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GRADUATE COLLEGE

AN INVESTIGATION OF THE VOCAL SIGHT-READING ABILITY OF COLLEGE FRESHMEN MUSIC MAJORS

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

DOCTOR OF MUSIC EDUCATION

BY

REUBEN E. RODEHEAVER

Norman, Oklahoma

1972

AN INVESTIGATION OF THE VOCAL SIGHT-READING ABILITY OF COLLEGE FRESHMEN MUSIC MAJORS

APPROVED BY

DISSERTATION COMMITTEE

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AN INVESTIGATION OF THE VOCAL SIGHT-READING ABILITY OF COLLEGE FRESHMEN MUSIC MAJORS

CHAPTER I

INTRODUCTION AND OVERVIEW OF THE STUDY

Since the eleventh century, when Guido d'Arezzo devised the first system of solmization, man has had an increasing interest in methods of reading music and the factors that contribute to music reading and its relation to music performance.

> "Music is both an art and a discipline. It is an art of tone which inspires men....It is a discipline which demands rigorous learning and practice from anyone who would understand it and perform it. There is both the art and the craft. To reach a depth of enjoyment in this great art, one is greatly aided by being able to read it and interpret its written symbols."[1]

The major problems of researchers dealing with music reading are two: (1) What part does heredity play in music reading ability? and (2) What environmental influences and training improve music reading? A few decades ago psychologists Schoen and Seashore, as hereditarians, held strongly to their conclusions that musical ability (talent) is inborn.

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[1]Alice M. Snyder, "Guidelines for a Music Reading Program," Music Educators Journal, February-March 1963, p. 65.

According to Schoen:

> "Musical talent is first an inborn capacity. Artistic musical performance rests ultimately on innate, inborn equipment. It is not something that is acquired in one's lifetime, but the person is born with or without it. All that training can do is develop that which already exists potentially. We therefore speak of musical capacity and not of music ability."[2]

Similarly, Seashore writes:

> "Family pride, musical and social history, investments in musical education, the making or breaking of a career, hinge upon an adequate evaluation of talent; and talent, by definition is an inherited trait."[3]

Other writers, Lundin,[4] Mursell[5] and Farnsworth,[6] have placed a more balanced emphasis on the importance of both heredity and environment. Farnsworth writes:

> "It is now clear that neither nature nor nurture can alone make a musician. Both must be present before musical and other abilities can emerge. The person who has excellent tonal and rhythmic sensitivities but who is in un-musical surroundings will not be as likely to achieve in music as will another with similar sensitivities who finds himself in a more propitious environment."[7]

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[2]M. Schoen, The Psychology of Music (New York: Ronald Press, 1940), p. 161.

[3]Carl Seashore, Psychology of Music (New York: McGraw-Hill, 1938), p. 330.

[4]R. W. Lundin, An Objective Psychology of Music (New York: Ronald Press, 1953), pp. 5-7.

[5]James Mursell, The Psychology of School Music Teaching (New York: Silver Burdett Co., 1938), pp. 140-142.

[6]Paul Farnsworth, The Social Psychology of Music (New York: Dryden Press, Inc. 1958), p. 184.

[7]Ibid.

This study was basically concerned with the environmental factors and their relationship to that aspect of musicality known as music reading. Music reading is defined as the "process of recognition of familiar symbols and combinations of these symbols in familiar or new surroundings and the reproduction of the sounds and concepts which these symbols represent.[8] "The skills that go into music reading are not far removed from those of other kinds of reading. What you see on the printed page is merely a proxy for the real music. The proof of real music is in the hearing."[9] "Music reading, then, is music understanding. It is much more than the ability to read notes, rests and music terms. It is the ability to interpret the printed page, to capture the spirit of the music by sight, and to discover, through symbols, the message and beauty of music."[10] Specifically, this study considered that primary aspect of music reading, known as sight-reading.

Sight-reading is defined as the ability to reproduce, vocally or instrumentally, those sounds designated by the written symbols, at first sight. Sight-reading is an integral part of a musician's equipment. The accurate reproduction of music requires the development of technical proficiency. In

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[8]Warren Joseph, "Music Reading: When and How," Music Educators Journal, April-May 1965, p. 66.

[9]Rudolph Weyland, Learning to Read Music, (Dubuque, Iowa: W. C. Brown Company, 1961), p. 2.

[10]Snyder, op. cit., p. 66.

performance, flexibility, physical dexterity and other skills are essential; and the musician spends countless hours in practice to develop these techniques. However, musicianship requires not only technical skill but fluency in sight-reading as well. What the musician sees printed on the page must be "heard" as "imaginary sounds" in his mind prior to reproduction. The gifted and well-trained musician can recreate the composer's intent quite faithfully when sight-reading.

The purpose of this dissertation was to determine to what extent certain musical factors are related to the ability to sight-read. Since students whose training is in part a product of formal music classes where sight-reading is done through the voice medium by all students, the study will show the relationship of these environmental experiences to vocal sight-reading ability.

