Webb, Marjorie Nan A.

AN INVESTIGATION OF THE RELATIONSHIP OF MUSICAL APTITUDE AND INTELLIGENCE OF STUDENTS AT THE THIRD GRADE LEVEL

The University of North Carolina at Greensboro ED.D. 1984

PLEASE NOTE:

In all cases this material has been filmed in the best possible way from the available copy. Problems encountered with this document have been identified here with a check mark _√_.

1. Glossy photographs or pages _____
2. Colored illustrations, paper or print _____
3. Photographs with dark background _____
4. Illustrations are poor copy _____
5. Pages with black marks, not original copy ✓
6. Print shows through as there is text on both sides of page _____
7. Indistinct, broken or small print on several pages ✓
8. Print exceeds margin requirements _____
9. Tightly bound copy with print lost in spine _____
10. Computer printout pages with indistinct print _____
11. Page(s) _____ lacking when material received, and not available from school or author.
12. Page(s) _____ seem to be missing in numbering only as text follows.
13. Two pages numbered _____. Text follows.
14. Curling and wrinkled pages _____
15. Other _____

AN INVESTIGATION OF THE RELATIONSHIP OF MUSICAL APTITUDE AND INTELLIGENCE OF STUDENTS AT THE THIRD GRADE LEVEL

by

Marjorie Nan Webb

A Dissertation Submitted to
The Faculty of the School of Music at
The University of North Carolina at Greensboro
in Partial Fulfillment
of the Requirement for the Degree
Doctor of Education

Greensboro
1984

Approved by

Walter L. Welsh
Dissertation Advisor

APPROVAL PAGE

This dissertation has been approved by the following committee of the Faculty of the Graduate School at the University of North Carolina at Greensboro.

Dissertation Advisor Walter L. Welker

Committee Members James W. Thurber

Barbara B. Bain

William H. Gentry

Arnulfo V. Pascual

Oct. 23, 1984
Date of Acceptance by Committee

Oct. 23, 1984
Date of Final Oral Examination

WEBB, MARJORIE NAN A., Ed. D. An Investigation of the Relationship of Musical Aptitude and Intelligence of Students at the Third Grade Level. (1984)
Directed by Dr. Walter Wehner. Pp. 91

The purpose of the present investigation was to determine the relationship, if any, between musical aptitude test scores and intelligence test scores of children at the third grade level. A related question also was considered: Do factors other than intelligence appear to be significant for identification of musical aptitude?

Subjects for the present study were third grade students in Burlington City Schools, Burlington, North Carolina. Scores on the Cognitive Abilities Test (CAT), an IQ test, and Primary Measures of Music Audiation (PMMA), a musical aptitude test, were compared. A stepwise regression analysis was applied to the data to determine the variance in musical aptitude scores that could be attributed to IQ scores.

Data were analyzed using the SPSSX program. The Pearson product-moment correlation coefficient for the scores was +.37. This result indicated a positive, but weak, relationship between the two scores. The variance in the stepwise regression was r square of .14 which is an indicator that factors other than intelligence affect the scores on the musical aptitude test. Other factors that may influence scores include previous musical study, sex, socio-economic status, school attended, age at which study began, and early musical experiences. Sex and school attended did not appear to influence the scores in the present research.

Implications for music educators, administrators and future study were drawn. This study may be useful to the music educator in planning goals, objectives and strategies, and to the administrator for planning personnel time and space as well as emphasizing the necessity for identification of students with musical aptitude. Additional research was recommended in the area of other factors such as environment, socio-economic status, motivation and early musical experiences which may affect the linear relationship of musical aptitude and intelligence.

ACKNOWLEDGEMENTS

To Dr. Walter Wehner, my advisor, whose steady guidance and advice kept me on target throughout each stage in pursuit of my degree.

To Dr. James Sherbon whose careful attention to details was invaluable.

To Mrs. Barbara Bair, who not only advised me but was a source of much practical help in each phase of my work.

To Dr. William Purkey, who gave generously of his excellent assistance when I needed it most.

To Dr. Donald Russell who encouraged me and answered questions with concern.

To Mr. Terry Woodings and the teachers and students of the third grade of Burlington City Schools who participated in the testing.

To my husband, Wallace, who not only paid the bills and encouraged me, but whose logical approach to problem solving reduced time and energy.

To my children who shared a camaraderie as students and also shared necessary household responsibilities and duties.

TABLE OF CONTENTS

Page

APPROVAL PAGE ii

ACKNOWLEDGMENTS iii

LIST OF TABLES vi

CHAPTER

I. INTRODUCTION 1

Background for the Study 1
Musical Aptitude Controversy 3
Operational Definitions of Aptitude and Intelligence 4
Relationship of Musical Aptitude and Intelligence 6
Predicting Musical Aptitude from IQ 8
Other Factors Affecting Musical Aptitude and Intelligence 10
Present Investigation 12
Null Hypothesis 13
Limitations of Study 13

II. REVIEW OF LITERATURE 16

Testing 16
Young Children 18
Predictive Properties 20
Identification 23
Intelligence and Musical Aptitude 27
Aptitude and Other Factors 31

III. PROCEDURE 33

Demographic Background 33
Test Description and Use 34
Equipment 36
Testing Method and Procedure 36

CHAPTER Page

IV. RESULTS 40

Correlation Coefficient 40
High Scoring Students 41
Students At or Above 80th Percentile 42
Comparison of Scores (IQ and PMMA) 43
Descriptive Data 44
Comparison of Mean Scores 45
Statistical Data 46
Scores Beyond Two Standard Deviations . . . 47
Subjects With IQ Scores 70-79 48
Subjects With IQ Scores 80-89 49
Stepwise Regression 51
Multiple Regression 52

V. SUMMARY AND DISCUSSION 53

Hypothesis 53
Summary of Results 54
Implications for Music Educator 57
Implications for Administrators 61
Implications for Future Researchers 61
Conclusions 62

BIBLIOGRAPHY 65

APPENDICES

Appendix A. Test Answer Sheets 76

Appendix B. Total Sample 81

Appendix C. Histograms 86

Appendix D. Analysis of PMMA 89

LIST OF TABLES

TABLE		Page
1	Pearson Product-Moment Correlation	40
2	Number of High Scoring Students	41
3	Students Scoring at or Above 80th Percentile	42
4	Highest Score on PMMA Versus IQ	43
5	Lowest Scores on PMMA Versus IQ	43
6	Descriptive Data of Subjects Scoring Above 127 IQ	44
7	Comparison of Mean Scores	45
8	Statistical Data	46
9	IQ Scores Greater than Two Standard Deviations	47
10	Subjects with IQ Scores 70-79	48
11	Subjects with IQ Scores 80-89	49
12	Multiple Regression	52

CHAPTER I

INTRODUCTION

The purpose of this study was to investigate the relationship, if any, between musical aptitude and intelligence in children. A related question was also considered: Do factors other than intelligence appear to be important in identifying musical aptitude? To accomplish the purpose and to examine the related question, it was necessary to obtain measures of musical aptitude and intelligence for a group of subjects.

Background for the Study

Standardized testing has received attention in educational applications for many years. Evidence of early forms of testing has been documented by DuBois (1970). He stated that some forms of testing date back to 2200 B.C. when the Chinese examined government workers to determine their fitness for remaining in office. By 1125 B.C. the Chinese examined government workers for proficiency in music, archery, horsemanship, writing, arithmetic, and ceremonial duties.

Through trade contacts Europeans observed and admired the Chinese system of competition, and DuBois reported that England in 1833 began to use competitive civil service examinations for selecting trainees. The English expanded the use of examinations, and educators began to test students to determine which ones should receive degrees or practice professions such as law and medicine.

By 1868 the Congress of the United States began to study forms of testing to use for examining civil service employees. During the remainder of the century psychologists and scientists such as Francis Galton (England), J.M. Cattell (United States) and Alfred Binet (France) studied

differences in human abilities and human behavior by using experimental tests and measurements. Binet studied the human intellect and developed tests for measuring intelligence.

Early studies of human abilities and behaviors focused on adults, but in 1900 E.L. Thorndike, a student of Cattell, began to study measurement of intelligence in children. In 1905 Binet completed his first intelligence-measuring instrument, and this instrument became a model for other intelligence instruments that were developed by Binet and other psychologists. Binet revised the original instrument and developed additional tests. In 1916 Terman developed the Stanford-Binet Intelligence Test in which half of the items were from earlier tests by Binet. The term "mental age" was introduced by Binet, but Terman added the concept of "intelligence quotient." After the development of the Stanford-Binet Test, educational evaluation gained momentum. Test manuals giving instructions on how to administer tests were developed to accompany the tests and explain their uses. The manuals also contained information on reliability, scoring, and meaning of norms and suggested applications for the test (DuBois, 1970).

From 1920 to 1929 tests were developed to evaluate English composition, grammar, reading, spelling, speech, foreign language, mathmatics, musical art, physical education, and agriculture. These tests were for students in grades nine through twelve.

One of the earliest documented studies concerning components of musical aptitude was in 1919 by Seashore, a psychologist. He sought to identify the abilities and skills that constituted "musical aptitude." Seashore believed that students who exhibited the abilities of accurate pitch discrimination, rhythmic pattern perception,

and tonal memory would develop faster in musical skills than students without these abilities. Seashore (1919) stated that he wanted to measure the student's innate ability which he thought human beings possessed in varying amounts.

Musical Aptitude Controversy

The origin of musical aptitude became a controversial question with some investigators theorizing that musical aptitude was inherited and others theorizing that it was the result of musical experiences and environment. As musical aptitude was studied, more questions arose and researchers began to disagree on which factors gave a clear image of aptitude.

According to Mursell (1937), musical aptitude was dependent on a perceptual rather than sensory ability. Schoen (1940), in contrast, advocated that the primary requirement of musical talent was a "keen ear" or auditory sensitivity. He stated that the musically talented person was usually above average in intelligence and that musical memory was a secondary factor. Madsen and Madsen (1969), recognizing the importance of listening in musical testing, wrote, "Listening to music seems prerequisite to all other musical pursuits. Discrimination is the basis for listening" (p.41). They further stated, "Listening is one of the most significant aspects of music; therefore, it is important enough to investigate thoroughly" (p.42).

Secondary and college students have been subjects for research in musical aptitude since Seashore developed the first test for musical aptitude in 1919. However, educators are beginning to recognize the importance of studying the young child. Leonhard and House (1972) stated that it

is nonsense for music educators to continue to use valuable resources for research and programs with students in high school and beyond. They conclude that the highest priority should be given to research and programs for primary grade and younger students. To accomplish study with young students, Gordon (1979) developed a musical aptitude test designed for students in kindergarten through third grade, thus making available an instrument for measuring this quality in young students. Recognizing the importance of studying young children, the present investigation was designed to examine the relationship of musical aptitude and intelligence at the third grade level.

Zimmerman (1971) and Gordon (1968) theorized that musical ability was developmental. Developmental research also seems to indicate that as the child develops, the musical aptitude may change. Michel (in International Research in Music Education, 1973) stated that musical abilities were the result of individual development under specific social conditions and under favorable conditions musical development may be high. Gordon's (1980) research led him to state that musical aptitude is in a developmental state before the age of nine at which time it seems to stabilize. Matter (1982) compared the stages of musical development to physical and psychological development as described by Piaget, a French psychologist, who studied the development of children from birth to adolescence. Piaget (1952) stated that children develop by specific stages and these stages do not follow age precisely.

Operational Definitions of Musical Aptitude and Intelligence

There are numerous definitions for musical aptitude, but it is important to define the term as it relates to this

study. Aptitude may be defined as a measure of an individual's potential to learn. Gordon (1971) stated that musical aptitude refered to capacity or "potential." Revesz (1954) stated the following definition.

> By aptitude we understand that inborn capacity of a person that enables him to realize and develop certain behavior, properties, and capacities (p. 141).

Psychologists have sought to identify and evaluate the skills, concepts, and behaviors that constitute intelligence. French (1977) assembled these definitions for intelligence:

> Terman defined it as the ability to "carry on abstract thinking;" Thorndike referred to it as "the power of good responses from the point of view of truth or fact;" Pinter said that it was "general modifiability of the nervous system," whereas Patterson called it a "biological mechanism by which the effects of complexity of stimuli are brought together and given a somewhat unified effect in behavior;" and Hagerty called it a "group of complex mental processes traditionally defined as sensation, perception, association, memory, imagination, discrimination, judgment, and reasoning". (p. 1)

Edwards (1971) stated Wechsler's definition of intelligence as "the aggregate or global capacity of the individual to act purposefully, to think rationally and to deal effectively with environment" (p. 163). Radocy and Boyle's (1979) definition of intelligence is "a means of coping with intellectual demands of the environment" (p. 269). Robinson (1983) defined intelligence as "the ability to learn and solve problems of all types" (p. 19).

