>1.8</td>
<td>Repeated note, c₂, on woo, moving hand over mouth</td>
</tr>
<tr>
<td>Cow</td>
<td>54</td>
<td>1.9</td>
<td>Moo, with vocal inflection</td>
</tr>
<tr>
<td>Doorbell</td>
<td>55</td>
<td>2.2</td>
<td>Ding dong on minor 3rd, d₁-b</td>
</tr>
</tbody>
</table>

The second part of Test I dealt with pitch matching. The tones which were produced with the greatest accuracy were c₁, d₁, and b, in that order. It is interesting to note here that c₁ was the first tone which the subjects were asked to match. In contrast to the first sound given (on which the subjects scored the lowest), subjects scored highest on the first tone. This phenomenon may be due to the fact that the subjects were accustomed to the testing procedure at this point and that c₁ usually falls within the range of most three-year-olds.

The system of scoring was as follows:

0--The subject made no response

1--The subject tried to match the pitch but was more
76

than a whole step off

2—The subject was a whole step or less off pitch
3—The subject accurately matched the pitch

The range in which the subjects scored 2 or better was from a to e=. This observation will be compared with the results of the other tests involving range.

| TABLE 5 |
| --- | --- | --- |
| Pitch | No. of Responses | Mean Score |
| g | 58 | 1.62 |
| a | 58 | 2.03 |
| b | 58 | 2.27 |
| c | 57 | 2.51 |
| d | 57 | 2.39 |
| e | 57 | 2.02 |
| f | 58 | 1.72 |
| g | 58 | 1.57 |
| a | 58 | 1.43 |
| b | 58 | 1.34 |
| c | 58 | 1.26 |

Test II—Structured Situation

In Test II, the subjects were asked to sing two of their favorite songs. In addition to data on range, data
regarding key, tempo, pitch accuracy, and rhythmic accuracy were recorded. There were 114 responses out of a possible 120.

The mean range of Test II was designated as the practical vocal range of three-year-old children. This range, which was tested in a structured situation in which the subjects were free to choose their songs and pitches, was utilized as a standard against which other results were compared.

Although the results of Test I were not considered conclusive and were not statistically compared with those of the other tests, it is interesting to note that the range found in Test I was a–e\textsuperscript{1} compared with b\textsuperscript{b+}–g\textsuperscript{1} in Test II. Mean tempo was M.M. 133.

Findings regarding pitch and rhythm showed that subjects scored much higher on rhythmic accuracy. Most subjects had an accurate approximation of rhythm, whereas few subjects reproduced accurate pitches and intervals. Children who chose only a short fragment of a song scored higher on pitch accuracy than those who chose a longer one. Also, subjects who chose a simpler song with fewer tones (e.g., pentatonic) made higher scores on pitch accuracy than those who sang complex songs with more than five tones.

The system of scoring for pitch accuracy was:

1--Monotone

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2—More than one pitch but little resemblance to melody
3—Approximately one-half of the pitches were correct
4—More than one-half of the pitches were correct, and
the general melodic contour was accurate
5—Accurate pitches and intervals

The system of scoring for rhythmic accuracy was:
1—Most or all of the rhythm was incorrect
2—Approximately one-half of the rhythm was correct
3—Rhythmic approximation was accurate

<p>| TABLE 6 |</p>
<table>
<thead>
<tr>
<th>MEAN SCORES ON TEST II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor</td>
</tr>
<tr>
<td>Range</td>
</tr>
<tr>
<td>Tempo</td>
</tr>
<tr>
<td>Pitch accuracy</td>
</tr>
<tr>
<td>Rhythmic accuracy</td>
</tr>
</tbody>
</table>

Regarding key, the largest percentage of songs were sung in $b^b$. The keys of A and B were also prominent. One of the selections, "Jesus Loves Me," is pentatonic. The tabulations for this song are listed under the note on which the pentatonic scale began.
### TABLE 7

DISTRIBUTION OF TONIC NOTES IN TEST II

<table>
<thead>
<tr>
<th>Tonic</th>
<th>No. of Responses</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A₇</td>
<td>9</td>
<td>7.8</td>
</tr>
<tr>
<td>A</td>
<td>17</td>
<td>14.9</td>
</tr>
<tr>
<td>A₉</td>
<td>19</td>
<td>16.7</td>
</tr>
<tr>
<td>B</td>
<td>14</td>
<td>12.3</td>
</tr>
<tr>
<td>C</td>
<td>10</td>
<td>8.8</td>
</tr>
<tr>
<td>D₉</td>
<td>12</td>
<td>10.5</td>
</tr>
<tr>
<td>D</td>
<td>3</td>
<td>2.6</td>
</tr>
<tr>
<td>E₉</td>
<td>8</td>
<td>7.0</td>
</tr>
<tr>
<td>E</td>
<td>3</td>
<td>2.6</td>
</tr>
<tr>
<td>F</td>
<td>6</td>
<td>5.3</td>
</tr>
<tr>
<td>G₉</td>
<td>1</td>
<td>.9</td>
</tr>
<tr>
<td>G</td>
<td>12</td>
<td>10.5</td>
</tr>
</tbody>
</table>

A list of songs that the children chose to sing is included in table 8. Out of the 114 responses, 54 of the songs were chosen by the subjects. In the remaining instances, the examiner had to suggest song titles because the subjects did not indicate any song which they wanted to sing. Many subjects made the same selections, however. Only seventeen different songs were chosen.
It is interesting to note that sixteen of the seventeen songs were songs taught in nursery school. "You Are My Sunshine" was the only song chosen which was learned at home. The selection of several Christmas songs was probably due to the fact that the subjects were tested in early February, following the Christmas season.

TABLE 8
FAVORITE SONGS

<table>
<thead>
<tr>
<th>Song Title</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>The ABC Song</td>
<td>17</td>
</tr>
<tr>
<td>Jesus Loves Me</td>
<td>7</td>
</tr>
<tr>
<td>Bingo</td>
<td>5</td>
</tr>
<tr>
<td>Jingle Bells</td>
<td>4</td>
</tr>
<tr>
<td>Mary Had a Little Lamb</td>
<td>3</td>
</tr>
<tr>
<td>Santa Claus Is Coming to Town</td>
<td>2</td>
</tr>
<tr>
<td>Itsy Bitsy Spider</td>
<td>2</td>
</tr>
<tr>
<td>Frosty the Snowman</td>
<td>2</td>
</tr>
<tr>
<td>I've Been Working on the Railroad</td>
<td>2</td>
</tr>
<tr>
<td>Frères Jacques</td>
<td>2</td>
</tr>
<tr>
<td>Twinkle, Twinkle Little Star</td>
<td>2</td>
</tr>
<tr>
<td>Old MacDonald Had a Farm</td>
<td>1</td>
</tr>
<tr>
<td>You Are My Sunshine</td>
<td>1</td>
</tr>
<tr>
<td>Here Comes Santa Claus</td>
<td>1</td>
</tr>
</tbody>
</table>

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TABLE 8—Continued

<table>
<thead>
<tr>
<th>Song Title</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Little Bunny Foofoo</td>
<td>1</td>
</tr>
<tr>
<td>Yankee Doodle</td>
<td>1</td>
</tr>
<tr>
<td>Rudolph, the Red-Nosed Reindeer</td>
<td>1</td>
</tr>
</tbody>
</table>

Another observation made during Test II concerned movement. Six out of the sixty subjects accompanied their singing with some type of body movement. In all cases, the movement was an attempt to keep the pulse of the music.