It appears that the ability to hear music is somewhat like the ability to hear a language, in that both are products of training for understanding. Among the vast majority of student and amateur musicians, there is quite a difference between the printed music they see and the sounds they produce.

Many students who have had considerable exposure to music, both formally and informally, cannot demonstrate a comprehension of the most simple rhythms and tonal skips in a sight-reading exercise. This inability points up to a lack of understanding that limits both quantity and quality of musical output. Apparently learning processes involved are many times

of a rote nature which requires considerable learning time. The musician - vocalist or instrumentalist - must depend on the ability to read symbols, hear (understand), and reproduce the music in a single operation. Sight-reading ability becomes all-important to the musician.

Wherever and whenever music teachers, directors, supervisors and students meet, one topic that merits discussion is sight-reading. In a research project supported by the Cooperative Research Program of the Office of Education, United States Department of Health, Education and Welfare, Thostensen states "many schools of music are concerned about not only the quality of students with whom they are working, but also about the college level courses for the training of these musicians."[11]

Questions such as these go unanswered: Why do so many singers read so poorly? Is it true that "the very best way to learn to sight-read, in fact the only way, is to sight-read?"[12] Do instrumentalists sight-read better than vocalists? Does choral ensemble experience contribute more to sight-reading ability than instrumental ensemble experience? Do specific musical experiences provide the indirect avenue for

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[11]Marvin Thostensen, "The Study and Evaluation of Certain Problems in Ear Training Related to Achievement in Sight-Singing and Music Dictation," Bulletin of the Council for Research in Music Education, XI (1967), p. 14.

[12]M. Feldman, "The Art of Sight Reading," The Instrumentalist, March 1963, p. 60.

learning to sight-read, or should one's learning evolve from a specific method designed for this purpose?

In conversing with graduates as to what they would consider an improvement in undergraduate music curricula, this author has many times heard the requests: "supplement the courses in ear-training and sight-singing," and "I wish somehow the importance of learning to sight-read could be greatly emphasized."

Judging from the amount of research completed during the last two decades, it is apparent that reading music, with understanding resulting in the ability to reproduce at sight, is a very desirable and important skill for the musician. In his doctoral dissertation, Ottman concluded that sight-reading is more closely allied to the aural ability in intervals than on theoretical knowledge of intervals.[13]

It is not within the scope of this study to develop a sight-reading method, but rather to determine the association of certain experiences with vocal sight-reading ability. The study has sought to evaluate the sight-reading ability of freshmen music majors entering Oklahoma colleges and universities in the fall of 1966, and to investigate the relationships of environmental experiences to their sight-reading scores.

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[13]Robert Ottman, "A Statistical Investigation of the Influence of Selected Factors on the Skill of Sightsinging." (Ph. D. Dissertation, North Texas State University, 1956), p. 223.

The study sought to answer these questions: (1) Is there a greater relationship between some musical experiences and sight-reading ability than others? (2) If so, what experiences show the stronger relationships? (3) If so, what implications do these associations have for music educators and directors? (4) If so, what implications do these associations have for music students?

Source of Subjects

The study involved 260 students who were enrolled as freshmen music majors in the fall of 1966. All data were gathered between October 7 and 28 of that year. The students were from twelve different colleges and universities in the State of Oklahoma. The schools and number of students from each are listed below:

Bethany Nazarene College, Bethany	35
Central State College, Edmond	34
East Central State College, Ada	23
Langston University, Langston	8
Northeastern State College, Tahlequah	28
Oklahoma Christian College, Oklahoma City	10
Oklahoma City University, Oklahoma City	37
Oklahoma State University, Stillwater	11
Phillips University, Enid	12
Southeastern State College, Durant	13
Southwestern State College, Weatherford	10
University of Oklahoma, Norman	39

A letter defining the research project and its purpose was sent to each chairman of the music departments of the nineteen four-year colleges in Oklahoma. The letter requested permission to come to their schools to gather the necessary data from their freshmen music major classes. Within a reasonable period of time, twelve schools responded favorably; four schools indicated that it was impossible for them to arrange to give the necessary two-hour block of time for the project; and three schools did not respond. The schools participating in the research represent various kinds of institutions of higher education, including church-affiliated liberal arts institutions, state colleges and major universities.

The students completed a music data sheet which served to gather information concerning their musical backgrounds. All students were given a music achievement test to determine their level of sight-reading ability. After completing the above items, each student took his turn at the vocal sight-reading test to determine his current reading ability.

Development of the Music Data Sheet

To study the relationships between certain environmental influences and vocal sight-reading ability, answers to the following questions were obtained through an eighteen-item music data sheet (see Appendix A).

1. When did you begin to enjoy music?
2. What was the extent of your enjoyment during different periods of your life?

3. What music activities did you participate in during your lifetime?
4. How much music listening have you done during different periods of your life?
5. What kind and how much formal music training have you had in your lifetime?