With intelligence defined as an individual's ability to learn and solve problems, and musical aptitude defined as musical capacity, a comparison may be made of scores on qualifying tests. Finding suitable tests to assess these qualities in third grade students was considered. The Cognitive Abilities Test (CAT) for IQ scores and the Primary Measures of Music Audiation (PMMA) for musical aptitude scores were selected.

Relationship of Musical Aptitude and Intelligence

The relationship of musical aptitude and intelligence has been a controversial subject since the nineteenth century (Phillips, 1976). Phillips documented research in measured musical ability and intelligence. He emphasized that social influence, musical interest of the home, difficulty of separating (musical) percept from concept, and the interaction of the individual personality with the environment affected the results obtained in studies of this relationship.

Sergeant and Thatcher (1974; Moore, 1966) concluded that musical individuals appeared to be highly intelligent, but that not all highly intelligent individuals have musical ability.They suggested that musical ability was the result of an interaction between intelligence and appropriate environmental stimulation. Therefore, the ability may not be manifest unless certain environmental stimuli are present. This interpretation supports the theory of Mursell and other music educators that all children need musical experiences. With musical experiences the child has the opportunity to manifest musical aptitude which might not be evident without the opportunity for manifestation.

Sergeant and Thatcher (1974) questioned the fact that some studies show a low correlation between musical aptitude scores and intelligence scores. They suggested the results may be due to the testing procedures and the reliability and validity of the music tests. The methods of testing and the various tests used may provide conflicting information. Newer measurements administered under scientific conditions may demonstrate that IQ test scores and musical aptitude test scores are strongly related.

Gordon (1968) explained that there are conflicting studies describing the relationship of intelligence and musicality. In some studies, musicality (defined as aptitude) was found to have no relationship to intelligence while the ability to perform music was found to correlate positively with intelligence test scores. Performance involves motor skills and coordination of muscles, thinking procedures, and memory. Gordon's results might indicate that the measures or procedures used were not applicable to testing for the factors involved in musical aptitude, but were better suited to the factors involved in performance. However, the results may suggest that intelligence test scores reflect some factors associated with performance ability and do not reflect those factors associated with musical aptitude.

Phillips (1976) reported that Cleak found low intelligence and low musical aptitude tended to coincide, but that high intelligence and high musical ability did not show the same relationship. Phillips stated that Cleak concluded that this factor accounted for the low correlation between IQ and musical aptitude test scores.

Khatena (1982) theorized that intelligence and some functions of artistic ideas may be related. "Intelligence has been recognized as having some relevance for the visual and performing arts" (p. 58). He concluded that those who have extraordinary talents in arts tend to be gifted intellectually, but this intellectual ability may not be evident in terms of IQ test scores. The IQ test scores may not measure the factors that indicate artistic ability. Creative ability, creativity, and sensitivity to sounds, colors, and patterns may be important factors in determining artistic aptitude. Khatena suggested that IQ tests in use at this time may not measure these factors.

Musical aptitude and intelligence appear to be related in that Sergeant and Thatcher (1974), Moore (1966), and Khatena (1982) suggested that those with high musical aptitude have above-average intelligence. The correlation of musical aptitude test scores and intelligence test scores may demonstrate the results of the tests used. There may be factors such as creativity and sensitivity to sound that affect the relationship and these factors may not be measured in the available tests.

Predicting Musical Aptitude From IQ

By making use of the relationship between intelligence test scores and musical aptitude test scores, the music educator may be able to identify students who would benefit most from musical experiences. In addition to identification applications there is a possibility of predicting musical achievement. According to Radocy and Boyle (1979) "identifying ability and predicting the likelihood of musical success are traditional concerns of music educators as well as psychologists" (p. 26).

It appears to be difficult to separate aptitude from achievement. Some tests are designed to measure achievement and others are designed to measure aptitude. However, achievement may indicate aptitude. French (1977) stated that the purpose of evaluation determines terminology meaning. "A test used for the prediction of future performance is called an aptitude measure while the same test employed to evaluate learning is called an achievement test" (p. 2). This statement indicates the difficulty of separating achievement from aptitude. Lehman (1968) stated that it appeared to be impossible to entirely separate aptitude and achievement. He further stated that not only does achievement affect the measurement of aptitude but also appears to be an excellent indicator of aptitude. In a recent study Hedden (1982) reported that intelligence and academic achievement were better predictors of success in elementary instrumental programs than was musical aptitude.

In a study of auditory conservation, Norton (1980) found that musical aptitude and IQ when acting in combination were more effective predictors of auditory conservation than either factor alone. Norton explained that conservation is a cognitive process in which the student abstracts ideas from an experience and transfers ideas to other experiences. Norton's subjects were children with a mean age of 6.6 years. She used Primary Measures of Music Audiation for testing musical aptitude and Wechsler Intelligence Scale for Children for IQ as well as two criterion measures. She found that auditory conservation was significantly related to musical aptitude, to intelligence, and to the interaction of musical aptitude and IQ. Norton found that the student who is adept at auditory conservation is superior in both IQ

and musical aptitude. She determined that musical aptitude and IQ, when acting in combination, are more effective predictors of auditory conservation than either factor alone. It would appear that musical aptitude and intelligence are interrelated and could offer the possibility of predicting one from the other.

Edwards (1971) cautioned that intelligence tests were weighted toward verbal capacity and may not be predictors of success in musical activities. Moore (1966) stated that IQ should be viewed as a test score that may indicate how well the student uses cognitive processes such as convergent thinking, retention of facts, and conservation (applying learned concepts to new situations). Sellin and Birch (1981) cautioned that intelligence may be confused with IQ which is only a test score that should be used for determining activities, teaching plans, and possible achievement in school.

Apparently many factors affect the interaction of musical aptitude and intelligence, and could influence the prediction possibilities. Researchers have isolated factors such as achievement, auditory conservation, verbal capacity, convergent thinking, and retention of facts, that appear to interact with musical aptitude and intelligence thereby influencing the prediction capacity of intelligence and musical aptitude test scores.

Other Factors Affecting Musical Aptitude and Intelligence

Rainbow (1965) listed additional factors such as environment, training, and socioeconomic status which may influence musical development. Any or all of these factors may be related or interrelated. Phillips (1976) suggested that factors in the environment influenced the results when musical aptitude was tested.

According to Pressey (1955), concomitance of favorable factors during the years of early growth may be responsible for certain abilities of the individual being manifest. French (1977) stated that "all ability tests, whether called intelligence, aptitude, or achievement, measure current performance" (p. 2). Both of these reports seem to agree with Sergeant and Thatcher who found environmental stimulation important. Favorable environment with appropriate stimulation in the early years of childhood may be an important factor in the manifestation of musical ability. Gordon (1980) confirmed this possibility. "The younger the children are, the more they can profit from advanced and compensatory instruction. Through such instruction their aptitude should stabilize at a higher level" (p. 108).

If the developmental process is not completed until the age of nine, as suggested by Gordon (1979), perhaps the important focus is to provide whatever stimuli are necessary to assure comprehensive musical development. Providing the stimuli and experiences for development may be more significant than measuring aptitude or intelligence. Present-day educators are studying the child to determine what kinds of learning appear to take place at what specific age. If all children were given musical experiences early in life they might develop whatever ability they possess. Psychologists have learned that children who have opportunities for speech talk and develop faster in language skills than those who do not have the opportunity. The same theory may apply to learning music. Orff (1980) theorized that children learn and develop musical ability through using it, in the same manner that a child learns to speak the language.

Present Investigation

The present investigation used standardized IQ test scores compared to standardized musical aptitude test scores of third grade children to determine if there is a relationship. Consideration was given to some of the implications associated with the findings. Music educators may benefit from understanding the relationship of IQ scores and musical aptitude test scores. By using the IQ scores to predict musical aptitude, schools may strengthen the selection process for guiding students who may be expected to achieve in musical activities.

The problems of assessing an individual's intelligence are greater than the problems of defining intelligence, according to Gallagher (1964). Numerous standardized tests have been devised to determine an individual's Intelligence Quotient (IQ). For this investigation the Cognitive Abilities Test (1968) was used to determine the IQ of the students. The Cognitive Abilities Test (CAT) was selected because it is appropriate for third grade children and was the IQ test routinely administered in the schools in which this investigator conducted the present research. It is an intellignce test which is suitable for primary grades in that it does not require proficient reading ability, and the instructions are given orally.

Primary Measures of Music Audiation (PMMA) by Gordon (1979) was used to determine the musical aptitude score of the students tested. The PMMA is designed for students in kindergarten through grade three. The test does not require that the students be able to read or follow numbers.

The purpose of the present investigation was to determine if there is a linear relationship between musical aptitude test scores and intelligence test scores of children at

the third grade level. The null hypothesis was that there is no significant relationship between musical aptitude test scores and intelligence test scores in children at the third grade level. The focus of the present study was on the following questions:

1. Is there a significant linear relationship between intelligence test scores and musical aptitude test scores of children at the third grade level?
2. Do factors other than intelligence appear to be significant for identification of musical aptitude?

The above questions were examined by obtaining musical aptitude and intelligence test scores for a group of students at the third grade level. Measurement instruments, used for obtaining scores, were selected. Factors surrounding the testing environment were considered and plans were adjusted to control problems where anticipated. While accurate assessment of abilities was a goal of this study there were some minor limitations that could not be eliminated.

Limitations of Study

The results of this study were derived from an assessment of musical aptitude test scores (PMMA) and intelligence test scores (CAT) of third grade students in the Burlington City Schools, Burlington, North Carolina. Limitations evident in this study include such factors as the age of the subjects, specific socioeconomic information, subculture representation, and weakness of the test instruments and correlational studies. Details of these limitations were considered.

Age of subjects. The age of the subjects in the present study ranged from eight years two months to ten years ten months, but all subjects were in the third grade. Both the CAT and the PMMA were validated for a wider age range but third grade was a clearly defined group of subjects.

Socioeconomic representation. The school system could not release socioeconomic information about the students. This type of information requires that parents of young children assist with the forms, and parents may not be willing to give this information. Therefore socioeconomic information is difficult to obtain. Public schools often do not have socioeconomic information on individual students.

Subculture representation. The main subcultures in the Burlington City Schools are European ancestry and African ancestry. The schools were 33% black and 67% white which reflects the make-up of the city and the industrial areas of North Carolina. Larger cities as well as sparsely inhabited desert areas may have different subcultures which could affect the results of the tests.

Measurement. The controversies surrounding intelligence and aptitude and the factors which constitute and affect these variables exemplify the many unknowns that may affect studies of physiological and psychological properties. Sternberg (1984) pointed out that little change has occurred in intelligence tests since the first ones were developed. "Better tests of intelligence could arise only from better ideas of what intelligence is; curiously enough, few psychologists have sought better tests through better understanding" (p. 38).

Correlational studies. According to Glass and Stanley (1970) weaknesses exist in a correlational study. These are the following: (a) variables other than those under consideration may be responsible for observed results, (b) the relationships found in education and social sciences may be too complex to be easily explained, and (c) a correlation tells nothing by itself.

The above five limitations of the study, while of some concern, did not, in the judgment of the researcher, severely impair the study. The age of students, while narrow, was clearly defined and provides a useful data base for future research. The socioeconomic status, while unavailable, was not considered important in determining linear relationship between two clearly defined sets of scores for a total population of third grade students. The subculture representation was typical of the area studied. The researcher recognizes other areas of the country may have additional subcultures as well as large cultures of specific countries which would be included in testing in those areas. However, there was no evidence in the research literature to indicate that subcultures would appreciably affect scores. The measurement instruments, while not without weaknesses, were standardized and recognized as suitable for these subjects. They are among the most reliable instruments available at this time (Buros, 1978; Wehner, in press). Finally, a correlational study has statistical weaknesses, but it is a measure of linear relationship which is accepted by researchers in many fields.