Test III—Unstructured Situation

Test III involved the identification of the mean vocal range in an unstructured situation while the children were engaged in free play. Twenty-one subjects responded with forty-one examples of singing. One other subject talked but did not sing. Two subjects did not play with the toys which were provided. One would not stay in the room, and one did not want the door closed (due presumably to having been abandoned as a child).

As reported in chapter II, most studies show that range is higher when measured in an unstructured situation, often extending up to $d^2$. Findings in

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Test III, however, indicate that the range is extended very little in such situations ($c^1-g^{b1+}$). Instead, it remains close to the practical range found in Test II ($b^{b+}-g^{b1}$). The range results are compared statistically with those of the other tests below in this chapter. In addition, mean tempo is somewhat slower ($M=118$ versus $M=133$) than in Test II.

Besides range and tempo, several other characteristics of the vocalizations were investigated. Approximately sixty-one percent of the responses were in only notes of equal value. The remainder were composed of notes of both equal and unequal value.

The intervallic content consisted of some examples that contained only one type of interval (e.g., perfect fourths) and of some examples that contained a mixture of intervals. The largest grouping was composed of a combination of seconds (major and minor), thirds (major and minor), and other intervals (twenty-nine percent). The next largest group was composed of only seconds and thirds. (See table 9 for these results.)

There was an even distribution of the use of major thirds and minor thirds, most of the major thirds occurring in examples with words (e.g., songs) and most of the minor thirds occurring in examples which used nonsense syllables instead of words. The outline of major triads was frequent, but it was sometimes difficult to ascertain key relationships.
Ninety-five percent of the vocalizations were performed legato, while five percent were performed with a combination of legato and staccato. None were purely staccato.

Another interesting observation was that sixty-eight percent of the examples were interspersed with talking. Some of the examples were composed of nonsense syllables only, while others were composed of words (usually songs learned in class).

**TABLE 9**

**ANALYSIS OF VOCALIZATIONS IN TEST III**

<table>
<thead>
<tr>
<th>Factor</th>
<th>No. of Responses</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Note values</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equal</td>
<td>25</td>
<td>61</td>
</tr>
<tr>
<td>Equal and unequal</td>
<td>16</td>
<td>39</td>
</tr>
<tr>
<td><strong>Intervallic content</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monotone</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Seconds</td>
<td>9</td>
<td>22</td>
</tr>
<tr>
<td>Thirds</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>Fourths</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Seconds and thirds</td>
<td>11</td>
<td>27</td>
</tr>
<tr>
<td>Seconds, thirds, and others</td>
<td>12</td>
<td>29</td>
</tr>
<tr>
<td><strong>Performance style</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Legato</td>
<td>39</td>
<td>95</td>
</tr>
<tr>
<td>Staccato</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mixed</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td><strong>Content of vocalizations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Singing</td>
<td>13</td>
<td>32</td>
</tr>
<tr>
<td>Singing and talking</td>
<td>28</td>
<td>68</td>
</tr>
<tr>
<td>Words</td>
<td>22</td>
<td>54</td>
</tr>
<tr>
<td>Nonsense syllables</td>
<td>19</td>
<td>46</td>
</tr>
</tbody>
</table>

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There was a wide distribution of keys in Test III. Out of forty-one examples, it was impossible to determine the key in four instances. Of the remainder of the responses, the largest percentage, twenty-two percent, was performed in C. Sixteen percent were in B, while eleven percent were in D. Three responses were in minor keys.

**TABLE 10**

**DISTRIBUTION OF KEYS IN TEST III**

<table>
<thead>
<tr>
<th>Key</th>
<th>No. of Responses</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>8</td>
<td>22</td>
</tr>
<tr>
<td>C minor</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>D minor</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>E</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>E minor</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>F minor</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>G</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>G minor</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>A</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>A minor</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>B</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>B minor</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Bb</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Eb</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Eb minor</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>F</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>F minor</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>G</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>G</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Subject</td>
<td>Tempo</td>
<td>Pattern</td>
</tr>
<tr>
<td>---------</td>
<td>-------</td>
<td>---------</td>
</tr>
<tr>
<td>BM10</td>
<td>116</td>
<td>I love my mommy, Daddy loves mommy</td>
</tr>
<tr>
<td>CM4</td>
<td>100</td>
<td>I did, I do love you. Tell me I do love you.</td>
</tr>
<tr>
<td>CM6</td>
<td>186</td>
<td>Nonsense syllables</td>
</tr>
<tr>
<td>CM3</td>
<td>120</td>
<td>Pop I, poo poo poo, Pop I, poo poo</td>
</tr>
<tr>
<td>BF7</td>
<td>108</td>
<td>Oh, one day in high school, Nonsense syllables</td>
</tr>
<tr>
<td>BF4</td>
<td>88</td>
<td>Nonsense syllables</td>
</tr>
<tr>
<td>BM3</td>
<td>72</td>
<td>Yes, God loves me, Yes, God loves me</td>
</tr>
</tbody>
</table>
Test IV--Unstructured Situation  
With Female Stimulus

Test IV was administered under the same conditions as Test III except that there was an added stimulus--a recording of a female vocalist. Twenty-three subjects made thirty-three singing responses. Four other subjects talked but did not sing.

Two children wanted the door left open, and another subject opened the door to leave but went back inside when she realized that the examiner was watching her. One child wandered around the room instead of playing, while another child became quite violent with the toys. Before playing, several subjects sat down and listened to the recording. One sought out the source of the stimulus--the tape recorder--and uncovered it (it was hidden). Then, he looked at the recorder, touched it, covered it, and continued playing.

Even though the range of the stimulus was high ($f^1-f^2$), the range of the responses ($c^1-a^b_1$) remained close to the practical range of Test II ($b^{b^1}-g^{b_1}$) and varied little from the range identified in Test III ($c^1-g^{b_1^+}$). Only one example was performed on one pitch. (These results are compared statistically below in this chapter.)