Guidelines were designed and read by the administrator to help standardize the value judgements the students were required to make (see Appendix A). To facilitate administering and answering, all items were designed to require only a check from the respondent. All items were keyed and later transferred to punch cards for data processing.

Selection of Music Achievement Test

Although the major portion of the study is devoted to relating environmental experiences to sight-reading ability, it was considered worthwhile to investigate any relationship that may exist between a standardized measure of music achievement and sight-reading ability. To the author's knowledge no such study has been made with the Music Achievement Test, College Entrance Level, by James Aliferis.[14]

Scores on musical aptitude tests have been compared to sight-reading ability. In a study by Zimmerman[15] using the

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[14]James Aliferis, "Music Achievement Test," (University of Minnesota Press, 1954).

[15]Robert Zimmerman, "Relationship of Musical Environment to Choral Sight-Reading Ability," (Ed. D. Dissertation, University of Oregon, 1962), p. 29.

Drake Musical Aptitude Test, he concludes that "neither of the musical aptitude tests showed any strong relationship to choral sight-reading ability." This study sought to show the relationship between sight-reading ability and music achievement.

Aliferis defines his test as a measure of "the music student's power of auditory-visual discrimination."[16] The test is in three sections - melody, harmony and rhythm (see Appendix C). A test booklet was provided each student (Appendix C), while the administrator was furnished a test manual and tape recording of the test items played on the piano. The test was administered in forty minutes.

Aliferis conducted tests of validity for his measure, contending that scores should be related to freshmen grades and honor points. He found a correlation coefficient of .61 between the test total score and grades in music courses involving 177 students. By successive use of the test in various classes an estimate of reliability was sought. Aliferis published the following reliability coefficients for each section of the test and for the test as a whole.[17] These estimates are based on a random sample of 100 from the 1,768 students tested.

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[16]Aliferis, op. cit., p. 1.

[17]Ibid., p. 14.

Aliferis Test Sections	Reliability Estimates
Melodic	.84
Harmonic	.72
Rhythmic	.67
All Sections	.88

Additional Instruments for Gathering Data

Two items on the music data sheet required the student to give the name of his music theory instructor and his major instrument (voice) private lesson instructor, respectively. Subsequent to administering the tests and gathering data, the instructors were asked to evaluate each student's applied music and theory performance. A five-point scale was used for the evaluations.

Additional data used was the composite of the standard scores each student scored on the American College Testing Program battery of tests. These scores were available on nearly all college students in Oklahoma; they were compared to the scores on the sight-reading test.

Design of the Sight-Reading Test

A standardized test was not available, therefore the test used was designed by this writer (see Appendix C). The test consisted of two melodies, excerpted from the beginning pages of A New Approach to Sight-Singing by Berkowitz.[18] The first

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[18]Sol Berkowitz, G. Fontrier and Leo Kraft, A New Approach to Sight Singing, (New York: W. W. Norton and Company, 1960), p. 26 and p. 54.

melody paired compound meter with a major tonality; the second melody paired simple meter with a major tonality. Two elements of music, pitch and rhythm, were tested. No emphasis was given to tone quality or the use of text in administering and evaluating the test. The test was designed to measure the ability of the student to conceive and produce vocally the sounds of the printed music. To use a cliche, the student's ability to "hear with his eyes" was measured.

For this study, the test served to determine a point of reference to which varying environmental influences could be related. With this procedure it was possible to determine the degrees of strength or weakness of the relationship of specific music-oriented environmental influences to sight-reading ability.

General Procedures

The music data sheet and the music achievement test were designed to be given to groups. The sight-reading test had to be given individually; therefore, the group data instruments were administered first. The arrangements for a two-hour block of time was made with each music department. The first hour was used for administering the music data sheet and the music achievement test in formal classroom style. During the second hour the individual reading test was given in studios remote from the other class members who remained in the classroom.

The classroom conditions, including lighting, ventilation,

temperature, proper writing facilities, spacing of seats and reverberation were controlled as much as possible. The students were permitted a few minutes for relaxation between the completion of the data sheet and beginning the Aliferis Test.

Of the 306 students involved in some aspect of the study, only 260 completed all portions of the tests and data sheet. The additional data sought from school officials were requested for the 260 giving complete information.

All data received from all sources were transferred to punch cards and tabulated for computation and study. These data are recorded in textual, graphic and table forms in the succeeding chapters of this study.

CHAPTER II

DATA-GATHERING INSTRUMENTS AND PROCEDURES

To determine to what extent each student's background influenced his sight-reading ability, the writer obtained, as far as possible, complete information on the individual's musical experiences and achievements. Each student was tested to determine his present ability to read music at sight.