CHAPTER II

REVIEW OF LITERATURE

In recent years educators, psychologists and music educators have become aware of the learning abilities of preschool and early elementary children (Abraham et al, 1977; Clark, 1979; Ely, 1977; Hickok and Smith, 1974; Khatena, 1978; Roedell, 1980; Torrance, 1965; Tuttle & Becker, 1980; Zimmerman, 1971). Research with children may be more difficult than with older individuals due to the child's lack of reading skills, number orientation, communication skills, and extended attention span. The child may be easily distracted, upset emotionally, or unmotivated. Special tests may need to be developed to compensate for some of these problems.

Testing

Early tests were developed in the latter part of the nineteenth century. Wundt began studying experimental psychology in Germany in 1879 (Whybrew, 1962). Sir Francis Galton, an English biologist, developed the process of testing and later Binet and Thorndike expanded the studies in the early nineteen hundreds. Terman and others developed the intelligence test and used the concept of IQ. During World War I testing was expanded in order to classify the men in the army.

As early as 1919 Seashore developed Measures of Musical Talent to study musical aptitude. Later, Kwalwasser, Dykema, Wing, Gaston and others designed instruments to measure musical aptitude and music achievement. Whybrew (1962) stated that "It is as tools for guidance and teaching that aptitude measures can be of greatest value" (p. 11).

Shuter (1968) stated that tests should be suitable for students who are being measured. Suitability includes such factors as language that can be understood by the subjects and the length of the test. Shuter also explained that the author of a test is expected to furnish evidence of reliability and validity. Both the Cognitive Abilities Test, used to establish IQ scores, and the PMMA are standardized tests and both fill the qualification of suitability for the students being measured.

Whybrew (1962) explained the meaning of a standardized test.

> Standardized tests may be defined as those tests which have been so devised and set up that they can be administered and scored in a uniform way upon different occasions by different persons. (p. 15)

The PMMA qualifies as a standardized test by offering exact instructions to be given by the administrator, scoring charts, raw scores, and percentile ranks. Also, the manual explains interpretation and instructional applications that should be considered. Standard norms were selected to offer evidence of the statistical properties of the test and to provide for objective evaluation when local norms were not available. The PMMA was validated in Irondequait, New York with 873 children in grades kindergarten through third. Gordon (1979) stated that the subjects were heterogeneous in terms of socioeconomic status, academic achievement and IQ. The children were judged by Gordon as representative of elementary children.

Wehner (in Michell, in press) predicted that the PMMA test will serve an important need in testing musical aptitude for young children. He further stated that this is an area of study deserving more research, and this test should be a valuable tool for research.

Young Children

Musicians and psychologists have investigated the musical development of children. Matter (1982) compared the stages of musical development through application of Piaget's theory of development. Attempts are presently in progress to try to determine experimentally a child's ability to discriminate and comprehend the complexities of music. Matter explained that rhythm and sound were evident in the first sounds made by a baby. He believed early exposure to music was very important and parents and teachers should offer musical experiences to children. Pond (1980) stated that awareness of auditory phenomena is innate in the young child and through this ability the child develops emerging musicality. The child is aware of sound and experiments with it.

Short term music instruction may increase aptitude. Flohr (1981) found that 5-year-old children showed significant increases in PMMA scores when given a period of music instruction. The effects of instruction may be temporary.

Gordon (1980) discussed music aptitude in young children as developmental. He stated that the young child's musical aptitude may fluctuate. He suggested that children who have instruction in music during the developing period, (birth through eight years) may have their musical aptitude stabilize at a higher level.

The importance of testing young children was recognized by Seashore in 1919. He felt the young child offered a clearer picture of potential than the older student. Revesz (1954) recognized that musical aptitude showed itself at a very early age. "It is significant that, of all the arts, music is the only one that manifests itself during childhood" (p. 145). He pointed out that the gifted children play compositions with musical intelligence. They play forcefully with precision and passion when required by the music, and they play delicately and softly when the music calls for such.

High aptitude does not assure high achievement (Rainbow, 1965; Gordon, 1979). However, it does indicate that under favorable conditions there is the possibility for achievement. Seashore (1919) stated that it was important for young talented children to have many experiences with music, especially if the children showed some interest in areas of music.

> While a child of five or seven has not acquired much formal information, his mind is already stored with that kind of content for which he has a natural bent, and indeed the sample of mental content at that age is perhaps a clearer indication of the situation than it would be later for the reason that the child of this age is spontaneous and reveals his real nature which has not yet been set by any educational forcing (p.255).

Seashore (1938) suggested observations that could be made to determine the musical aptitude of children. These observations, while not measured scientifically, did focus on the possibility that children may display musical aptitude before they learn reading and communication skills. Seashore recognized that children need experiences with music and, given the opportunity, may demonstrate abilities in rhythmic and tonal perception before they have formal instruction in music.

Predictive Properties

Factors related to identifying the potential of a child were reported by Colwell (1970), Ogilvie (1973), and Rainbow (1965). In 1938 Seashore theorized that the senses of pitch, time, loudness, and timbre were inborn and functioned from early childhood. However, Seashore recognized that there were probably other capacities, unmeasured, which affected these senses.

Hedden (1982) reported that differences in achievement of music classes in elementary schools apparently were attributable to factors other than teaching materials and strategies. One of these factors may be aptitude or musicality. He cited studies, using fifth and sixth grade band students, which suggested that musical aptitude was a less effective predictor of achievement in elementary instrumental music than were intelligence and academic achievement.

Gordon (1980) defended aptitude testing for predictive purposes. He stated it is helpful to determine whether private or group instruction would be beneficial to the student, and that test results were important when they differed from a teacher's subjective evaluations of the student. Gordon (1979) listed the following purposes of testing for musical aptitude.

1. To evaluate the tonal and rhythm aptitude so that strengths and weaknesses may be determined
2. To identify young children who could profit from participation in special groups or private music study
3. To compare tonal and rhythm aptitudes of groups of children of similar age

In discussing the possibility of predicting musical aptitude, Gordon (1967) stated that one of the purposes of testing for musical aptitude was "to identify musically talented students who can profit most from and contribute most to school music activities" (p. 1).

He concluded from his study that musical aptitude tests do function as a valid objective aid in identifying those musically talented students who could profit from and contribute most to school music activities. He further stated that correlations between the aptitude and achievement of a student over a period of time of training would offer better validation of predictive ability.

Norton (1980) found that music aptitude and IQ in combination were more effective predictors of musical aptitude. High aptitude does not assure high achievement (Rainbow, 1965; Gordon, 1979). However, it does indicate that under favorable conditions there is the possibility for achievement. Rainbow concluded that the results, based on fourth, fifth, and sixth grade students, supported the belief that pitch discrimination, rhythmic sensitivity, and memory for tonal expressions are constructs of musical aptitude. The results also indicated that extra musical variables such as interest in music, home enrichment, academic intelligence, socioeconomic background, and musical training affect music aptitude. Of these extra factors interest in music, home enrichment, and socio-economic background appeared to be prime factors as predictors.

> If good music programs existed for students at the levels where music is required (grades 1-6)....then selection of students for further training would present no problem. The record of achievement would clearly show the potential. Aptitude tests could then assume the role of guiding the selection of appropriate learning experience for gifted students and the formulation of long range plans for all students (Colwell, 1970, p.74).

Both Gordon (1980) and Dorhout (1982) emphasized that teacher judgments of student ability were only about fifty

percent correct. Apparently teachers are influenced by factors in the child's personality that interfere with accurate evaluations by observation alone.

A good musical environment is important if the child is to reach maximum potential based on aptitude (Matter, 1982; Brand, 1982; Farnsworth, 1958). In a study to determine the relationship between musical environment and musical aptitude, Brand (1982) found no relationship between music aptitude and such factors as parents attending operas or symphonies, family members who play piano or organ, and number of records owned. He did find that the musical and educational experiences of the children such as investigative opportunities and hands-on opportunities provided an environment in which children could grow in many areas of interest.

Seashore also believed the young child should have a suitable musical environment in which to develop. He thought trained musicians could identify the talented child by observing musical activities of the child. In speaking of identifying the young child with musical talent he said:

> We do not need measuring instruments so much as we need training of teachers and parents to an understanding of what constitutes musical capacities so that we can observe the child critically in his early natural responses (p. 18).

Seashore (1919) believed that "Musical talent is a gift bestowed very unequally upon individuals" (p. 6).

Rubenzer (1979) stated that accurate identification of intellectually gifted students was possible as early as kindergarten if an individual intelligence test was used. The individual tests are used to identify exceptional ability in problem solving, learning, and vocational success. Rubenzer believed the child's preschool environment influences may be a factor in exhibiting a special talent.

Identification

Gordon researched the use of pitch and rhythm as identification for aptitude in children. He defined aptitude as a measure of the individual's potential to learn. Gordon (1979) defined achievement as a measure of what the individual has learned. He stated that achievement presupposed aptitude, but aptitude does not guarantee achievement. However, it does appear that if a student has aptitude there should be some evidence of it at an early age if the opportunities for demonstration are available.

Gordon (1979) theorized that aptitude may be developed or improved. "Encouragement in exploration and experimentation is far more valuable in the development of music aptitude than is correctness in performance" (p.4). The young child needs the opportunity to play with sounds and music rather than working toward perfect performance of a single composition. Gordon stated that the most valid means of assessing musical aptitude and identifying the musically gifted child was the use of a well designed aptitude test combined with teacher knowledge and judgment of the individual child.

Colwell (1970) recognized the value of identifying the child with musical talent. He felt that both aptitude and intelligence are difficult to define, but saw aptitude as identifying the student who could benefit from further study. He further explained that performance and achievement become a part of recognition of aptitude. However, Colwell saw aptitude tests as identifying the student who had already had some musical training and was being identified for further study. He suggested that students be tested in the late elementary years after several years of

musical study, to determine if they would benefit from further study in special musical groups such as band or chorus. Colwell may have viewed achievement as the manifestation of aptitude.

Seashore investigated musical aptitude in the early nineteen hundreds. He believed that the infant experimented with sound as the voice and speech developed (Seashore, 1941). The child's manifestation of rhythmic development was evident as the child played with pitch, loudness, duration, and tone quality.

> He [the child] early reveals command of the four elements of all music, as such; namely, pitch, loudness, time, and kind of tone or tone quality; and we observe the unfolding of melody, dynamic expression, rhythm, and richness of tone (p. 14).

Dorhout (1982) recommended a multifaceted procedure for identifying musically gifted children. Children may possess a high degree of sensitivity to sound and lack the physical maturation to demonstrate these traits. Dorhout recommended a systematic assessment of aptitude, achievement and attitude through formal testing. Teacher identification, in which teachers identify students from observations, may be influenced by factors other than aptitude and achievement (Gordon & Thomas 1967; Dorhout, 1982) and is not reliable. Dorhout (1982) believed achievement should be considered when determining the musically gifted student.

Some researchers believe that musical ability is inherited. Schoen (1940) stated that musical talent was inherited and could not be acquired. He believed that

training could only develop the potential that existed in the individual. He took the position that there was a complete range of talent from the musical genius to the individual who had virtually no musical talent. Seashore (1919) also stated that musical talent was inherited, and that adequate evaluation of the talent was necessary to identify those individuals with this talent. Copp in 1916 stated that musical ability was thought to be innate. She advocated that children learn music by ear just as they learn spoken language. She believed musical ability might lie latent without the possibility of expression.

> Musical ability is part of the universal inheritance of man just as the ability to talk is, and that the differences between individuals in respect to it are due much more to training than to differences in heredity (p. 305).

On the basis of questionnaires, Heymans and Wiersma (in Revesz, 1954) reported that children of parents with good aural discrimination will have good aural discrimination 84% of the time. This decreases if only one parent has good aural discrimination. These findings tend to support heredity as a factor in musical aptitude. However, when heredity is mentioned it is always pointed out that in Haydn's family it was impossible to find a musician on either his mother's or father's side for several generations. As with almost any statement, exceptions can be found.

Gordon (1971) stated that "Musical aptitude is a product of innate potential and early environmental influences" (p.7). This would seem to support the ideas that while aptitude may be an inborn attribute, it is affected by early

musical opportunities. Previous studies seem to indicate that some abilities such as a sensitivity to pitch and rhythm perception may be innate within the student, but these abilities may not be manifest unless there are opportunities for the child to respond to music. These responses may serve to intensify the abilities already present. Therefore it seems important that young children have opportunities to experience the elements of music such as pitch or rhythm, to experiment with sounds and rhythms, and to develop and strengthen abilities they may have.