In addition to range, several other areas were examined. Tempo was not investigated because it would have been difficult to determine whether the stimulus...
affected the tempo or whether the tempo was affected by
the type of pattern.

Sixty-four percent of the responses contained only
notes of equal value, and ninety-seven percent were
legato. Sixty-seven percent of the examples were com­
posed of talking as well as singing. Four subjects
talked but did not sing. All of these scores were con­
sistent with those found in Test III. (Refer to table 9.)

In the previous test in which there was no stimulus,
fifty-four percent of the subjects sang using words. In
this test, however, where the stimulus used syllables,
only eighteen percent sang with words. The remainder,
eighty-two percent, used syllables, a factor which shows
the influence of the stimulus. The examiner did not
investigate intervallic content on this test or on
Test V because it would have been impossible to determine
whether the stimulus was a factor.

TABLE 12
ANALYSIS OF VOCALIZATIONS IN TEST IV

<table>
<thead>
<tr>
<th>Factor</th>
<th>No. of Responses</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Note values</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equal</td>
<td>21</td>
<td>64</td>
</tr>
<tr>
<td>Equal and unequal</td>
<td>12</td>
<td>36</td>
</tr>
<tr>
<td>Performance style</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Legato</td>
<td>32</td>
<td>97</td>
</tr>
<tr>
<td>Staccato</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Mixed</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
TABLE 12—Continued

<table>
<thead>
<tr>
<th>Factor</th>
<th>No. of Responses</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content of vocalizations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Singing</td>
<td>11</td>
<td>33</td>
</tr>
<tr>
<td>Singing and talking</td>
<td>22</td>
<td>67</td>
</tr>
<tr>
<td>Words</td>
<td>6</td>
<td>18</td>
</tr>
<tr>
<td>Nonsense syllables</td>
<td>27</td>
<td>82</td>
</tr>
</tbody>
</table>

Another interesting phenomenon of Test IV was tonal orientation. The performance key of the stimulus was B♭. Out of the thirty-three responses, it was impossible to determine a key in three instances because too few notes were sung. As table 13 shows, forty-three percent of the tonal songs were pitched in B and thirty-three percent in B♭. In Test III, in which there was no stimulus, only five percent of the responses were sung in B♭. The results of Test III also showed a wide distribution of keys, whereas seventy-seven percent of the total in Test IV were in the keys of B♭ or B. Because the mean standard deviation from B♭ was low, .81 half-steps, it is likely that the stimulus influenced, to some degree, the key in which the children chose to sing. (See table 13.)

Following table 13 is table 14 which contains representative examples of the subjects' responses.
### TABLE 13
DISTRIBUTION OF KEYS IN TEST IV

<table>
<thead>
<tr>
<th>Key</th>
<th>No. of Responses</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A²</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>A</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>B²</td>
<td>10</td>
<td>33</td>
</tr>
<tr>
<td>B</td>
<td>13</td>
<td>43</td>
</tr>
<tr>
<td>C</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>D²</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>D</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>G minor</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

### TABLE 14
REPRESENTATIVE EXAMPLES FROM TEST IV

<table>
<thead>
<tr>
<th>Subject</th>
<th>Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM2</td>
<td><img src="image" alt="Musical notation" /></td>
</tr>
<tr>
<td></td>
<td>Bum, bum, bum. Dum, dum, dum. Hum-----</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subject</th>
<th>Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP7</td>
<td><img src="image" alt="Musical notation" /></td>
</tr>
<tr>
<td></td>
<td>Ya, ya. Hum------------------</td>
</tr>
<tr>
<td>Subject</td>
<td>Pattern</td>
</tr>
<tr>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>CM4</td>
<td><img src="image" alt="CM4 Pattern" /> On syllable oo</td>
</tr>
<tr>
<td>CF5</td>
<td><img src="image" alt="CF5 Pattern" /> Nonsense syllables</td>
</tr>
<tr>
<td>CM2</td>
<td><img src="image" alt="CM2 Pattern" /> On syllable oo</td>
</tr>
<tr>
<td>BM5</td>
<td><img src="image" alt="BM5 Pattern" /> Oh, the funny clown. Oh, the funny clown.</td>
</tr>
<tr>
<td>BF3</td>
<td><img src="image" alt="BF3 Pattern" /> Woo, too, too</td>
</tr>
<tr>
<td>BM6</td>
<td><img src="image" alt="BM6 Pattern" /> Nonsense syllables</td>
</tr>
</tbody>
</table>

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Test V—Unstructured Situation  
With Male Stimulus

Test V was the same as Test IV except that the stimulus was a recording of a male vocalist instead of a female one. Twenty-one subjects made a total of thirty-four singing responses. Two other subjects talked but did not sing.

Four children did not play but sat quietly or walked around the room. Three subjects sought out the sound source. The examiner was able to test one of the subjects for only half of the time because of personal problems which the subject had. The child became so distraught that it was impossible to retest him in this setting.

The range of the male vocal stimulus was low, $\text{a}^b$ to $\text{b}^b$. This range, however, had no effect on the mean range of the responses ($\text{c}^{1+}-\text{c}^1$). Instead, the lowest note of the range, $\text{c}^{1+}$, was higher than in any of the previous tests. (These results are compared statistically below in this chapter.)

Several other factors were investigated as well. Thirty-eight percent of the subjects sang using only notes of equal value. This percentage differed greatly from the results in Test II (sixty-one percent) and in Test IV (sixty-four percent).

The fact that the majority of the responses in
Test V contained notes of equal and unequal value is unusual. Findings reported by Moorhead and Pond indicate that in most spontaneous singing, the notes are of equal value.\(^1\) This discrepancy in results is due, in all likelihood, to the fact that the stimulus was composed of a number of dotted note values which the children imitated in their responses.

Regarding performance style, one hundred percent of the responses were legato. This result was consistent with the findings in the previous tests as well as with those of Alford. As reported in chapter II, Alford found that, in the majority of cases, spontaneous vocalizations were legato, lacking a strong accent.\(^2\)

As in the other tests, the majority of the responses (sixty-five percent) involved talking as well as singing. Seventy-six percent of the patterns used syllables rather than words. In Test III, in which there was no stimulus, the majority of the responses were words only (see table 9). In the two tests which involved stimuli, the majority consisted of syllables only. (See tables 12 and 15.) This phenomenon is probably due to the fact that both stimuli were syllabic.