Several instruments were used in obtaining the necessary data: (1) a music data sheet which sought to obtain a detailed picture of each student's environmental-musical experiences; (2) an evaluation and rating of each student as to his performance ability by his private instructor; (3) an evaluation of each student's knowledge of music theory at the time of data-gathering, given by his theory instructor; (4) the standard composite score of the student's performance on the American College Testing Program (ACT); (5) a music achievement test to determine whether or not certain achievements in the identification of melodic, rhythmic, and harmonic elements of music contributed to sight-reading ability; and (6) a sight-reading test to determine the student's fluency in reading music at sight. Each student reproduced vocally his concept of the printed page.

Data Sheet

The music data sheet was designed and administered to collect detailed information regarding the musical experiences of the individual. In order to obtain as complete a list of data as possible, questions were asked in several areas, including (1) the amount and kinds of family musical experiences; (2) the amount and kinds of school musical experiences; (3) amount and kinds of non-family and non-school musical experiences; and (4) the amount and kinds of formal music training. The data sheet also asked the student to rate or identify the method of music reading he utilized. Furthermore, each individual was asked to rate the various experiences he thought contributed most to his ability to sight-read. From the beginning of the study it was assumed that the information gathered by the music data sheet, when compared to the scores students made on the sight-reading test, would give necessary information to test for the relationship between certain environmental musical experiences and sight-reading ability.

The music data sheet was designed with no open-ended questions. All questions relating to the environmental experiences were answered by checking a certain space subsequent to the question. The purpose of this design was to obtain the information speedily; most of the schools involved in the research project were limited in the amount of time they could allow for gathering the necessary data. The data

sheet could be easily completed in a twenty-minute period. The only writing required by the student was for identification purposes. He was asked to give his name, school, age, date and the names of his theory and applied music instructors.

Some of the questions on the music sheet required the student to recall both the experience and the amount of experience since childhood. Therefore, the data sheet was designed with multiple ratings to enable the student to quickly reach a decision and answer the question. The test administrator provided guidelines and statements which defined the quantities - "none," "little," "moderate," and "much" - thereby assisting the student in answering each question.

The procedure used was for the administrator to first discuss the purpose of the research project. After getting identification information, the administrator read the question, defined the categories for answering, and then permitted the student to answer the question. Subsequent questions were treated in the same manner. At the conclusion, time was allowed for the student to ask further questions for clarification purposes. The data sheet and guidelines used by the administrator appear in Appendix A. The information supplied by each student was keyed and transferred to punch cards for data processing. Throughout twelve higher education institutions in the State of Oklahoma the questionnaire was

administered to 306 freshmen music majors entering college in the fall of 1966.

Theory Evaluation

During the planning stage for this study, it seemed appropriate to look for as many relationships as possible between the varied background experiences and sight-reading ability. Subsequent to the visitations to the campuses to collect data and administer tests, a request was made to the music theory instructors, by letter, asking them to indicate the average grade of each student in music theory. As is indicated in the administrator's guidelines for the music data sheet in Appendix A, the music theory grade was requested of the harmony instructor, whether or not the written and aural aspects of theory were taught in separate courses. The purpose was to attempt to determine the relationship between a general knowledge of music theory and sight-reading ability. In all schools, classes had been in session for approximately one month. The grading was based on the traditional five-point system (A,B,C,D,F). The relationship between theory ratings and music reading may be conditioned by (1) the degree of musical aptitude of each student; (2) the amount of formal music training; and (3) any number or combination of background experiences. The form and letter of request for this information appear in Appendix B.

Performance Evaluation

The same procedure was used to obtain a performance rating on each student. From the information given on the data sheet, the writer had knowledge of the applied music instructor of each student. Each instructor was notified of the research project involving his students and was requested to supply an evaluation of each student's performance as a freshman music major. A five-point scale was used. It is not within the scope of this project to determine causes for the differences in performance ratings; therefore, any relationship between performance and sight-reading ability may be more directly related to amount and kind of private study, intelligence, or some other capacity of the student. The instruments for obtaining this information appear in Appendix B.

ACT Scores

Colleges and universities are making use of the testing services of the American College Testing Program, Incorporated. Most colleges recommend the student to take this battery of tests before enrollment. Because of the rather universal acceptance of ACT scores as a factor in college admission standards, many high schools encourage students planning for college to take the test, which is divided into four parts: English, mathematics, social studies and natural science.

The standard composite score for this test is available

through the registrar or director of testing on each campus. The director of testing was requested to supply ACT scores for the purpose of comparing them with the sight-reading scores. The instruments requesting this data appear in Appendix B.

Aliferis Music Achievement Test

Since the turn of the century, musicians and psychologists alike have debated the relationship of music aptitude to musicianship, of which sight-reading ability is considered a part. According to the study conducted by Zimmerman[19] no strong relationship exists between scores on the Drake Musical Aptitude Test[20] and sight-reading ability. In previous studies, very little consideration has been given to a comparison of music achievement and sight-reading ability.