Gordon (1971) concluded that musical aptitude is normally distributed in the population. The three dimensions covered are rhythmic, tonal and aesthetic-interpretative. He felt that musical aptitude probably does not stabilize until the child is about nine or ten years old. "Musical aptitude is comprised of tonal imagery, rhythm imagery, and musical sensitivity" (p.36). Gordon stated that socioeconomic status and musical training have little or no relationship to musical aptitude. However, he did state that low socioeconomic status may inhibit musical achievement. He pointed out that academic achievement test scores correlate somewhat with musical aptitude test scores, but stated that the relationship between musical aptitude and intelligence is positive but low.

Christy (1956) determined that musicality is slightly related to intelligence and that intelligence shows less relationship to achievement than does musicality. Holman (1958) supported the premise that the development of musical talent is limited in lower socioeconomic status areas. He thought that learning styles differed according to socioeconomic status.

Identification of the young musically gifted student may not be an easy task. However, it does seem to be a goal that parents, teachers, and music educators should recognize. Sellin and Birch (1981) and Kellman (1981) stated that researchers need to study similarities and differences between academically and musically gifted students. Perhaps Ogilvie (1973) offered one of the most thought-provoking ideas when he explained that it is important for the child to have the opportunities and facilities necessary for specific talent to be demonstrated. If there is no exposure to musical experiences in the early years, how will anyone know how the child reacts to music? The problem of recognition is often the problem of opportunity.

Intelligence and Music Aptitude

Is the highly intelligent student likely to rate high in musical aptitude? Research on this question has been inconclusive. Gordon (1971) stated "The correlation between intelligence and musical aptitude test scores is positive but low" (p.36). He further confirmed "Academic achievement test scores correlate somewhat higher with musical aptitude test scores" (p.36). Khatena (1982) reported:

> Generally, however, those individuals who show themselves to have extraordinary talent in the arts tend to be highly gifted intellectually (e.g. Passaw, Goldberg, Tannenbaum and French, 1955) although they may not necessarily show this on an IQ test. (p.58)

Talarunis (1981) stated that there was some correlation between intellectual ability and musical talent, but he pointed out that researchers confirm that superior musical ability does not require superior intellect.

Gordon (1968) admitted there were conflicting studies in the relationship of general intelligence and musicality. He documented that in some instances musicality, as measured by Seashore, was found to have no relationship while performance, as measured by Schussler, Haecker and Liehen, was found to correlate positively. These findings were based on tests of fourth grade students. Hollingworth (1926) described tests with children aged eight to eleven in which the median IQ was 153. She found that these intellectually gifted children were less able to make pitch discriminations than "average" children when administered the music test designed by Seashore.

> It is evident from data thus far presented that these intellectually superior children are not superior to average children of their age in musical sensitivity, as measured by these tests. (p.104)

Barlsch (in Revesz, 1954) found no clear-cut relationship between musicality and general intellectual ability. These findings were based on term reports of intermediate school students.

There may be a general factor of rhythmic ability in children. Thackray (1972) found that rhythmic ability may be more closely related to intelligence than either general musical ability or other specific attributes of musical ability. He stated that further research was needed to study the relationship between rhythmic abilities and other abilities.

> Rhythmic ability in children appears to be significantly correlated with general musical ability, general intelligence, verbal and numerical ability, but with older children the correlations are not high. (p. 81)

To further confuse the picture Gordon (1961) revealed that Seashore believed musical talent was inherited, not acquired, while Lundin (1953) believed environment was important for success in music and exerted strong influence on musical aptitude. In tests with ninth grade students Gordon concluded that special musical training was beneficial to students who had musical ability, but was not particularly helpful for those students who did not have musical aptitude.

"One far-reaching element in musical merit is the general level of intelligence" (Seashore, 1919, p. 257). Seashore acknowledged general intelligence as an important part of musical achievement.

> It is possible for a person, strong in other capacities, but with relatively low intellectual power, to assume fairly important roles in music within restricted fields of activity; but the great musician is always a person of great intellect. (p. 253)

This theory is supported by Critchley and Henson (1977) who theorized that the outstanding musicians were people of superior intellect and talent. Moore (1966) drew the conclusion that intelligence was basic to talent in the arts. He suggested that IQ scores of 110 to 120 are important in the arts but above that level the influence of these scores diminishes.

Citing research showing the range of IQ scores found in orphanage studies, Eysenck (1981) suggested that because these children with nearly identical environment in the orphanage demonstrated the usual range of IQ scores, heredity appeared very important. Mehrens (1978) stated a test measures performance at the time of testing.

The performance demonstrated what the student had achieved using the innate ability possessed. Both Eysenck and Mehrens viewed heredity as a foundation for performance.

Measurement of intelligence is often difficult. Wechsler (1969) stated that not enough research on human capacities has been carried out in recent years, and better measuring instruments are needed. Wechsler insisted the main difficulty in measurement of mental abilities is the absence of truly quantitative scales.

The relationship between musicality and intelligence is complex. McLeish and Higgs (1982) explained that musical capacity involved some basic hearing abilities. The pitch receptor is particularly important. Musicality is a complex amalgam of perceptual, attitudinal and cognitive factors. McLeish and Higgs concluded that "retardation in general ability is associated with retardation in musical ability" (p. 371). They found the general deficit to be about the same percentage in both general ability and musical ability.

Farnsworth (1958) suggested that aptitude is only part innate ability. He pointed out that children with high IQ scores tend to have music test scores appropriate to the chronological age rather than their IQ. However, he stated that to reach the highest levels of musical success (performance or composition), the individual needed above-average intelligence. Farnsworth also believed environment was very important for development of any possessed ability. The final result involved the interplay of both heredity and environment.

Aptitude and Other Factors

Some factors may have more influence on musical talent than others. Lundin (1953) believed musical talent consisted of primary and secondary factors. The primary factors were the ones given by Seashore which included sensitivity to pitch, loudness, timbre, tonal memory, tonal and harmonic sequences, rhythm, and inherited motor capacities (musical virtuosity). Lundin listed secondary factors suggested by Schoen which include intelligence, musical memory, self-motivation, self-confidence, and temperament.

Mursell (1937) set forth the theory that musicality was a combination of attributes. He listed three basic ones as "(a) responsiveness to tone and tonal rhythmic patterns, (b) perceptual awareness of tonal relationships, and (c) perceptual awareness of rhythmic groups" (p. 181). Mursell believed that musicality involved the responsiveness of the individual to the emotional qualities of music. He argued for the "Gestalt" in which the whole is greater than the sum of the parts. In other words, the interaction of many factors overules the separate abilities. Each musical specialization may require highly developed senses which are not the same in each specialization.

"Musicality has both an intellectual and an emotional side" (p.322), stated Mursell (1937). He believed that musicality did not depend directly on sensory abilities. He refuted the psychological abilities used by Seashore and Kwalwasser-Dykema in their tests which measured discrimination abilities in pitch, rhythm, and other factors. Mursell explained that this kind of test did not measure musical endowment. Mursell (1937) stated that musicality depended on a complex of psychological functions "which may exist in varying degrees and relationships" (p. 328). To illustrate,

a brain surgeon may have a unique aptitude for surgery, but less ability for dentistry or orthopedics. Some fine musicians are not performers, while an excellent pianist may not be able to perform well vocally or play a violin musically.

Schoen (1940) stated that musical talent was an inborn capacity. He believed training could only develop that ability which the individual possessed. He defined ability as that which is gained by training, and capacity as innate ability. Schoen explained that one requirement of musical talent was a keen ear for auditory sensitivity. He saw intelligence as a secondary factor, but thought a musically talented person was above average in intelligence. Other secondary factors listed by Schoen (1940) included temperament, self confidence, will power and resolve, and musical memory. Copp (1916) also thought ear training was very important in the young child. "The very large majority of children lose their native musical ability through lack of training of the ear and mind during their most susceptible period" (p.297).

What do these conflicting results and theories prove? They reinforce the fact that there is still much to learn about intelligence, creativity, musical aptitude, learning strategies, sensory perception, and the interaction of all of these. Rainbow (1965) mentioned the important element of student interest. Without interest little is accomplished in any field. Interest may be the prime factor underlying achievement, regardless of aptitude. It would appear that intelligence cannot be denied as an important factor in achievement. Another consideration in these documented reports appeared to be the age at which the students were evaluated.

CHAPTER III

PROCEDURE

Third grade students in the Burlington City Schools, Burlington, North Carolina, served as subjects for this author's investigation. These subjects were selected because they were within the grade range for whom the Primary Measures Of Music Audiation test, by Gordon, was designed. Moreover, third grade was the level at which Burlington City Schools initially test for IQ scores using the Cognitive Abilities Test. The third grade students met the age criterion necessary for using both the musical aptitude test and the IQ test. These subjects attended general music classes once a week for thirty minutes, and were taught by a music specialist.

The Burlington City Schools, which serve 7150 students, consist of six elementary schools (grades K-5), two middle schools (grades 6-8), and two high schools (grades 9-12). The school population is 33% black and 67% white which is in proportion to the population of the city of Burlington as verified by the United States Census, 1980. Students are assigned to a specific school according to the zone in which they live.

The mean income is $18,192, and the median income is $15,234 with per capita income of $7,055. These figures compare with the North Carolina median income of $14,481 and per capita income of $6,133.

Of the residents of Burlington, 25 years or older, 56% graduated from high school and 16% attended four years of college. Of the same group 21% had eight or less years of schooling (U.S. Census, 1980)

Of the employed workers 43% work in manufacturing, 19% in wholesale and retail trade, and 17% in professional services. The remaining 21% are employed in assorted technical, laborer, and domestic jobs (U.S. Census, 1980).

All third grade students in the Burlington City Schools served as the population for the present study. With a 33% black and a 67% white population ratio, the school is in proportion to the city in racial make-up. All schools are accredited by Southern Association of Colleges and Schools indicating that these are schools with approved class size and curriculum standards. With 43% of the employed workers in manufacturing the area qualifies as an industrial area, and is so classified by the Chamber of Commerce (Burlington City Schools, 1983).

Test Description and Use

The Cognitive Abilities Test (CAT), which is a revision of the Lorge-Thorndike Intelligence Test, was used to determine intelligence scores. This test is routinely administered to third grade students in the Burlington City Schools in the fall. The primary level two, form three was administered to these specific students by the teachers in October, 1983. The primary levels yield a single score based on the standardized age score with mean of 100 and a standard deviation of 16, thus paralleling IQ scores (Hopkins in Buros, 1978).

Goldschmid (in Buros, 1972) reported that the influence of reading competence is eliminated by the use of paced, oral, item-by-item directions. He described the CAT as a "well constructed and standardized test with excellent reliability."

Cox (in Buros, 1972) stated that the CAT "does have some validity as a downward extension of the Lorge-Thorndike Intelligence Test." He explained that the CAT was impressive as judged by the adequacy of directions, general test design, norm data, and practical features. He further stated that the CAT is a group test for measuring cognitive ability at an early age, an area practically void of available standardized tests.

The Primary Measures of Music Audiation (PMMA) (Gordon, 1979) was used because it is designed for young students and does not require that the student be able to read or understand numbers. Answers are marked by selecting the appropriate picture, and questions are referenced by pictures of objects familiar to children. The PMMA uses perception of pitch and rhythm to identify musical aptitude. The test contains two 20-minute subtests. Examples and test patterns are recorded on cassette tapes. The author documented reliability and validity, and included norms for the test. (Wehner, in press).

Gordon (1979) reported that at the third grade level the mean, as stated in the manual, on the tonal portion is 34.6 (out of a possible 40), with S.D.of 3.35; on the rhythm portion the mean is 29.4 (out of a possible 40), with S.D. of 3.99. The composite mean is 64.0 with S.D. of 6.29. Reliability by split-halves on the composite test is .90 and by test-retest .73. The standard error of measurement on the composite is 1.9. Gordon suggested that the fluctuations in the child's developmental music aptitude explained the lower test-retest coefficients. The PMMA was administered to the third grade students in February, 1984 by this investigator, a music specialist.

The school record of scores on the CAT was made available to the investigator. In addition to the scores, sex, classroom teacher, and school attended were identified and coded for each student. The scores on the CAT and the PMMA were compared for correlation. Additional factors were analyzed to determine their influence on the scores.