TABLE 15
ANALYSIS OF VOCALIZATIONS IN TEST V

<table>
<thead>
<tr>
<th>Factor</th>
<th>No. of Responses</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Note values</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equal</td>
<td>13</td>
<td>38</td>
</tr>
<tr>
<td>Equal and unequal</td>
<td>21</td>
<td>62</td>
</tr>
<tr>
<td>Performance style</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Legato</td>
<td>34</td>
<td>100</td>
</tr>
<tr>
<td>Staccato</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mixed</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Content of vocalizations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Singing</td>
<td>12</td>
<td>35</td>
</tr>
<tr>
<td>Singing and talking</td>
<td>22</td>
<td>65</td>
</tr>
<tr>
<td>Words</td>
<td>8</td>
<td>24</td>
</tr>
<tr>
<td>Nonsense syllables</td>
<td>26</td>
<td>76</td>
</tr>
</tbody>
</table>

Another phenomenon was tonal orientation. The performance key of the stimulus was $B^\flat$. It was impossible to determine a key in four of the examples. As shown in table 16, thirty-seven percent of the tonal songs were pitched in $B^\flat$. The keys of A and $B^\natural$ account for an additional twenty percent. In Test III, which had no stimulus, only five percent of the responses were in $B^\flat$. Because the mean standard deviation from $B^\flat$ was 1.64 half-steps, it is likely that the presence of the stimulus influenced the tonality of the responses.

A total of thirty-nine subjects (sixty-five percent) responded in at least one of the unstructured situations. Fifty-nine percent were male, and forty-one percent were...
female. This large percentage indicates that the majority of three-year-old children do sing during play.
Seven subjects, or twelve percent, performed in all three situations. (Percentages are rounded to the nearest whole number.)

**TABLE 16**

**DISTRIBUTION OF KEYS IN TEST V**

<table>
<thead>
<tr>
<th>Key</th>
<th>No. of Responses</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>A</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>B&lt;sup&gt;b&lt;/sup&gt;</td>
<td>11</td>
<td>37</td>
</tr>
<tr>
<td>F</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>C</td>
<td>5</td>
<td>17</td>
</tr>
<tr>
<td>D&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>D minor</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>E&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>E</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>F</td>
<td>3</td>
<td>10</td>
</tr>
</tbody>
</table>
TABLE 17
REPRESENTATIVE EXAMPLES FROM TEST V

<table>
<thead>
<tr>
<th>Subject</th>
<th>Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP5</td>
<td><img src="image.png" alt="Nonsense syllables" /></td>
</tr>
<tr>
<td>BM4</td>
<td><img src="image.png" alt="On syllables oo and choo" /></td>
</tr>
<tr>
<td>BM5</td>
<td><img src="image.png" alt="We're gonna take a roller coaster (2 times)" /></td>
</tr>
<tr>
<td>AF1</td>
<td><img src="image.png" alt="Mary had a little lamb (2 times)" /></td>
</tr>
<tr>
<td>BF9</td>
<td><img src="image.png" alt="Nonsense syllables" /></td>
</tr>
<tr>
<td>BF7</td>
<td><img src="image.png" alt="Nonsense syllables" /></td>
</tr>
</tbody>
</table>

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Test VI--Structured Situation Involving Training

In Test VI, the examiner investigated the effect of training on vocal range. The sixty subjects were divided into three groups--a control group and two experimental groups. Each group was taught four songs. The control group, Group A, was taught in a different key using a different range each day. Each experimental group, Groups B and C, was taught in the same key each day. The mean range for Group A was $b_b^\text{bb}_1$, for Group B was $c^1\text{-}g^1$, and for Group C was $b^b_f^1$. (Statistical analysis of these means compared with other test means are presented below in this chapter in table 19.)

In addition to range, tonal orientation was examined. The mean key of response for all songs in Group A was C, for Group B was C#, and for Group C was E. The group trained in a higher range sang in a higher key, and the group trained in a lower range responded in a lower key.

Pitch and rhythmic accuracy were analyzed as well. The same system of scoring used in Test II was employed. (See p. 72.) Results showed that rhythmic accuracy was at a maximum (3.0), but that pitch accuracy, as might be expected with this age group, was minimal in some cases. The mean of 3.6 indicates that the average subject performed at least half of the pitches correctly. These results were .2 lower than the pitch
accuracy scores in Test II. The examiner attributes this to the fact that in Test II, children sang their favorite songs, songs which they had sung many times. In Test VI, on the other hand, the songs were new to the subjects. Exposure time was only ten sessions.

The results of the rhythmic accuracy were .1 better than on Test II. This phenomenon is probably due to the nature of the rhythmic activities which the examiner used in teaching the songs.

TABLE 18
MEAN SCORES FOR PITCH AND RHYTHMIC ACCURACY ON TEST VI

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<thead>
<tr>
<th>Group</th>
<th>Pitch</th>
<th>Rhythm</th>
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<td>Group A</td>
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<td>Group B</td>
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<td>Total</td>
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Results Regarding Range

Twelve null hypotheses regarding range were tested using an F ratio. A two-factor analysis of variance was employed to test the significance of the two variables—test number and sex. Interaction between the variables was measured as well.

Range is defined as the distance from the mean.
low to the mean high. Therefore, when comparing the range of one test to another, significance levels are expressed in terms of low mean versus low mean and high versus high. There are high and low coefficients for each test-number variable as well as for the sex variable. If either the coefficient for the high end or for the low end of the range is significant, then the hypothesis is rejected.

Each note from $f-f^2$ was given a number, zero through twenty-four. After the computations were completed, the mean numbers were then translated back into letters to indicate mean ranges.

Data regarding range from Tests II-VI are found in table 19. Abbreviations used in the table are as follows:

1. NI--number of responses on the first test under comparison
2. NII--number of responses on the second test under comparison
3. GM--grand mean (the overall mean range for both tests and both sexes)
4. IL--level of significance between the mean low notes of the two tests and involves only the test variable
5. SL--level of significance between the mean low notes of the two tests and involves only the sex variable
6. TH--level of significance between the mean high notes of the two tests and involves only the test variable
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<th>GM</th>
<th>TL</th>
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<th>TH</th>
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**NOTE:** All of the information in the following discussion of hypotheses refers to this table.
7. SH—level of significance between the mean high notes of the two tests and involves only the sex variable
8. RI—mean range of the first test under comparison
9. RII—mean range of the second test under comparison
10. I—interaction between the variables
11. NS—not significant

Hypothesis I

The first hypothesis was that there would be no significant difference between the mean vocal range of the subjects in a structured situation (Test II) and in an unstructured situation with no musical stimulus (Test III). As Table 19 shows, there was a significant difference in the lower end of the range (.006) regarding the test variable, with the range of Test II being lower than that of Test III. Sex was not significant on the low end.

The reverse was true of the high end of the range, however. Test number was not a factor but sex was. The high for males was $14.15 (g_1^1)$ and for females was $12.75 (f_1^1)$. The significance level was .02. The range on Test II was $b_1^-g_1^1$, while the range on Test III was $g_1^-b_1^+$.