The College Entrance Level of the Aliferis Music Achievement Test was used in this study. The test measures the "student's power of auditory-visual discrimination of melodic, harmonic and rhythmic elements and idioms."[21] Aliferis has developed a College Mid-Point and Graduate Level Test to measure the complete range of the college music student's achievement in auditory-visual discrimination.

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[19]Zimmerman, op. cit., p. 29.

[20]R. M. Drake, "Drake Musical Aptitude Tests," 1954.

[21]Aliferis, op. cit., p. 2.

After the college's music department chairman accepted the request to conduct the research project among his students, a block of time was scheduled sufficient to gather data and administer the tests. The Aliferis test is approximately forty minutes in length. It was given via tape recording, provided by the publisher. The test administrator was careful to have a good tape recorder with adequate sound reproduction for all groups.

Each student was supplied with a test booklet which included an information page and the test examples that would be heard by tape recording. The student was given a choice of answers for each element of the test. He answered by placing a corresponding letter, A, B, C or D, beside the numbered item. See Appendix C for the test items and the student booklet.

The Aliferis test is divided into three sections - melody, harmony and rhythm. The material in each section is presented in two ways: first as an element (out of context), then as an idiom (in context). All items are played on the piano. At the beginning of each section and its sub-divisions, three sample items and answers are given to properly orient the student.

In the melodic section, which is first, the melodic elements are two tones of an interval, played separately. The student looks at the four intervals in the student booklet and chooses the one he thinks was sounded. Each

interval is played only once. In the melodic idiom sub-division, a four-note melody is played. The first three tones are printed separately in the student booklet for his observation. He is to choose the fourth tone played from the four possible answers given, thereby identifying the last interval of the melody. Each item is played once only.

In the harmonic section, elements sub-division, a four-part chord is sounded. The student studies the four chords printed in his booklet for that item, and chooses the answer he thinks is the notation of the chord heard. The top part (soprano) of each item is the same in all four chords printed. Each chord is played twice. In the harmonic section, idioms sub-division, a progression of three chords is heard. These progressions of three chords each are printed for the student. The soprano and bass parts, as well as the first chord of each progression are the same. After hearing the progression twice, the student chooses an answer.

In the rhythmic section, elements sub-division, a rhythmic figure, one beat in length, is played three times, melodically. The student's booklet shows three possible answers. Preceding the playing of the element, the tempo and beat are counted aloud for two measures. After the element is played, the student selects an answer. In the rhythmic section, idioms sub-division, the same process is continued, but with a two-beat rhythmic figure. In both the element and idiom items, the

example is played only once.

The test was scored by use of a template, and raw scores for each of the three sections and for the entire test were transferred to the punch cards for data processing.

Sight-Reading Test

The purpose of this test was to determine the present sight-reading ability, vocally, of all students. In all aspects of administering this test, controls were designed to be sure that all students were reading the notation at first sight.

The test was designed by this author with both the major and minor tonalities and simple and compound meters represented. The author has designed many sight-reading tests to ascertain levels of improvement of students in aural theory classes. In order to eliminate the tendency to have melodies too advanced for entering freshmen music majors, the melodies were selected from a freshman level book, "A New Approach to Sight Singing"[22] by Berkowitz and others.

The first melody was taken from the very first section of melodies. Of the melodies in his first section, Berkowitz writes:

> The first melodies emphasize the basic aspects of tonality. They were designed to include easily recognizable scale and chordal patterns. These diatonic melodies are based upon both major and

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[22]Berkowitz, op. cit., pp. 26, 54

> minor modes. The phrases are usually symmetrical and short enough to be grasped at a glance."[23]

The first melody combines the major tonality with compound meter. The second melody is taken from a succeeding page and combines minor tonality with simple meter. The test and basic instructions appear in Appendix C.

From this author's experience, students often state that the reading exercise is out of their vocal range. The ranges for the melodies, as related to bass clef, were from second-space "C" to "D" above the staff, and from second-line "B" to "B" an octave higher, respectively. The selected melodies were presented in treble and bass clef notation with the student choosing his preference for reading.

The test was administered to the 260 students completing the other data materials. The testing procedure was begun by passing out an information sheet to the student group with these instructions.

> "The examination consists of <u>two</u> melodies. You may choose either the treble or bass clef version, (reverse side). After scanning Melody #1, state your name, sound the "key" (tonic) on the piano, and sing. Keep the rhythm and tempo and do not stop. Sing the melody once only. After you have finished Melody #1, proceed to Melody #2, following the same instructions."

Then, one by one, each student was permitted to go to a studio designated as the "sight-reading room" while the balance of the group remained in the classroom.[24] The sight-reading

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[23] <u>Ibid</u>., p. 19.

[24] In the larger groups two studios were set up for testing.

room was equipped with a treble and bass clef copy of the melodies and instructions placed on an adjustable music stand, a piano, and a tape recorder. All testing was taped to enable a more correct evaluation of the student's performance. The recorder was operating all the time, so the students were not obligated to use the controls. When finished singing, the student left the area.