One of the purposes of the PMMA test, according to Gordon (1979), is to identify musically gifted students. The norms included in the manual explain the interpretation of the test for the stated purpose. Gordon suggested that the musically gifted student, as identified by the PMMA, could benefit and contribute to such musical activities as instrumental study, participation in dancing or eurhythmics, and participation in improvisation courses.

Equipment

The manual stated specifically how to prepare the students for the test. These instructions were followed as stated. A Bell and Howell cassette player, model 3085 of the Educators Series, was used for playing the tapes. A Studio 49 alto xylophone was used by the investigator to demonstrate to the students tonal and rhythm patterns that sound the "same" and "different." The examples from the tapes were then used as described by the manual.

Testing Method and Procedures

The answer sheets consisted of the tonal sheet, and the rhythm sheet. The tonal and rhythm answer sheets require that the students complete both front and back of the page. Since young children do not usually use the back of paper a method was devised to reduce confusion.

Young students are accustomed to using books in which all pages are secured on the left hand side and pages are turned and read from left to right. In order to duplicate the accustomed reading method, the two answer sheets were stapled on the left side and could be used exactly as a book would be read. The children appeared to have no trouble proceeding through the "book."

Testing took place in cafeterias and media rooms. The testing environment was controlled for noise and confusion by whatever methods were practical in the specific school. The rooms were equipped with comfortable chairs and tables for student use. The cassette player was centrally located so all subjects could hear it.

For uniformity, all third grade students in each school were administered the test at the same time. To avoid confusion, a package had been prepared containing the answer "books" identified with student name and number as determined from the school computer print-out. All students were tested even if they had come into the school since the computer list was compiled. The teacher or aid was asked to give each student the correct "book." Each answer sheet had been color-coded using a small half-inch color spot on the right hand corner of each sheet for additional identification. Pink was used on the T (tonal sheet),and blue on the R (rhythm sheet). The color coding allowed the teacher, aide, or investigator to observe from a distance that the proper page was being marked. The teacher or the aide remained with the students during testing.

The teachers had been given the schedule for testing times and had been asked to have students bring a pencil with them. The classes were prompt in arrival. Teachers and aides were alert to solving any minor problems that arose.

This investigator used a large drawing similar to the blocks on the answer sheet to discuss "same" and "different." The xylophone was used by the investigator to play examples of "same" and "different" tonal and rhythm patterns. The tonal tape was begun and the manual followed as the subjects practiced determining "same" and "different." Subjects responded freely with raised hands to identify "same" and "different" tonal and rhythm patterns during the practice examples.

Each subject placed a finger on the first test item in order that the group might begin together in the correct place on the answer sheet. Subjects were told that the tape would play through the last item on that sheet before stopping. After the last item on page one the tape was stopped, and the subjects were instructed to turn the page. The subjects placed a finger on the first item of the new page and again were told the tape would play to the end of the page. This pattern was followed until the two subtests were completed. Testing, including directions and return of the answer sheets, took approximately forty-five minutes in each school.

After the test books were completed, each teacher or aide collected them, and they were returned to the investigator. The data were analyzed by computer using the SPSSX program. The Pearson product-moment correlation coefficient was determined, and a stepwise regression was used to determine the variance in music aptitude that could be attributed to IQ score.

In summary, all third grade students were administered the PMMA, a test for identifying musical aptitude, by this investigator, a music specialist. After students were given

instructions and heard the demonstrations they listened to tonal and rhythm patterns of the subtests of PMMA. Students marked their answer sheets and these were returned to the investigator for scoring. The PMMA scores were compared to the CAT scores.

CHAPTER IV

RESULTS

In the present study, the data analyses were conducted to determine correlation coefficient, linear regression, and similarities and differences between expected norms, as stated in the PMMA Manual, and the norms established by the population of third graders who were subjects. The correlation coefficient and the linear regression were computed using the SPSSX program. Results of these computations and the analyses of similarities and differences in norms are presented in this chapter.

Correlation Coefficient

The test scores of 415 students on the Cognitive Abilities Test (CAT) and the Primary Measures of Music Audiation (PMMA) test were compared using the Pearson product-moment correlation coefficient. The correlation of the two test scores was +.3717. On the two subtests of the PMMA the correlation of the tonal subtest was +.3740 and of the rhythm subtest was +.2785. Table 1 presents the results of the correlation applied to scores of PMMA and CAT.

TABLE 1

Pearson Product-Moment Correlation Coefficients of Test Scores of PMMA and CAT

PMMA	N	r	p
Tonal	415	+.3740	.01
Rhythm	415	+.2785	.01
Total	415	+.3717	.01

Comparison of Similarities and Differences

According to Gordon (1979) the composite score of children in kindergarten through grade two is influenced more by the tonal subtest score, but the composite score for children in grade three is influenced more by the rhythm subtest score. The items on the tonal subtest may have been easier for younger children than those on the rhythm subtest. There were 30 subjects in this investigation who achieved a perfect score on the tonal subtest and no students who achieved a perfect score on the rhythm subtest. The highest score on the rhythm subtest was 39 out of a possible 40, and this score was achieved by one subject. There were five scores of 38. In Table 2 letters designate the six schools, and the numbers indicate the number of students with high tonal and rhythm subtest scores.

TABLE 2

Number of High Scoring Students on the Tonal and Rhythm Subtests of PMMA

School	A	B	C	D	E	F
Tonal score						
40	7	2	5	6	5	5
39	8	5	8	3	23	5
38	5	8	7	9	7	8
Rhythm score						
40	0	0	0	0	0	0
39	0	0	0	0	0	1
38	1	0	2	0	0	2

Students scoring above the 80th percentile for their grade level were designated by Gordon as students who could be expected to benefit from or contribute to special musical activities. These activities include instrumental study, dance classes, and participation in improvisation classes. Students scoring 38 or above on the tonal subtest and students scoring 35 or above on the rhythm subtest fall in the 80th percentile on the respective subtests. A composite score of 73 denotes the 80th percentile on the PMMA. In the present study 128 (31%) students scored at or above the 80th percentile on the tonal subtest, 170 (41%) students scored at or above the 80th percentile on the rhythm subtest, and 119 (28.6%) students scored at or above the 80th percentile on the composite PMMA. Table 3 shows the number of students achieving these scores.

TABLE 3

Number of Students Scoring at

or Above 80th Percentile

School	A	B	C	D	E	F
Tonal Score						
40	7	2	5	6	5	5
39	8	5	8	3	23	5
38	5	8	7	9	7	8
Rhythm Score						
40	0	0	0	0	0	0
39	0	0	0	0	0	1
38	1	0	2	0	0	2
37	3	5	4	4	13	5
36	8	11	13	6	15	9
35	12	11	13	14	13	13

In the present study the highest composite score on the PMMA was 77 out of a possible 80, and six subjects achieved this score. IQ scores of these six subjects ranged from 97 to 132. The scores on the PMMA were skewed toward the upper levels. This should be expected since these subjects were at the top of the group in age for which the test is standardized. Table 4 compares the highest scores on the PMMA with the IQ scores of the same subjects.

TABLE 4

Highest Score on PMMA Versus IQ

Subject	School	PMMA	IQ
1	C	77	106
2	D	77	118
3	E	77	125
4	F	77	98
5	F	77	119
6	F	77	132

The six lowest scores on the PMMA ranged from 36 to 49. Table 5 compares these six scores with the IQ score of the subject.

TABLE 5

Lowest Scores on PMMA Versus IQ

Subject	School	PMMA	IQ
1	F	36	58
2	C	40	94
3	C	46	83
4	D	47	88
5	E	48	82
6	F	49	93

The mean IQ score for students was 101 which is near the population norm of 100. The IQ of greatest frequency was 96, and there were 19 subjects that scored above 127 which is the score selected to designate the "gifted and talented" (now called "academically gifted" in North Carolina) in the Burlington City Schools. These gifted and talented students had PMMA scores that ranged from 61-77. Fifty-eight percent of these "above average" students scored above the 70th percentile on the PMMA. Table 6 represents the descriptive data of students scoring 127 or above on the CAT.

TABLE 6

Descriptive Data of Subjects Scoring Above 127 IQ

Subject	IQ score	PMMA score
1	127	71
2	129	61
3	129	74
4	129	75
5	130	71
6	131	68
7	132	72
8	132	76
9	132	77
10	134	69
11	134	74
12	135	65
13	136	65
14	136	68
15	136	72
17	139	75
18	140	75
19	144	67

Thirteen students or 67% of the "gifted and talented" students scored above the mean (68.63) on the PMMA. Six students or 32% if these students scored below the mean.

A comparison of the mean scores on IQ and total score on PMMA illustrates that the subjects scored slightly above the standard mean of 100 on the CAT, and above the expected mean of 64.0, as stated by Gordon in the PMMA Manual, on the total score. The expected tonal mean of 34.6 was exceeded by less than one point, but the expected rhythm subtest mean of 29.4 was exceeded by almost four points. However, the standard deviation was closely comparable to the expected standard deviation (S.D.) See Table 7.

TABLE 7

Comparison of Mean Scores

Test	Obtained Mean	S.D.	N	Expected Mean	S.D.
CAT	101.23	14.65	415	100.00	16.00
PMMA					
Tonal	35.39	3.78	415	34.60	3.35
Rhythm	33.30	3.34	415	29.40	3.99
Total	68.63	6.36	415	64.00	6.29

The minimum IQ (CAT) score was 58 and the maximum score was 144, a range of 86 points. The high score on the tonal subtest was 40 (perfect) and on the rhythm subtest was 39 (one less than perfect). The high total score was 77 (three less than perfect). The lowest score on the tonal subtest was 20 and on the rhythm subtest 12. See Table 8 for these comparisons.

TABLE 8

Statistical Data

Variable	IQ	Tonal	Rhythm	Total
Mean	101.23	35.39	33.30	68.63
Variance	214.56	14.28	11.12	40.48
Skewness	0.20	-1.51	-1.99	-1.89
Minimum	58.	20.	12.	32.
S.E. Mean	0.72	0.19	0.16	0.31
Maximum	144.	40.	39.	77.
Std Dev	14.65	3.78	3.34	6.36
Range	86.	20.	27.	45.

In the present study there were five students with IQ scores greater than two standard deviations below the mean, and 14 students with scores greater than two standard deviations above the mean. The five subjects averaged 57 on the total PMMA and the 14 students averaged 71 on the total PMMA. However, both groups fell within the two standard deviations on the PMMA. There were two students with scores greater than two standard deviations below the mean, and there were no students with scores greater than two standard deviations above the means. Table 9 shows these comparisons.

TABLE 9

IQ Scores Greater Than Two Standard Deviations Above and Below The Mean

Scores Below		Scores Above	
IQ Score	Total PMMA Score	IQ Score	Total PMMA Score
58	36	131	68
60	53	132	77
62	56	132	76
70	67	132	72
71	73	134	69
		134	74
		135	65
		136	65
		136	68
		136	72
		139	73
		139	75
		140	75
		144	67
$\bar{X}$ 64.2	57	135.7	71.1

The IQ scores below the "normal" range of 90-110 were examined. These scores were grouped as 80-89, 70-79, and below 70. Each group of scores was examined and compared to percentile ranks. There were three students with IQ scores below 70, and these three students scored 36, 53, and 56 on the PMMA. These three students, with IQ scores more than 20 points below the "normal" range scored below the 25th percentile on the PMMA. In all three cases the IQ score and the PMMA score were low.

There were twenty-one subjects with IQ scores ranging from 70 to 79. The tonal subtest scores for these students ranged from 20 to 39 (out of a possible 40), the average being 32. The rhythm subtest scores for these subjects ranged from 12 to 38 (out of a possible 40), the average being 31. The total scores ranged from 32 to 74 (out of a possible 80) with a mean of 63 which represents the 43rd percentile. The averages of this group were below the averages of the total group. It should be recognized that two students in this "below average" IQ group scored above the 80th percentile on the PMMA. See Table 10.