Hypothesis I was rejected, then, because there was a significant difference on the lower end of the range. Sex was a significant factor in the upper part.
Hypothesis II

Hypothesis II stated that there would be no significant difference between the mean vocal range of the subjects in a structured situation (Test II) and in an unstructured situation with a female vocal stimulus (Test IV). There was a significant difference in both the low and high ends of the ranges. Test II had a significantly lower (.003) low note, while Test IV had a significantly higher (.013) high note. The range for Test II was $bb^+-g^b_1$ compared to that of Test IV, which was $c^1-a^b_1$.

Sex was a factor only in the upper end of the range. Once again, males were significantly higher (.021) as opposed to $f^1+$. Hypothesis II, then, was rejected because there was a significant difference on both the low and the high end of the range between Tests II and IV. It might appear that the stimulus of a female singing in a higher range influenced the range, but, as seen in the next situation, the range was still high even though the stimulus was low.

Hypothesis III

In Hypothesis III, the range of Test II was measured against that of Test V. The results were significant (.000) on the low end of the range but were not significant on the high end. The range for Test II was $bb^+-g^b_1$, and the range for Test V, which had a male
vocal stimulus, was $c^1-g^1$. The hypothesis was rejected.

In this comparison, sex was a factor on both the low (.020) and the high (.028) extremes. The mean range for males was higher in both instances—$b^+g^1$ versus $b^b-f^1+$ for females. Even though the stimulus was low, the range remained higher than in a structured setting. The male stimulus, then, was not effective because it did not influence the subjects to lower their ranges.

Hypothesis IV

As shown in Hypotheses I-III, there were significant differences in the mean vocal range of subjects tested in a structured situation (Test II) and those tested in unstructured settings (Tests III, IV, and V). In Hypotheses IV-VI, the examiner investigated the differences in range among the various spontaneous conditions.

Hypothesis IV stated that there would be no significant difference between the range in Test III, which had no stimulus, and in Test IV, which had a female vocal stimulus. The hypothesis was accepted because results showed that the difference between the mean scores was not significant at the .05 level for either the test-number or the sex variables. Therefore, the presence of the stimulus had little effect on range. The range on Test III was $c^1-g^b1+$ and on Test IV was $c^1-g^b1$. 

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Hypothesis V

Hypothesis V dealt with the difference in range in the unstructured setting with no stimulus and in the unstructured situation with a male vocal stimulus. As in the case with the female vocal stimulus, there was no significant difference regarding either the test or sex variables. The hypothesis was accepted. The mean range for Test III was $c_1^1-g_2^1$ and for Test V was $c_1^1-g_1^1$. The addition of a stimulus (whether male or female) had little influence on range. Both stimuli did effect key, however, as discussed previously in this chapter.

Hypothesis VI

The next area of investigation was the difference in range in both situations in which there was a stimulus (Tests IV and V). Results indicated that there was no significant difference according to test or sex. The hypothesis was accepted. The range for Test IV was $c_1^1-a_2^1$ and for Test V was $c_1^1-g_1^1$. Whether there was a male or female stimulus did not affect range.

Hypothesis VII

The following three hypotheses involve the comparison of the practical range (Test II) with the range in the situations in which the children were trained. Hypothesis VII states that there will be no significant difference between the mean vocal range of subjects in a
structured situation and in Group A (Test VIA).

Children in Group A were taught four songs in a different key each day. The examiner assumed that when the subjects were asked to sing these songs for her, they would sing in a range similar to the practical range. The hypothesis was proven correct because there was no significant difference between the two ranges. This finding reinforces the accuracy of the practical range as identified in this experiment. The range for Test II was $b^{+}-g^{1}$, while the range for Test VIA was $b^{+}-f^{1}$.

Hypothesis VIII

This hypothesis stated that there was no significant difference between the mean vocal range of Test II and of Test VIA. The examiner taught the four songs to Group B in the same higher range and key each day. Even though there was no significant difference in the upper part of the range (.075), there was a decided difference in the lower part (.000).

The hypothesis was rejected with qualifications, however, because there was significant interaction between the variables on both the high and low ends of the range (.008 on the high and .045 on the low end). This interaction indicates that the effect of the test variable is not uniform across both sexes. The test variable affects one of the sexes more than the other.
Training appears to affect females more. The fact that interaction is significant suggests that a more thorough experiment should be carried out with this phenomenon in mind.

The range was $b^+ - g^1$ for Test II and $c^1 - g^1$ for Test VIB. Training, then, influenced the placement of the range, but more for girls than for boys.

Hypothesis IX

Next, the investigator examined the difference between the practical range (Test II) and the range of those subjects who were trained in a lower range each day. There was a significant difference in the upper part of the range (.012), but there also was significant interaction between the variables (.004) on the high end. This finding indicates that the difference in the test variables, which was training versus no training, was not uniform across the sexes. Once again, training appeared to affect females more than males. The hypothesis was rejected but with qualifications.

There was no significant difference regarding the low extreme. The subjects, who were trained in a low range, lowered the high note of their range but remained almost the same on the low note. The range for Test II was $b^+ - g^1$ and for Test VIB was $b^1 - f^1$. 

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Hypothesis X

The final three hypotheses tested the differences among the various types of training. Hypothesis X stated that there would be no significant difference between the range in Group A and in Group B. The hypothesis was rejected because test number on both ends of the range was significant at the .001 level. The range on Test VIA was $b^{b^+-f^1}$ and on Test VIB was $c^1$.

Sex was also significant on the high end of the range (.054). In all of the previous tests in which sex was significant, males were higher. In this instance, however, males were lower, $f^1+$ as opposed to $g^{b^1+}$ for females.

Training, therefore, had a definite effect on range. Subjects who were trained in a higher range responded in a higher range, significantly higher than the subjects who were taught in varying ranges each day.

Hypothesis XI

Even though training in a higher range was influential, the results of training in a lower range did not differ significantly from those of training in the control group. The hypothesis that there was no significant difference between the range in Group A and Group C was accepted. The ranges were $b^{b^+-f^1}$ and $b^{b-f^1}$ respectively.
Although test number was not a significant factor, sex was on the high end of the range (.024). As in the previous example, males were lower on the high note e\textsuperscript{1} as opposed to f\textsuperscript{1} for females.

Hypothesis XII

The final hypothesis stated that there was no significant difference between the mean vocal range of the subjects in the two experimental training groups. The hypothesis was rejected on both ends of the range, both significance levels being .000. The ranges were b\textsuperscript{b}-f\textsuperscript{1} for those subjects taught in the lower key and c\textsuperscript{1}-g\textsuperscript{1} for those taught in a higher one.