The evaluation of the tapes was accomplished by assigning one point per pitch and one point per rhythmic value. In the evaluation, no matter what note was sounded as tonic, if the intervallic relationships of the melodic tones were correct, credit was given. Rhythmically, if the student stopped or hesitated, he lost credit only for the note or rest at the point of hesitation. The total points possible for the first melody was: pitch, 48; rhythm, 50.[25] The total points possible for the second melody was: pitch, 38; rhythm, 39.[26] The total points for the two melodies were also recorded, with 86 points possible for correct pitches and 89 points possible for correct rhythm.

In succeeding chapters, these raw scores, both part and total scores, are compared to the tabulations made on all other data to determine the degree of relationship they hold.

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[25]Difference accounts for rest values.

[26]Difference accounts for rest values.

Measures Used in Data Analysis

Several statistical procedures are employed to accomplish the purpose of this study - to explore the possible relationships between quantitative variables (environmental influences and sight-reading ability), resulting from the data-gathering process.

Coefficient of Correlation

The term correlation refers exclusively to relationships between variables that can be quantified. The correlation statistic was selected because it is applicable when there is a pair of measures for each individual or instance in a given group. If the relationship is such that large values of one variable tend to be associated with large values of the other, the correlation is positive; when large values of one variable tend to be associated with small values of the other, the correlation is negative. When data consist of pairs of measures, they are technically known as bivariate data.

"The most widely used and best measure of correlation is the product-moment coefficient, developed by Karl Pearson. This complex measure is derived from the sum of products of pairs of deviation scores."[27] The correlation coefficient (measure) is expressed as a single number. It is an index of both the amount and direction of a relationship. The

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[27]Merle W. Tate, Statistics in Education and Psychology (New York: The MacMillan Company, 1965), p. 129.

range of the coefficient can extend from a perfect positive correlation, represented by +1.00, to a perfect negative correlation, represented by -1.00. The larger the value of "r" (symbol for correlation), the stronger the relationship between two variables. Tabular values of correlation coefficients indicate levels of significance, dependent upon the number of the population. In this study, the .05 level of significance is used, which means that there are five chances out of one hundred that the mutual relationship of a pair of variables does not exist. A product-moment method program was selected for the IBM 7040 Computer, by which the data in this study were processed.

Chi Square Test and Contingency Tables

The chi square test is a widely used statistic, and one of its more important applications is in "testing hypotheses by comparing observed or experimental data to theoretical or expected frequencies based on a hypothesis."[28] The use of the chi square (x^2) test in a hypothesis test is applicable where the data can be represented in the form of a contingency table. When the observations of two variables are classified in a two-way table consisting of a cross-tabulation of classes of observations, with the frequency for each cross-classification shown, they are known as contingency data. Generally,

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[28]Herbert Arkin and Raymond R. Colton, Statistical Methods (New York: Barnes & Noble, Inc., 1970), p. 136.

in dealing with such data, we want to know whether or not the variables are related. The chi square test is used to test for the significance of relationships. In the table proper, the values of one variable are placed in columns (vertical) and the values of the other variable are placed in rows (horizontal).

In the comparison of each pair of variables, the first objective is to state the research hypothesis, which is always that the classification of the columns and rows are related. The first step in applying the x^2 test of significance of relationship is to determine the expected or theoretical frequencies. The null hypothesis is used, which assumes the independence or un-relatedness of the variables. If the null hypothesis is disproved, the research hypothesis is true. The theoretical frequencies are calculated for each cell of the table in proportion to the marginal totals of the rows and columns. The difference of the observed and expected frequencies is then squared and divided by the expected frequency. If the observed frequencies differ little from the expected, then the null hypothesis is likely to prove true - there is little or no relationship between variables. If there is a positive relationship, greater differences between observed and theoretical frequencies will appear in the cells representing the highest and lowest scores of both variables on the table; if a negative relationship, the greater differences in frequencies will appear in

the cells representing high scores on one variable and low scores on the other, and vice versa.

$$x^2 = \frac{(f_o - f)^2}{f}$$

is applied to each cell of the table and the values are totaled. After determining the proper number of degrees of freedom for the contingency table, a table of chi square values is consulted for the appropriate significance level. If the calculated value of chi square is greater than the tabular value, the null hypothesis is rejected, and the alternate hypothesis - the relationship of the paired variables - is true. The .05 level of significance, meaning that 95 chances out of 100 there is a relationship, was selected for this study.

All the measured environmental influences (variables) of the student population in this study were paired to the sight-reading test scores. All significant associations are reported in narrative and tabular form in subsequent chapters.

Additional Statistical Measures

Three other appropriate measures were used to further analyze the data - analysis of variance, the t test, and the z or critical ratio test.