TABLE 10

Subjects With IQ Scores of 70-79

CAT Scores	PMMA Scores		
IQ	Tonal	Rhythm	Total
70	32	35	67
71	37	36	73
73	33	33	66
73	32	31	63
74	32	29	61
74	36	38	74
75	36	34	70
75	33	31	64
76	35	31	66
76	34	36	70
77	30	32	62
78	33	34	67
78	35	35	70
78	28	34	62
78	39	28	67
79	28	17	45
79	28	25	54
79	20	12	32
79	30	35	65
79	29	33	62
79	36	32	68

Of the sixty-one students with IQ scores between 80 and 89, ten or 16% scored above the 80th percentile on the PMMA, and 45% of this group scored above the mean of the PMMA. The average tonal subtest score was 34 and the average rhythm subtest score was 31. The mean score for this group was 66 which is below the mean of 68 scored by the group of third graders, but above the expected mean of 64. The lowest score in this group was 47 which corresponds to the eighth percentile, and there were nine students or 15% who scored below the 34th percentile. See Table 11.

TABLE 11

Subjects With IQ Scores of 80-89

CAT	PMMA Scores		
IQ Scores	Tonal	Rhythm	Total
80	33	32	65
80	27	31	58
80	33	35	68
81	30	27	57
81	27	31	58
81	37	30	67
81	31	34	65
82	32	35	67
82	36	36	72
82	37	35	72
82	32	34	66
82	23	25	48
83	29	32	61
83	36	35	71
83	37	36	73
83	31	26	57
83	20	26	46

(table continues)

Table 11
(continued)

IQ Scores	Tonal	Rhythm	Total
84	34	35	69
84	37	35	72
84	40	36	76
84	36	32	68
84	40	35	75
84	34	28	62
84	32	32	64
84	37	33	70
84	24	28	52
84	34	29	63
85	38	36	74
85	35	37	72
85	30	33	63
85	37	33	70
85	36	35	71
85	39	34	73
86	32	30	62
86	36	32	68
86	34	27	61
86	39	34	73
86	34	31	65
87	34	34	68
87	35	35	70
87	37	36	73
87	37	35	72
87	38	36	74
87	30	31	61
87	36	35	71
88	36	28	64
88	26	21	47
88	37	35	72
88	29	25	54
88	31	25	56
88	39	34	73
88	36	33	69
88	36	27	63
89	32	32	64
89	37	35	72
89	37	37	74
89	37	36	73
89	36	35	71
89	32	33	65
89	34	35	69
89	38	34	72

Stepwise Regression

When the stepwise regression was applied to the data, the r square was found to be .1339 with standard error of 5.87. The F value was 60.63 and is significant beyond the .01 level. When studying these statistics it should be remembered that while the IQ scores had a relatively normal distribution, the PMMA scores were somewhat negatively skewed.

One purpose of linear regression analysis is to determine the possibility of prediction using one variable to predict the reaction of another variable. In the present study, the possibility of predicting musical aptitude from the IQ scores was a factor considered. Glass and Stanley (1970) explained that a linear relationship does not imply that one variable causes the other. It does imply a systematic relationship between the two variables. The regression analysis for IQ and total score, as shown in Table 12, indicates that the linear relationship is positive though weak. The relationship established by the present research, though weak, might be considered with other evaluative methods for predictive purposes.

When the variables of sex and school attended were added to the regression formula there was little change as shown in Table 12. The r square for IQ, sex and school attended was .137. This finding seemed to indicate there were other factors, which were not included in this test, that could affect the scores on the music aptitude test. Other factors that could affect test scores include motivation and interest of students, previous musical experiences, and socioeconomic status of the students.

TABLE 12

Multiple Regression

Dependent Variable: Total Score PMMA

R Square .13731					
Variable	df	Sum of Squares	Mean Square	F	p
Sex and School	397	13690.08	34.48	21.06	.01

Variables in the Equation

Variable	B	SE B	Beta	T	Sig T
IQ	.151	.020	.352	7.454	.0010
Sex	-.407	.590	-.032	-0.690	.4908
School	-.248	.175	-.066	-1.414	.1581
(Constant)	54.609	2.288		23.869	.0010

CHAPTER V

Summary and Discussion

The purpose of this study was to determine the possibility of a significant relationship between musical aptitude test scores and intelligence test scores of children at the third grade level. The null hypothesis was stated as follows: there is no significant relationship between musical aptitude test scores and intelligence test scores of children at the third grade level. The statistical data as reported in Chapter IV demonstrate a relationship (+.37) between musical aptitude test scores of Primary Measures of Musical Audiation (PMMA) and Cognitive Abilities Test (CAT) scores.

The null hypothesis of this study was rejected ($p < .01$). With those children tested there appears to be a relationship between musical aptitude test scores and intelligence test scores at the third grade level. The correlation was low, but positive. This finding parallels those reported by Gordon (1979) and Bentley (1966).

A by-product of the present study was to consider the possibility that prediction of musical aptitude might be made from IQ test scores. A relationship exists which indicates prediction from these scores may be a consideration. More subjects and additional studies would be needed to determine if prediction of musical ability could be a reliable factor.

Another question dealt with factors other than intelligence that appear to be significant for identification of musical aptitude. The factors of sex and school attended by students were not found to be significant. However, unidentified factors appear to be important, and may have greater influence than IQ. The Pearson

product-moment correlation coefficient for the PMMA and the CAT in the present study is $r = +.37$. Since the linear relationship is positive, though small, it technically could be considered as a possible factor for consideration in determining which students could be expected to possess musical aptitude commensurate with IQ scores. The correlation coefficient is greater for the tonal subtest (+.3740) than for the rhythm subtest (+.2785) which could indicate that rhythm perception does not correlate with IQ as well as tonal perception. This finding is contrary to the theory of Thackray (1972).

Summary of Results

Scores on the PMMA ranged from a low of 32 (total score) to a high of 77 (out of a possible 80). The PMMA manual stated that third grade students scoring above the 80th percentile (composite score of 73) can profit from and contribute to special musical activities. These activities include studying an instrument, participation in dance or eurhythmic class, and experiences in improvisation and creativity. In the present study 119 subjects, or 28.6 percent of the students, scored above the 80th percentile. Better than one fourth of the students scored above the 80th percentile and this estimate could be a useful prediction.

There were 30 students with perfect scores on the tonal subtest (40 correct). These ranged from two in School B to seven in School A with an average of five per school for the six schools. In one school 23 additional subjects marked only one incorrect answer (39 correct). The other schools averaged six students with one incorrect answer on the tonal subtest. Forty-six additional students scored 38 correct answers on the tonal subtest for a total of 128 (31%) students scoring at the 80th percentile or above on the tonal subtest.

No students marked all answers correctly on the rhythm subtest. One had only one error, five had two errors, and 34 had three errors. A score of 35 or above on the rhythm subtest was needed to rank in the 80th percentile. A total of 170 (41%) students scored in the 80th percentile or above. Notice that even though there were no perfect scores on the rhythm subtest, there were more scores at or above the 80th percentile on this subtest. These findings reflect Gordon's statement that at the third grade level rhythm listening has greater weight than tonal listening.

The highest composite score on the PMMA was 77 (out of 80) and there were six students with this score. The IQ scores for the same six students ranged from 98 to 132 with an average of 116. This indicates that those students scoring highest on the PMMA also had IQ scores slightly above the "normal" range of 90-110. This finding may be consistent with the low positive correlation of IQ and PMMA scores.

The six lowest composite scores of the PMMA averaged 44, and the IQ scores of the same students averaged 83. The PMMA score average of 44 indicates these students are below the 12th percentile, and 83 (IQ score) falls below the "normal" range for IQ scores. The relationship demonstrates that PMMA scores of these students relate to IQ scores in the same manner.

One requirement for "gifted and talented" (now referred to as "academically gifted" in North Carolina) designation in the Burlington City Schools is an IQ score above 127. The nineteen students who scored above 127 had an average PMMA score of 67 which is in the 58th percentile. This relationship appears to be less supportive of the original premise. However, 67 percent of these students scored above the mean of 68.63 on the PMMA.

The mean of the IQ scores in Burlington third grade was 101 which was close to the expected mean of 100. The mean of the tonal subtest (35.39) was close to the expected mean as stated by Gordon (34.6). However, the mean on the rhythm subtest was 33.30 compared to the expected mean of 29.4 as stated in the manual. The students in the present test were 3.9 points or 13% above the expected mean on the rhythm subtest.

When the IQ scores below the "normal" range of 90-110 were examined, it was found that students in the 80-89 IQ group had average scores on the PMMA close to the average scores found for the third graders. The sixty-one students with IQ scores between 80-89 had a mean score on the PMMA of 65. This score was below the third grade group mean of 68.63 but above the expected mean of 64. When scores of the students with IQ of 70-79 were examined, it was found that the mean PMMA score was 63 which is more than five points below the test group mean, but only one point below the expected mean of the PMMA.

The stepwise regression was applied to the data to determine variance in musical aptitude that could be attributed to IQ score. The variance found was r square equals .14. When the additional variables of sex and school attended were added to the equation, the variance did not change significantly. Since IQ score, sex, and school attended account for only a small part of the variance there appeared to be other factors which affected the scores on the musical aptitude test.

The correlation coefficient of +.37 indicated that a weak, positive linear relationship exists between musical aptitude test scores and intelligence test scores of third grade students. Analyses of similarities and differences

in scores of "below average" and "above average" students (as measured by IQ scores) indicated that teaching strategies may be influenced by these differences. The implications drawn from the analyses of data may affect music educators, administrators and future researchers.

Implications for Music Educators

Music educators, who are aware of the wide range of musical aptitude that may be found in a single grade level, could establish opportunities to stimulate interest, to provide a variety of musical experiences, and to give each student a chance to explore musical activities. Music educators as well as administrators may recognize the necessity for using specialized tests, such as the PMMA, to identify students with musical ability, and to plan for classes, personnel time, and equipment. School personnel may benefit from the estimate that between one fourth and one third of children at a given age could be expected to benefit from special musical activities such as chorus, recorder classes, or advanced rhythmic activities. Music educators and administrators, as well as parents, should recognize that children with "below average" IQ scores may have "above average" musical ability.

The analysis of data has resulted in finding that there is a positive correlation, though weak (+.37), between IQ test scores and musical aptitude test scores for third grade children. Since most schools routinely administer IQ tests and have these scores available for teacher use, the music educator, by examining these scores, could be aided in the selection of specific students for advanced or special music groups or activities. However, the limits of the tests and the limits of correlation should be considered. The importance of using other evaluative criteria in conjunction with IQ scores should be remembered.

The data from this study, when combined with data from Gordon (1979) and Bentley (1966) indicated that the low, positive correlation of musical aptitude and intelligence test scores was evident in different types of schools. Similar correlations were found in private as well as public schools. Music educators, who may change their employment from public to private school could use this information in planning activities and in designing musical objectives in a new teaching situation.

Since there were no perfect scores on the rhythm subtest of the PMMA, while there were 40 perfect scores on the tonal subtest, this fact may indicate that careful attention to rhythmic activities is important in the primary grades in order to develop consistent rhythm and tonal perception. Gordon (1979) pointed out that tonal memory appeared stronger in the early grades than did rhythmic pattern memory. The implication drawn from this finding could influence music educators to include additional rhythmic activities in their plans.

A factor considered in this study was "school attended." The data indicated that "school attended" did not contribute appreciably to the variance found in musical aptitude. Since the six schools studied had different music educators, this fact may indicate that the method and strategies of teaching do not affect the musical aptitude. This finding parallels the conclusion of Hedden (1982).

The wide range of musical aptitude scores found in a single grade in the present study might encourage the music educator to seek funds for testing musical aptitude in the lower grades. It would be very helpful to the music educator to know the range of interests and abilities in a grade level. With this information the educator could provide lesson plans that would interest all students in some way.

Since specialized tests such as the PMMA are not routinely administered, the findings in the present study could help the music educator convince administrators that money spent for identification of students with musical ability could benefit the students and the school. Students so identified could be given opportunities for special musical activities, and the school could benefit from the performance of talented students.

The finding of a wide range of musical aptitude should alert the music educator to use a wide variety of music and activities so that all students could find some areas in which they perform well. Many grade levels of music may be needed in a single school-designated grade level. For example, the educator may use a range of music suitable for grades one through four with third grade students. The music educator will need to plan carefully to make the best use of each student's ability.

There were sixty-one students with IQ scores between 80-89. The mean total score for this group on the PMMA was 66 which is close to the mean score (68.63) for the third grade. The expected mean for the PMMA was 64 which was below the mean score achieved by this group. This finding may indicate that many of the students in this IQ range could be expected to accomplish "average" work in music classes. While these students scored "below average" on the intelligence test, many of them had sufficient total scores on the PMMA to be included in the average group of music classes. It should be stated that the students with IQ scores of 80-89 had a mean total score on the PMMA of 66 while those students with IQ scores above 127 had a mean total score on the PMMA of 67. The mean total score of both of the IQ groups was above the expected mean of the PMMA.