Sex was also a factor on the upper end of the range (.003). As in the two previous hypotheses, males were lower on the high note, f\textsuperscript{1} as opposed to g\textsuperscript{1} for females. These results showed that the mean range of subjects can be altered by training.

A summary of all of these findings is included in the following chapter. Several deductions are made and conclusions are drawn to relate the importance of these results to music education.
CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

The preschool years are of the utmost importance in the American educational system today. Approximately one-third of the three-year-olds in this country receive some type of formal schooling. This fraction continues to increase because of a number of complex societal problems— inflation, divorce rate, and working mothers. Because more and more children are involved in early childhood education, researchers must investigate the area in order to formulate curricula and methodology. At this point, because the field is quite new, research remains incomplete and contradictory.

In past years, preschool education often was thought of as merely a babysitting situation. Now, however, educators realize that young children are capable of learning quite a lot— much more than was previously conceived. The job of the teacher, then, is to expose the child to as many stimuli as possible as early as possible. Each child must receive a well-rounded course of study involving the cognitive, affective, and psychomotor
domains of learning.

Music is an integral part of the life of young children, particularly of their play. Music educators must realize this significance and place music in its proper perspective. They must utilize music as a means of helping the child in his overall development. In order to accomplish this goal, musicians must know how and what to teach.

The purpose of this project was to aid the teacher in formulating a workable music curriculum. Because the basis of the curriculum for the three-year-old is singing, the investigator chose to explore the voice. Before the teaching of singing can begin, it is imperative to know the range of the voice.

After surveying the literature, the examiner found that there is a wide discrepancy in the identification of vocal range. Many textbooks ignore it, while others present contradictory information. Most songs written for preschool children are pitched too high—some as much as a fifth above the practical range.

Several authors stated that there are two vocal ranges of the young child—one, a practical range, and the other, an extended range which is used during play. The investigator examined range in both structured and unstructured environments and then tested the effect of training on range. This project was designed to benefit
the classroom teacher as well as the music specialist in building a feasible curriculum.

**Procedure**

Sixty subjects, thirty males and thirty females, were used in this experiment. All of the subjects were three years old, and they all attended the Kiddie Korner Day Schools, Inc., in Charlotte, North Carolina. Prior to the beginning of the testing procedure, the examiner observed the children, played with them, and sang with them. This process was completed to help the subjects become acquainted with the examiner so that they would feel free to respond to her in a testing situation.

Each subject was given a warm-up test on matching sounds. He was asked to reproduce ten sounds and to sing all the white notes between $g$ and $c^2$, matching the examiner's initial sounds and pitches. The results of this test were recorded and reported but were not compared statistically with those of the other tests. This test was employed to initiate the subjects to a testing procedure.

Following this test, each subject was tested in five situations—two structured settings and three unstructured settings. The **structured situations** were those in which the subject was aware that he was being tested, whereas the unstructured situations were those in which he was unaware of a testing device.
The first test in a structured environment was Test II. In this test, each subject was asked to sing two of his favorite songs. If he was unable to think of a song, the examiner suggested a song title. Responses were recorded and were evaluated later according to range, key, tempo, pitch accuracy, rhythmic accuracy, and title.

Test III involved testing in an unstructured situation. Each subject was placed in a room which contained several toys. He was left alone there for five minutes. During this time, the test administrator watched the child through a window in order to be sure that he was safe and to make additional observations. A tape recorder, which was hidden in the room, recorded all sounds that were made.

The purpose of this test was to investigate vocalizations made during free play and to identify range under these conditions. The examiner sought to determine whether, as several researchers claim, range is extended in an unstructured situation because the subject is less inhibited. Other factors which were investigated were tonal orientation, performance style, content of the vocalizations, tempo, note values, and intervallic content.

Test IV also involved testing in an unstructured situation. The only difference between Test III and Test IV was the addition of a female vocal stimulus. A
recording of a soprano singing "Behold a Silly Tender Babe" on the syllable la was played on another hidden tape recorder. The song was repeated for five minutes.

The purpose of this test was to determine whether the presence of the stimulus had any effect on the vocal range. The range of the stimulus was $f^1$ to $f^2$. In addition to range, tonal orientation, performance style, content of vocalizations, and note values were examined.

Test V was a replication of Test IV, except that the stimulus was a recording of a male singing "Leaping and Dancing" in the range of $E^b$ to $B^b$. The investigator sought to determine the effect of a male stimulus on vocal range. Other factors, the same ones as in Test IV, were also analyzed.

The final test, Test VI, occurred in a structured setting. It involved the training of three groups of children, Groups A, B, and C. Each group contained ten subjects of each sex. Group A was the control group, while Groups B and C were experimental groups.

The examiner taught each group the same four songs in ten fifteen-minute sessions covering a two-week period. The subjects in Group A sang the songs in a different key each day, while subjects in Groups B and C sang the songs in a given key each session. Group B learned all examples in a higher range, and Group C learned them all in a lower one.
Then, individual testing was begun. Each subject was asked to sing each of the four songs for the examiner. He was given no help, being at liberty to choose his own key and range.

The test measured the effect of training on range. In addition to range, the examiner investigated tonal orientation, pitch accuracy, and rhythmic accuracy.

Findings on Range

Twelve hypotheses regarding range were tested using a two-factor analysis of variance. The two variables, which were tested at or beyond the .05 level of significance, were test number and sex. An F ratio was employed to determine the significance.

The results of the hypotheses are as follows:

1. There was a significant difference between the lower end of the mean range of subjects in Test II (a structured situation) and of those in Test III (an unstructured situation with no stimulus). The lower end was lower on Test II, while the upper end remained approximately the same. Sex was a significant factor in the upper part of the range, the males being one whole step higher than the females.

2. Hypothesis II was rejected because there was a significant difference between the mean range of the subjects in Test II and in Test IV (an unstructured situation with a female stimulus), on both the high and the low ends of the range. The range of Test II was lower overall than the range of Test IV. Sex was a factor on the high end of the range. Once again, males were a whole step higher than females.

3. Regarding Test II and Test V (an unstructured situation with a male stimulus), there was a significant difference in range on the low end but not on the high end. The subjects in Test II had lower scores on the low extreme; therefore, the fact that the stimulus was low was insignificant. Sex was signi-
significant on both ends of the range, the males being higher in both cases

4. Hypothesis IV involved a comparison between subjects in unstructured situations—Tests III and IV. The hypothesis was accepted because there was no significant difference between the mean range of the subjects who received no stimulus and those who experienced a female vocal stimulus. Neither test number nor sex was a significant factor.

5. Likewise, there was no significant difference between the scores of those subjects who had no stimulus (Test III) and those who had a male stimulus (Test V). Neither test nor sex was a factor so the hypothesis was accepted.