The analysis of variance technique was used to test the statistical significance of the differences between the means of two or more samples. The method provides an indication as to whether or not the observed differences among the means of

the samples may be significant or simply ascribed to chance and other sampling fluctuations. To perform the test, two estimates of the population variance, obtained in different ways from the samples, are compared with each other. One estimate is known as the "between" variance and the other, based on the variation of the values within each sample is called "within" variance. If the variance estimated from the means of the groups is significantly greater than that estimated for the variations within the group, it may be said that the differences between the means must be greater than that ascribable to sampling fluctuations. The comparison is accomplished through the F test and presented in tabular form.

To further test for the significance of the difference between two sample means, the common t test was employed. If the obtained value of t exceeds the tabular value, the difference between means is significant. In some cases, where the samples were large, the critical ratio test (z) was used to test for a significant difference. In this study only those differences significant at the .05 level were reported.

CHAPTER III

INFORMAL INFLUENCES

"Informal" influences are defined as those musical influences which are not planned experiences -- incidental experiences that might affect both the musical and non-musical person alike. The investigation of the relationship of lessons and courses in music study and participation in music ensembles to sight-reading ability is reserved for Chapter IV of the study.

The basic premise is that some musical experiences, passive in nature, which are common to daily living, may show a significant relationship to sight-reading ability. Perhaps the environment of the home - the musical experiences within the family - can be linked to the ability to sight-read. The exposure to sound recordings and radio programming as well as concert attendance may well associate with sight-reading ability. A foremost factor to investigate is the amount of interest in and enjoyment of music at various age levels.

The coverage of these informal influences is divided into three categories. The first section attempts to ascertain when the students first enjoyed music and the intensity or amount of enjoyment during the different periods of their

lives; and the relationship of these factors to their sight-reading ability. The second category pursues the relationship of family music activities, both singing and instrumental, to sight-reading ability. The third area is the relationship of students' listening experiences to sight-reading ability.

All data-gathering materials were completed by 260 students. The sight-reading test had a possible score of 175. Students' scores ranged from 1 to 175, with a mean score of 90.12, median of 90.74, and a standard deviation of 40.69. The extremely wide range of scores indicates extreme degrees of sight-reading ability among the college freshmen music majors. As illustrated in Figure 1, the frequency distribution is reasonably close to normal as might be expected for the relatively large sample of 260. The test results were considered satisfactory for further use, and all other data are related directly to the scores achieved on the sight-reading test.

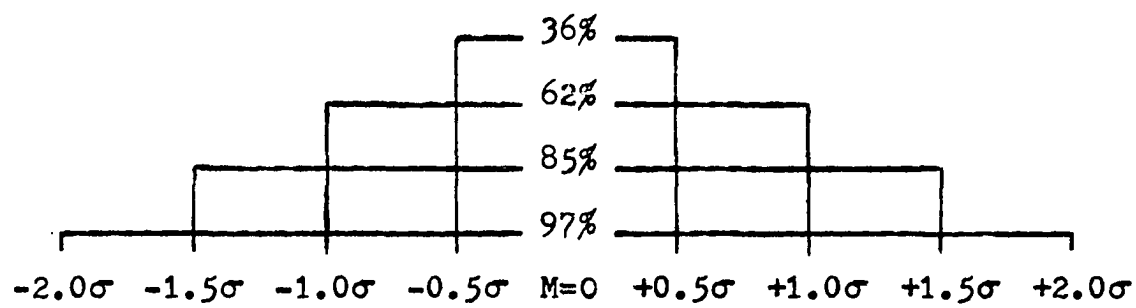

Figure 1 -- Percentages of Sight-Reading Test Scores Within Standard Deviations From the Arithmetic Mean in the Sample Distribution.

Intercorrelations between part and total scores of the sight-reading test are presented in Table 1. Substantial correlation is found between the melodic parts and the melodic total scores and in turn, between the melodic total scores and the total test scores. The same is true of the rhythmic parts and total scores. A lesser relationship is observed when comparing the rhythmic parts to the melodic parts. The high correlation coefficients of the part scores with the total scores indicate that each section of the test is contributing toward the overall measurement of sight-reading ability.

Table 1

Intercorrelations of Part and Total Scores of the Sight-Reading Test.

Test Scores	Melodic Exercise No. 1	Melodic Exercise No. 2	Melodic Total	Rhythmic Exercise No. 1	Rhythmic Exercise No. 2	Rhythmic Total
Melodic Ex.No.1						
Melodic Ex.No.2	.57					
Melodic Total	.92	.70				
Rhythmic Ex.No.1	.42	.35	.46			
Rhythmic Ex.No.2	.44	.47	.46	.56		
Rhythmic Total	.48	.44	.52	.95	.79	
Test Total	.79	.70	.86	.83	.73	.89

Music Enjoyment

It might be expected that the student would achieve most in subjects which interest him. If the student has chosen to major in music because of an early interest in music, perhaps interest is related to sight-reading ability. Therefore, it seemed proper to attempt to determine both the duration and degree of music enjoyment. These questions were asked: "When did you first become interested in music? How much did you enjoy music in elementary school...in junior high school...in senior high school?" From analysis of the responses to these questions and the sight-reading scores, the relationship of music enjoyment to sight-reading ability may be determined.