These findings indicate that IQ scores alone do not appear to be reliable indicators of the individual student's ability in musical activities.

Of the sixty-one students with IQ scores of 80-89 there were ten, or 16%, who scored at or above the 80th percentile on the PMMA. This indicates that these ten students with "below average" IQ scores could benefit from special and "advanced" music classes. If students were judged by IQ scores rather than the score on the specialized music aptitude tests, these students would not be included in special groups which would mean both the school and the student would be penalized. The school would not have access to the student's ability, and the student would not have the opportunity for growth and development of musical ability.

Gordon (1979) suggested that students in a classroom may be grouped in high, medium, and low groups depending on their total score. He suggested that students in the 75th percentile and above should be seated in the middle of the class with the average students (25th to 74th percentile) seated on one side and the below average (below 25th percentile) seated on the other side of the high-scoring students. If the students in this study with IQ scores from 80-89 were grouped according to PMMA scores, as suggested by Gordon, they would form a typical expected group with the following breakdown by number and percentage.

1. 36 students (25th to 74th percentile) equals 59%.
2. 19 students (above 75th percentile) equals 31%.
3. 6 students (below 25th percentile) equals 9.8%

The expected breakdown was 50% to 65% in average group and 6% to 30% in each of the other groups. These scores support findings by Ellis (1982) in which he concluded that the educable students could function acceptably in classes with "average" students.

Implications for Administrators

Many teachers and administrators feel pressured to offer opportunities for development of the potential of the individual student. Results of this study, using PMMA, indicate that some students have musical ability when their intellectual level or IQ score is "below normal." If these students could be identified, they could be offered opportunities for development of this potential.

There were some students with IQ below the normal range that scored above the 80th percentile on the PMMA. It could be important to identify these students so that their abilities could be encouraged. These students would be eligible for advanced music activities. The administrator that is aware of this possibility might be willing to make funds available for specialized testing in musical aptitude. The present study indicated that students with musical aptitude should be identified by using specialized tests such as the PMMA.

Based on the results of this study, administrators may be aided in planning space and equipment requirements. The calculation that between 25% and 30% of the students could be expected to be eligible for special or advanced music classes may help determine space, equipment, and personnel needs. Since scheduling of space and personnel time is a big factor in efficient management, administrators may use the results of the present study as an aid in scheduling these resources.

Implications for Future Research

According to Sternberg (1984), IQ tests have changed little since they were first developed. One of the limitations of testing involves the instruments available for evaluating IQ. It appears that further research into the IQ

measurement might answer some questions concerning factors which may influence scores on these tests.

There is evidence that factors other than measured IQ influence musical aptitude test scores. Some of these factors may include previous musical training, age of the students, socioeconomic status, interest in and motivation for music study, and age at which musical experiences began.

The question of the relationship of musical aptitude and musical achievement remains to be answered. Research using longitudinal studies would appear to be necessary to verify the results of musical aptitude tests as related to musical achievement. Other factors such as early musical training and length of study could contribute to results in longitudinal studies.

Conclusions

Based on the correlation coefficient of +.37, the null hypothesis was rejected. This study found a linear relationship between IQ scores and musical aptitude scores as measured. This linear relationship appears more evident at the lower range of IQ scores (below 70 and from 70-79) than at the higher range of IQ scores (above 127). Tables 6 and 10 in Chapter IV present a breakdown of these scores. Subjects with IQ scores in the range of 80-89, which is below "average", appear to score better on musical aptitude than might be expected based on the total group mean and the expected mean of the PMMA.

The results of the study suggest the following eight conclusions:

1. Identification of students with musical aptitude could help music educators emphasize strengths and eliminate weaknesses in instructional methodology.

2. By recognizing the linear relationship of musical aptitude and IQ scores, the music educator may use this information as one factor in selecting students expected to contribute to musical activities.
3. While a positive linear relationship between IQ and musical aptitude was found to exist, IQ scores alone do not appear to be reliable indicators of the individual student's ability for musical activities. Some students with relatively low IQ scores achieved a musical aptitude score in the 80th percentile.
4. By recognizing the wide range of musical aptitude that may be found in one grade level, the music educator may plan for various activities which would be beneficial to students.
5. New situations of employment may be smoothly facilitated by the music educator who understands the relationship of IQ, musical aptitude, and other factors affecting the development of teaching goals and objectives.
6. Testing for musical aptitude is important in order to identify all students who could be expected to benefit from special or advanced programs.
7. Administrators could make use of current research to provide better use of student abilities, personnel time, space, and funds.
8. Additional research in the areas of musical aptitude and its relation to age, environment, socioeconomic status, motivation, and early musical experiences could provide a better understanding of children and their abilities.

This study provided data that may be of benefit to music educators, administrators, parents, and students. Music educators, through an awareness of the wide range of musical aptitude found in a single grade level, may better plan objectives, strategies, and activities. Administrators, through recognition of the importance of testing for musical aptitude in all children, may make funds available for these special tests which could benefit both school and students. Parents and students gain when the student who has a "below average" IQ score is found to have an "above average" musical aptitude score. These students, given the opportunity to develop musically, may gain valuable self-esteem and self-confidence.

BIBLIOGRAPHY

BIBLIOGRAPHY

Abraham, W., Berkovitz, I. G., Howard, M. R., Jenkins, R.C., Robinson, H. B. (1977). Gifts, talents and the very young. Ventura, CA: Ventura County Superintendent of Schools Office.

Atterbury, B. W. (1983). A comparison of rhythm pattern perception and performance in normal and learning-disabled readers, age seven and eight. Journal of Research in Music Education, 31 (4), 259-270.

Bentley, A. C. (1966). Musical ability in children and its measurement. New York: October House.

Blocking, J. (1973). How musical is man? Seattle: University of Washington Press.

Brand, M. (1982). Relationship between musical environment and musical aptitude. (ERIC Document Reproduction Service No. ED 220 361)

Burlington City Schools (1983). Inside Burlington city schools. Burlington, NC.

Buros, O. K. (Ed.). (1972). Seventh mental measurements yearbook. Highland Park, NJ.: Gryphon Press.

Buros, O. K. (Ed.). (1978). Eighth mental measurements yearbook. Highland Park, NJ: Gryphon Press.

Christy, L. J. (1956). A study of the relationship between musicality, intelligence and achievement. Dissertation Abstracts, 17, 373A.

Clark, B. (1979). Growing up gifted. Columbus, OH: Charles C. Merrill.

Cognitive Abilities Test (1968). Thorndike, R. L., Hagen, E., Lorge, I. New York: Houghton Mifflin.

Colwell, R. (1977). The evaluation of music teaching and learning. Englewood Cliffs, NJ: Prentice-Hall.

Copp E. F. (1916). Musical ability. Journal of Heredity, 7, 297-304.

Critchley, M. & Henson, R. A. (Eds.). (1977). Music and the brain. Southampton, England: The Camelot Press.

Dorhout, A. (1982). Identifying musically gifted children. Journal for the Education of The Gifted, 5 (1), 56-66.

DuBois, P. H. (1970). A history of psychological testing. Boston: Allyn & Bacon.

Edwards, A. J. (1971). Individual mental testing: Part I. History and theories. Scranton, PA: International Textbook.

Ellis, D. L. (1982). Differences in music achievement among gifted and talented, average, and educable mentally handicapped fifth- and sixth-grade students. (Doctoral dissertation, University of North Carolina at Greensboro). Dissertation Abstracts International, 43.

Ely, J. M. (1977). Teaching gifted children music in grades one through six. Sacramento: California State Department of Education.

Eysenck H. J. & Kamin, L. (1981). The intelligence controversy. New York: John Wiley and Sons.

Farnsworth, P. R. (1958). The social psychology of music. New York: The Dryden Press.

Farnsworth, P. R. (1928). The effects of nature and nurture on musicality. National Society for the Study of Education (Pt. 2).

Farnsworth, P. R. (1938). Ratings in music, art, and abnormality in the first four grades. Journal of Psychology, 6, 89-94.

Flohr, J. W. (1981). Short-term music instruction and young children's developmental music aptitude. Journal of Research in Music Education, 29 (3), 219-223.

French, J. L. (1977). Intelligence: Its measurement and its relevance for education. Presidential address presented to Division 16 at meeting of the American Psychological Association, San Francisco.

Gallagher, J. J. (1964). Teaching the gifted child. Boston: Allyn & Bacon.

Getzels, J. W. & Jackson, P. W. (1962). Creativity and intelligence. New York: John Wiley and Sons.

Giles, D. (1972). The exploration of perceptual and cognitive processes involved in piano study with implications for disabled children. (ERIC Document Resume ED 119 435)

Glass, G. V. & Stanley, J. C. (1970). Statistical methods in education and psychology. Englewood Cliffs, NJ: Prentice-Hall.

Gordon, E. E. (1961). A study to determine the effects of training and practice on Drake Musical Aptitude Test scores. Journal of Research in Music Education, 9 (1), 63-72.

Gordon, E. E. (1968). A study of the efficacy of general intelligence and musical aptitude tests in predicting achievement in music. Bulletin of Council of Research in Music Education, 13, 40-45.

Gordon, E. E. (1971). The psychology of music teaching. Englewood Cliffs, NJ: Prentice-Hall.

Gordon, E. E. (1979). Primary measures of music audiation manual. Chicago: G.I.A. Publications.

Gordon, E. E. (1980). The assessment of music aptitudes of very young children. Gifted Child Quarterly, 24 930, 107-111.

Gordon, E. E. & Thomas, A. (1967). Children's behavioral style and the teacher's appraisal of their intelligence. Journal of School Psychology, 5 (4), 292-300.

Hickok, D. & Smith, J. A. (1974). Creative teaching of music in the elementary school. Boston: Allyn and Bacon.

Hedden, S. K. (1982). Prediction of musical achievement in the elementary school. Journal of Research in Music Education, 30 (1), 61-68.

Hollingworth, L. (1926). Musical sensitivity of children who test above 135 IQ (Stanford-Binet). Journal of Educational Psychology, 28, 95-109.

Holman, F.L. (1958). An analysis of research pertaining to the intellectual abilities of lower socioeconomic status children and implications for teaching and learning processes involved in the development of musicality. Dissertation Abstracts International, 34, 3450A. (University Microfilms No. 73-30185)

Hopkins, N. C. (1978). Cognitive abilities test. In Seventh mental measurements yearbook. O. K. Buros (Ed.), Highland Park, NJ: Gryphon Press.

Kellman, R. (1981). Point of view. Music Educator's Journal, 67 (5), 54-67.

Khatena, J. (1982). Educational psychology of the gifted. New York: John Wiley and Sons.

Khatena, J. (1978). The creatively gifted child. New York: Vantage Press.

Kimura, D. (1973). The asymmetry of the human brain. Scientific American, 228 (3), 70-78.

Larson, R. C. (1955). Finding and guiding musical talent. Music Educator's Journal, 42 (1), 22-25.

Lehman, P. R. (1968). Tests and measurements in music. Englewood Cliffs, NJ: Ronald Press.

Leonhard, C. & House, R. W. (1972). Foundations and principles of music education. New York: McGraw-Hill.

Lundin, R. W. (1953). An objective psychology of music. New York: Ronald Press.

Madsen, C. & Madsen, C. H. (1973). Experimental research in music. Englewood Cliffs, NJ: Prentice-Hall.

Martinson, R. A. (1968). Curriculum enrichment for the gifted in the primary grades. Englewood Cliffs, NJ: Prentice-Hall.

Matter, D. E. (1982). Musical development in young children. Childhood Education, 58 (5), 305-307.

May, W. V. (1982). Early identification of the musically gifted. Update - The Application of Research in Music Education, 1 (2), 20-22.

Mehrens, W. A. (1978). Measurement and evaluation in education and psychology. New York: I. Lehmann.

Mendenhall, W., McClave, J. T. & Ramey, M. (1977). Statistics for psychology. North Scituate, MA: Duxbury Press.

McGinnis, E. (1932). Seashore's measures of musical ability applied to children of the pre-school age. The American Journal of Psychology, 40, 116-126.