6. Hypothesis VI was also accepted. There was no significant difference on either end of the range between the scores of those subjects who experienced a female stimulus and those who experienced a male stimulus (Tests IV and V).

7. The next hypothesis, Hypothesis VII, dealt with the comparison of the ranges between those subjects in Test II (a structured situation) and those in Test VIA. Subjects in Group A were taught four songs in different keys each day. It was assumed that there would be no significant difference between the two tests because both tests were an indication of practical range. The hypothesis was accepted because there was no significant difference regarding either variable.

8. Hypothesis VIII stated that there was no significant difference between the mean range of Test II and that of Test VII. The subjects in Group B were taught each of the four songs in the same higher range each session. Results showed that there was a significant difference in the lower end of the range, with Test II scores being lower, but not in the upper end. Sex was not a factor. There was significant interaction between the variables, however, on both ends of the range. This phenomenon indicates that the hypothesis was rejected with qualifications.

9. Regarding Test II and Test VIC, there was a significant difference in the upper part of the range, but there also was interaction between the variables. The results of Test VIC were one half-step lower on the high end of the range. Hypothesis IX was rejected with qualifications.
10. This hypothesis tested the difference between the ranges in various types of training. The hypothesis was rejected because there was a significant difference between the range of Group A and of Group B at both extremes. Sex also was significant on the high end. In the previous tests, males were higher, but on this test comparison, females were one half-step higher. Training in a higher range had a definite effect.

11. Training in a lower range was not significantly different from Group A, however. The hypothesis that there was no difference between Group A and Group C was accepted. Even though test number was not a factor, sex was, with males performing one half-step lower on the high end of the range.

12. The final hypothesis involved a comparison between the mean range of subjects taught in the high key (Group B) and those taught in the low key (Group C). The hypothesis was rejected at both levels at .000. Sex was also a factor on the upper end of the range with males, once again, being lower.

Conclusions drawn from these findings are presented below in this chapter. A listing of the mean range scores for all tests is given below in Table 20.

**TABLE 20**

**MEAN RANGES ON ALL TESTS**

<table>
<thead>
<tr>
<th>Test Number</th>
<th>Mean Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>( b_{1}^{+} - a_{1}^{1} )</td>
</tr>
<tr>
<td>III</td>
<td>( c_{1}^{-} - b_{1}^{1}^{+} )</td>
</tr>
<tr>
<td>IV</td>
<td>( c_{1}^{1} - a_{1}^{1} )</td>
</tr>
<tr>
<td>V</td>
<td>( c_{1}^{1} - g_{1}^{1} )</td>
</tr>
<tr>
<td>VIA</td>
<td>( b_{1}^{1} - f_{1}^{1} )</td>
</tr>
<tr>
<td>VIIB</td>
<td>( c_{1}^{1} - g_{1}^{1} )</td>
</tr>
<tr>
<td>VIC</td>
<td>( b_{1}^{1} - f_{1}^{1} )</td>
</tr>
</tbody>
</table>
Other Findings

The following statements are findings from various other phases of the study:

1. The mean age for all subjects was three years and five months.

2. In Test I, which involved matching various sounds, sounds that were the most accurately reproduced were those of the minor third.

3. Pitches which were reproduced with the most accuracy in Test I were c♯, d♯, and b—in that order.

4. Mean tempo for vocalizations in a structured situation (Test II) was M.M. 133 compared with M.M. 118 for those in an unstructured setting (Test III).

5. On all tests, subjects performed with greater accuracy on rhythm tests than on pitch tests.

6. Subjects scored higher on pitch accuracy tests when the songs they chose to sing were in a limited range (Test II).

7. The most prominent keys exhibited in a structured setting (Test II) were b, A, and B—in that order. In an unstructured setting (Test III), the most prominent keys chosen were C and B.

<table>
<thead>
<tr>
<th>Test</th>
<th>Stimulus</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>None</td>
<td>19</td>
</tr>
<tr>
<td>III</td>
<td>None</td>
<td>5</td>
</tr>
<tr>
<td>IV</td>
<td>b</td>
<td>33</td>
</tr>
<tr>
<td>V</td>
<td>b</td>
<td>37</td>
</tr>
</tbody>
</table>
3. When subjects were given the key of $B^b$ as a stimulus (Tests IV and V), the percentage of those responding in $B^b$ was much greater than in Tests II and III. The stimuli had a significant effect on key choice.

9. The majority of responses in Tests III and IV were of notes of equal value. In Test V, however, where the stimulus contained many dotted notes, the majority of responses contained notes of equal and unequal value. Stimulus was a factor.

10. In all of the unstructured situations, at least ninety-five percent of the vocalizations were legato.

11. At least sixty-five percent of all singing responses in unstructured environments were interspersed with talking.

12. The majority of vocalizations which occurred during free play were in a major tonality.

13. In Test III, in which there was no stimulus, the majority of responses were composed of words. In Tests IV and V, however, which contained syllabic stimuli, the majority of responses were composed of syllables.

14. In Test VI, which involved training, subjects taught in a higher key responded in a higher key, whereas those taught in a lower key, sang in a lower key.

15. Thirty-nine subjects, sixty-five percent of the total, sang in at least one of the three unstructured testing situations.

Conclusions

Results from this research indicate that three-year-old children are quite musical. A minimum of ninety-five percent of the subjects responded in the structured situations. They enjoyed singing for other people. Sixty-five percent sang at least once during their free-play activities.
Range in Test II ($b^{\text{b}^+\text{b}^1}$), the structured setting, was lower than most of the previous research indicates. Many teachers and researchers continue to think of the three-year-old as a small child with a high, light voice. This is not the case. The child's voice is low, and the quality is heavier than might be expected. Music educators must acknowledge this phenomenon when formulating curricula and writing songs.

Results regarding range in the unstructured situation (Test III) were quite different from those of other studies. Mean range in this type of setting was not an extended range. Instead, the range in the unstructured situation ($c^1\text{--}g^1$) was practically the same as the range in the structured environment ($b^{\text{b}^+\text{b}^1}$). Subjects tended to sing familiar songs in normal ranges. The only time that they really extended their voices on the high end of the range was during Test I, when they were asked to make various sounds.

Other studies have shown that children extended their range to approximately $d^2$ in unstructured situations and that they sang mainly creative material. This finding was attributed to the fact that children were less inhibited vocally in such situations.

The examiner accounts for this discrepancy in several ways. The nursery school gives the child a basic structure. All of the vocal instruction that
he receives at school lies within this structure. When he is left on his own to play, he is still functioning within the guidelines of the school. He frequently sings the same songs or patterns during his play period that he sings during class time. The teachers that were observed did not encourage creativity in singing. They did encourage conformity, however.