McLeish, J. L., & Higgs, G. (1982). Rhythmic abilities in young children. British Journal of Educational Psychology, 52 Pt. 3, 370-373.

Michel, P. (1973). International research in music education. (The third international seminar on research in music education) Kassel, West Germany: Barenreiter-Verla.

Moore, R. (1966). The relationship of intelligence to creativity. Journal of Research in Music Education, 14 (4), 243-254.

Mursell, J. L. (1937). The Psychology of music. New York: W. W. Norton.

Norton, D. (1980). Interrelationships among music aptitude, IQ, and auditory conservation. Journal of Research in Music Education, 28 (4), 207-217.

Ogilvie, E. (1973). Gifted children in primary schools. London: Macmillan Education.

Orff, C. (1980). (Schulwerk) Music for children (American Edition). New York: Schott Music.

Phillips, D. (1976). An investigation of the relationship between musicality and intelligence. Psychology of Music, 4 (2), 16-31.

Piaget, J. (1952). The origins of intelligence in children (M. Cook, Trans.). New York: International Universities Press.

Pond, D. (1980). The young child's playful world of sound. Music Educator's Journal, 66 (7), 39-41.

Portnoy, J. (1963). Music in the life of man. New York: Holt, Rinehart & Winston.

Pressey, S. L. (1955). Concerning the nature and nurture of genius. Science, 68, 123-129.

Radocy, R. E. & Boyle, J. D. (1979). Psychological foundations of musical behavior. Springfield, IL: Charles C. Thomas.

Rainbow, E. L. (1965). Pilot study to investigate the constructs of musical aptitude. Journal of Research in Music Education, 13 (1), 3-14.

Revesz, G. (1954). Introduction to the psychology of music (G. I. C. DeCourcy, Trans.). Norman: University of Oklahoma Press.

Robinson, R.L. (1983). The relationship between musical ability and intelligence. Update - The Applications of Research in Music Education, I (4), 19-21.

Roedell, W. C., Jackson, N. E., & Robinson, H. B. (1980). Gifted young children. New York: Teachers' College Press.

Rubenzer, J. (1979). Identification and evaluation procedures for gifted and talented programs. Gifted Child Quarterly, 23 (2), 304-316.

Sage, W. (1976). The split brain lab. Human Behavior, 6, 25-28.

Schleuter, S. I. & DeYarman, R. (1977). Musical aptitude stability among primary school children. Bulletin of the Council for Research in Music Education, 51, 14-22.

Schmidt, L. (1981). Gifted programs in music: A nuclear model. Roeper Review, 3 (3), 31-34.

Schoen, M. (1940). The psychology of music. New York: Roland Press.

Seashore, C. E. (1919). The psychology of musical talent. New York: Silver Burdett.

Seashore, C. E. (1938). The psychology of music. New York: McGraw-Hill.

Seashore, C. E. (1941). Why we love music. Philadelphia: Oliver Ditson.

Sellin, D. F. & Birch, J. W. (1981). Psychoeducational development of gifted and talented learners. Rockville, MD: Aspen Systems Corporation.

Sergeant, D. & Thatcher, G. (1974). General intelligence, social status and musical abilities. Psychology of Music, 2 (2), 32-57.

Shavelson, R. J. (1981). Statistical reasoning for the behavioral sciences. Boston: Allyn & Bacon.

Sheets, L. M. (1979). Identifying musically gifted students. School Musician, 50 (5), 40-41, 47.

Shuter, R. (1968). The psychology of musical ability. London: Methuen & Co.

Statistical Package for the Social Sciences X (1983). User's guide. New York: McGraw-Hill.

Sternberg, R.J. (1984). How can we teach intelligence? Educational Leadership, 42 (1), 38-48.

Talarunis, A. M. (1981). Exceptional programs for talented students. Music Educator's Journal, 68 (3), 55-60.

Thackray, R. (1972). Rhythmic abilities in children. London: Novello & Co.

Torrance, E. P. (1965). Gifted children in the classroom. New York: Macmillan.

Tuttle, F. B. & Becker, L. A. (1980). Characteristics and identification of gifted and talented students. Washington, DC: National Education Association.

United States Census (1980). General social and economic characteristics of North Carolina (C3-223/7:980/c 35). Burlington, NC (C3-223/11:980/107).

Wechsler, D. (1969). The range of human capacities. New York: Hafner.

Wehner, W. (in press). Primary measures of music audiation. In Wm. Michell (Ed.), Ninth mental measurement yearbook. (Buros Institute of Mental Measurement). Lincoln: University of Nebraska.

Whybrew, W. E. (1962). Measurement and evaluation in music. Dubuque, IA: Wm. C. Brown.

Wing, H. (1971). Tests of musical ability and appreciation. Cambridge: University Press.

Wittrock, M. C. (1977). The human brain. Englewood Cliffs, NJ: Prentice-Hall.

Zimmerman, M. (1971). Musical characteristics of children. Washington, DC: Music Educator's National Conference.

APPENDIX A
TEST ANSWER SHEETS

APPENDIX B
TOTAL SAMPLE

TONAL [illegible] TONAL SCORE

VALUE LABEL	VALUE	FREQUENCY	%	VALID PERCENT	CUM PERCENT
	20	4	1.0	1.0	1.0
	23	4	1.0	1.0	1.9
	24	1	.2	.2	2.2
	25	5	1.2	1.2	3.4
	26	1	.2	.2	3.6
	27	4	1.0	1.0	4.6
	28	6	1.4	1.4	6.0
	29	7	1.7	1.7	7.7
	30	8	1.9	1.9	9.6
	31	10	2.4	2.4	12.0
	32	20	4.8	4.8	16.9
	33	26	6.3	6.3	23.1
	34	33	8.0	8.0	31.1
	35	39	9.4	9.4	40.5
	36	53	12.8	12.8	53.3
	37	66	15.9	15.9	69.2
	38	45	10.8	10.8	80.0
	39	53	12.8	12.8	92.8
	40	30	7.2	7.2	100.0
	TOTAL	415	100.0	100.0	

VALID CASES 415 MISSING CASES 0

RHYTHM RHYTHM SCORE

VALUE LABEL	VALUE	FREQUENCY	%	VALID PERCENT	CUM PERCENT
	12	1	.2	.2	.2
	16	1	.2	.2	.5
	17	1	.2	.2	.7
	21	1	.2	.2	1.0
	23	1	.2	.2	1.2
	24	2	.5	.5	1.7
	25	6	1.4	1.4	3.1
	26	7	1.7	1.7	4.8
	27	4	1.0	1.0	5.8
	28	10	2.4	2.4	8.2
	29	12	2.9	2.9	11.1
	30	19	4.6	4.6	15.7
	31	23	5.5	5.5	21.2
	32	33	8.0	8.0	29.2
	33	49	11.8	11.8	41.0
	34	65	15.7	15.7	56.6
	35	78	18.8	18.8	75.4
	36	62	14.9	14.9	90.4
	37	34	8.2	8.2	98.6
	38	5	1.2	1.2	99.8
	39	1	.2	.2	100.0
	TOTAL	415	100.0	100.0	

VALID CASES 415 MISSING CASES 0

TOTAL TOTAL SCORE

VALUE LABEL

VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
32	1	.2	.2	.2
36	1	.2	.2	.5
40	1	.2	.2	.7
45	1	.2	.2	1.0
46	1	.2	.2	1.2
47	1	.2	.2	1.4
48	1	.2	.2	1.7
49	1	.2	.2	1.9
51	1	.2	.2	2.2
52	2	.5	.5	2.7
53	1	.2	.2	2.9
54	3	.7	.7	3.6
55	3	.7	.7	4.3
56	4	1.0	1.0	5.3
57	2	.5	.5	5.8
58	6	1.4	1.4	7.2
59	2	.5	.5	7.7
60	3	.7	.7	8.4
61	9	2.2	2.2	10.6
62	10	2.4	2.4	13.0
63	16	3.9	3.9	16.9
64	10	2.4	2.4	19.3
65	18	4.3	4.3	23.6
66	13	3.1	3.1	26.7
67	20	4.8	4.8	31.6
68	29	7.0	7.0	38.6
69	21	5.1	5.1	43.6
70	37	8.9	8.9	52.5
71	37	8.9	8.9	61.4
72	42	10.1	10.1	71.6
73	40	9.6	9.6	81.2
74	26	6.3	6.3	87.5
75	28	6.7	6.7	94.2
76	18	4.3	4.3	98.6
77	6	1.4	1.4	100.0
TOTAL	415	100.0	100.0	

22-MAR-84 SPSS-X RELEASE 2.0A FOR VAX/VMS

13:17:02 UNC-G ACADEMIC COMPUTER CENTER VAX-11/780 VMS 3.4

TOTAL TOTAL SCORE

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	32	1	.2	.2	.2
	36	1	.2	.2	.5
	40	1	.2	.2	.7
	45	1	.2	.2	1.0
	46	1	.2	.2	1.2
	47	1	.2	.2	1.4
	48	1	.2	.2	1.7
	49	1	.2	.2	1.9
	51	1	.2	.2	2.2
	52	2	.5	.5	2.7
	53	1	.2	.2	2.9
	54	3	.7	.7	3.6
	55	3	.7	.7	4.3
	56	4	1.0	1.0	5.3
	57	2	.5	.5	5.8
	58	6	1.4	1.4	7.2
	59	2	.5	.5	7.7
	60	3	.7	.7	8.4
	61	9	2.2	2.2	10.6
	62	10	2.4	2.4	13.0
	63	16	3.9	3.9	16.9
	64	10	2.4	2.4	19.3
	65	18	4.3	4.3	23.6
	66	13	3.1	3.1	26.7
	67	20	4.8	4.8	31.6
	68	29	7.0	7.0	38.6
	69	21	5.1	5.1	43.6
	70	37	8.9	8.9	52.5
	71	37	8.9	8.9	61.4
	72	42	10.1	10.1	71.6
	73	40	9.6	9.6	81.2
	74	26	6.3	6.3	87.5
	75	28	6.7	6.7	94.2
	76	18	4.3	4.3	98.6
	77	6	1.4	1.4	100.0
	TOTAL	415	100.0	100.0	

APPENDIX C
HISTOGRAMS

```
   COUNT    MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY  4.00 OCCURRENCES

       0       29.5
       1       32.0
       0       34.5
       1       37.0
       1       39.5
       0       42.0
       1       44.5
       3       47.0   *
       1       49.5


       4       52.0   *
       6       54.5   **
      12       57.0   ***
       5       59.5   *
      35       62.0   *********
      28       64.5   *******
      62       67.0   ****************
      58       69.5   **************
     119       72.0   ********************************
      54       74.5   **************
      24       77.0   ******
       0       79.5
                      I....+....I....+....I....+....I....+....I....+....I
                      0         40         80         120        160        200
                                HISTOGRAM FREQUENCY

VALID CASES      415       MISSING CASES      0
```

IQ IQ SCORE

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	86	20.7	20.7	20.7
	2	224	54.0	54.0	74.7
	3	86	20.7	20.7	95.4
	4	19	4.6	4.6	100.0
	TOTAL	415	100.0	100.0	

COUNT	VALUE	ONE SYMBOL EQUALS APPROXIMATELY 8.00 OCCURRENCES
86	1.00	**********
224	2.00	**************************
86	3.00	**********
19	4.00	**

I.....I.....I.....I.....I.....I
0 80 160 240 320 400

HISTOGRAM FREQUENCY

VALID CASES 415 MISSING CASES 0

APPENDIX D

ANALYSIS OF PRIMARY MEASURES OF MUSIC AUDIATION

PEARSON CORRELATION COEFFICIENTS

Category	Coefficient	Cases	Significance
Tonal	.3740	415	$p < .01$
Rhythm	.2786	415	$p < .01$
Total	.3717	415	$p < .01$

MULTIPLE REGRESSION

Variables: Sex
School

Dependent Variable: Total Score

Stepwise Regression:

R Square	.13731
Standard Error	5.87229

Analysis of Variance:

F 21.062
Significant F 0.0

	df	Sum of Squares	Mean Square
Regression	3	2178.94	726.31
Residual	397	13690.08	34.48

Variables in the Equation:

Variable	B	SE B	Beta	T	Sig T
IQ	.151	.020	.352	7.454	.0010
Sex	-.407	.590	-.032	-0.690	.4908
School	-.248	.175	-.066	-1.414	.1581
(Constant)	54.609	2.288		23.869	.0010