Also, even though the subjects were unaware of a testing device in the room, they were aware that they were in a room alone—a new situation. They may have been more restrained because they were experiencing something new, or because they wanted to please the examiner by being quiet. Because the children were in an unfamiliar place, they may have been more cognizant of a lower noise level, inhibiting them from singing out loud as they might during noisy group activity.

Ideally, it would have been beneficial to test the subjects during group play, but this procedure would have been impossible because the noise level was too high to record only one subject's response. It also might have been better to test some subjects in a room which was familiar to them. Then they could have concentrated totally on playing with the toys instead of exploring other things in the room.

Another interesting phenomenon was that on test
comparisons involving Test II and all of the tests in the unstructured situations, males continually were higher on the upper end of the range. In the comparisons among the tests involving training, however, females consistently were higher. The probable reason for this discrepancy is that females related to the examiner, who is a woman. Males, to the contrary, probably perceived the voice of the examiner as feminine and unmasculine. They probably did not try as hard to imitate the examiner as did the females.

The addition of a stimulus to an unstructured situation had no significant effect on range. It did affect the choice of key, note values, and verbal content.

An important finding which is of great significance to music educators is that training does affect vocal range. Subjects who were taught in a higher range and key responded accordingly. Those taught in a lower range and key responded to training as well. This phenomenon should be used as a guideline in formulating curricula.

**Recommendations**

It would be advisable to complete a similar study involving other preschool children. Of particular interest would be experiments on the vocal range of two-and-of-four-year-old subjects to see how range expands and
changes during these crucial years. A comparison among
the various age groups would be revealing.

If possible, a project involving a different type
of testing procedure in the unstructured situation would
be helpful. This procedure would be one which would test
the range of the child while he is engaged in individual
free play. Instead of being in a room by himself, he
would be in his natural play environment among his peers.
Indoor play versus outdoor play might provide an
interesting contrast. An extension of this concept
would be to test the range on vocalizations which occur
as a group effort.

In order to point out the common fallacies in
identifying the range of the three-year-old, it would
be beneficial to complete a survey of the existing song
literature. The ranges found in these sources could be
compared statistically with the practical range. Conclusions could be drawn regarding the practicality of
the current literature.

Stimulus had little effect on range, but it did
have an effect on key. This same type of study should
be conducted investigating key as opposed to range.
It should examine whether children can be taught to
sing in a particular key. This area of interest
further involves the investigation of how children
perceive sound, how they learn to match pitches and
tonalities, and how they develop a sense of pitch.

The final area which should be investigated and which is of the most importance to this study is the training of range. The time period for training in this project was ten sessions over a two-week period. Because training significantly affected range within this short time, it would behoove music educators to examine the long term effects. If longer periods produced continued results, then it would be profitable to design new curricula accordingly.
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**Articles**


Music


**Theses and Dissertations**


APPENDIXES

I. PERMISSION FORM REQUIRED BY RESEARCHER

II. PERMISSION FORM REQUIRED BY LOUISIANA STATE UNIVERSITY

III. APPROVAL SHEET FROM THE LOUISIANA STATE UNIVERSITY COMMITTEE ON THE USE OF HUMANS AND ANIMALS AS RESEARCH SUBJECTS

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
PERMISSION SLIP

My child, ____________________________________________ has my permission to participate in a study in music education conducted by Bonnie L. Harkey, a graduate student at Louisiana State University. The experiment will be held at the Kiddie Korner Day Schools, Inc., Charlotte, N.C., during the months of January, February, and March, 1978.

Signature __________________

Date ________
* TO BE RETAINED BY THE INVESTIGATOR:

EXPERIMENT SIGN-UP FORM

My signature, on this sheet, by which I volunteer to participate in the
experiment on ______________________________________________________________________
__________________________________________________________________________________
conducting by
__________________________________________________________________________________

Experiment

indicates that I understand that all subjects in the project are volunteers, that I can withdraw at any time from the experiment, that I have been or will be informed as to the nature of the experiment, that the data I provide will be anonymous and my identity will not be revealed without my permission, and that my performance in this experiment may be used for additional approved projects. Finally, I shall be given an opportunity to ask questions prior to the start of the experiment and after my participation is complete.

Subject's signature
From: Committee on Humans and Animals as Research Subjects.

To: Vice Chancellor for Advanced Studies and Research
    David Boyd Hall

Re: Proposal of Bonnie H. Marnell
    Principal Investigator

Entitled "The Identification and Training of the Vocal Range of 3-year-old Preschool Children"

This is to certify that a quorum of the Committee on Humans and Animals as Research Subjects reviewed the above proposal. The Committee evaluated the procedures of the proposal with appropriate guidelines established for activities supported by federal funds involving as subjects humans and/or animals.

Recommendation of Committee Approved

Comments:

A review of this proposal by the Committee will be accomplished at least on an annual basis and at more frequent intervals depending on the element of risk.

Date April 3, 1978

Chairman, Committee on Use of Humans and Animals as Research Subjects
VITA

Bonnie Lynn Harkey was born December 4, 1948, in Charlotte, North Carolina. In the summer of 1969, she researched Carib music in Nicaragua. She graduated from Duke University in 1971 with a B.A. in music education and from Loyola University in 1974 with a M.M.Ed. During the fall semester of 1974, she studied at Cambridge University and at the University of London.

She has had three years of full-time experience teaching vocal music in grades K-6 and part-time experience with both junior and senior high school students. She taught music education courses at Louisiana State University for one year as part of a teaching assistantship, and she taught the Orff technique of music education in a program for underprivileged children sponsored by the government. She has been organist for several churches.

In addition, Miss Harkey taught private piano students for eight years and taught dancing at Loyola University for two years. She is a professional dancer and choreographer as well.

Her activities include giving lectures and workshops.
in elementary and early childhood music education and participating in planning sessions for MENC. Her professional memberships include: Who's Who Among Students in American Universities and Colleges, American Guild of Organists, Music Educators National Conference, and Pi Kappa Lambda. At Duke University, Miss Harkey was awarded the Mary Alyse Smith Cooper Award for the outstanding senior woman and the James V. Oliver Music Award.

At present, Miss Harkey is an assistant professor of music at Wingate College, Wingate, North Carolina.
EXAMINATION AND THESIS REPORT

Candidate: Bonnie Lynn Harkey

Major Field: Music

Title of Thesis: The Identification of and the Training of the Vocal Range of Three-Year-Old Preschool Children

Approved:

Robert Shambaugh
Major Professor and Chairman

Carolyn M. Hargrove
Dean of the Graduate School

EXAMINING COMMITTEE:

Paul Louis Abel

J. Frederick West

Robert C. Con

S. L. Chisholm

Date of Examination:
October 19, 1978