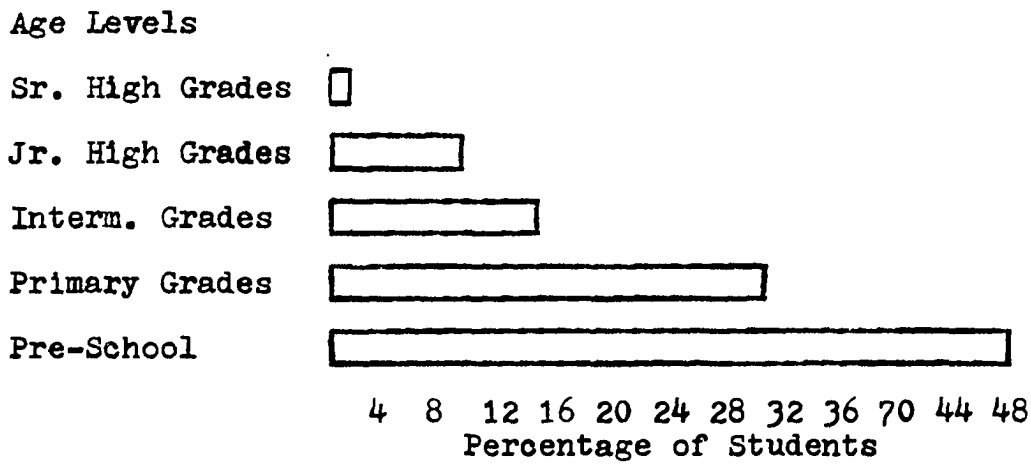

Figure 2 - First Enjoyment of Music

The responses to the questions regarding the first enjoyment of music clearly indicate that the majority of the students had developed a strong interest in music in pre-school years and the primary grades. A total of

76 percent of the 260 students reported their first enjoyment of music in these early years. Less than one percent experienced their first enjoyment during the senior high grades (see Figure 2).

For the contingency data in Table 2, the research hypothesis is that early enjoyment of music can be associated with sight-reading ability. In applying the chi square test, the null hypothesis of independence (no relationship) of the two variables is employed. A comparison of the observed and theoretical frequencies (in parentheses) of each cell reveals somewhat large differences. The sum of the obtained x^2

Table 2

The Relationship of the First Enjoyment of Music and the Sight-Reading Test Scores.

		First Enjoyment of Music					
	Score Range	Pre-School	Prim. Grades	Interm. Grades	Jr.Hi. Grades	Sr.Hi. Grades	Totals
Sight-Reading Test Scores	121-175	41 (31.7)	16 (19.9)	7 (9.2)	3 (6.5)	1 (0.6)	68
	61-120	60 (57.5)	30 (36.1)	18 (16.6)	14 (11.9)	1 (0.9)	123
	1-60	20 (31.8)	30 (20.0)	10 (9.2)	8 (6.6)	0 (0.5)	68
	Totals	121	76	35	25	2	259

$x^2 = 17.47$

$x^2_{.05} = 15.51$

values for all cells is 17.47, greater than 15.51, the value of x^2 necessary to reject the null hypothesis at the .05 level of significance, with eight degrees of freedom. Therefore, the null hypothesis can be rejected, and the research hypothesis accepted as true. There is a positive relationship between early enjoyment of music and sight-reading ability. This relationship is further confirmed by application of the correlation statistic. The coefficient of correlation, significant at the .05 level, is expressed as .155.

Amount of Music Enjoyment

The students were asked to rate the degree of enjoyment of music in elementary school, junior high school, and senior high school. Only four students checked "none," while 195 checked "moderate" and "much" when rating their elementary school experience. When rating the junior high experience, all but five students indicated "moderate" and "much" enjoyment. Only one student rated his enjoyment less than "moderate" or "much" during the high school years. It is apparent that intense interest had developed among all students by high school age.

Since an early enjoyment of music is associated with sight-reading ability, the amount of enjoyment during the three age levels - elementary grades, junior high school grades, and senior high grades - was tested for association. For the data in Table 3, the research hypothesis was that the amount of music enjoyment in the elementary grades can

Table 3

The Relationship of Music Enjoyment in Elementary School and the Sight-Reading Test Scores.

Sight-Reading Test Scores: Score Range	Amount of Enjoyment: None	Little	Moderate	Much	Totals
121-175	1 (1.0)	11 (15.8)	26 (19.7)	31 (32.5)	69
61-120	1 (1.9)	29 (27.7)	58 (52.1)	33 (39.4)	121
1-60	2 (1.1)	19 (15.5)	27 (29.3)	20 (22.1)	68
Totals	4	59	111	84	258

$x^2 = 9.79$

$x^2_{.05} = 12.59$

be associated with sight-reading ability. To accomplish the chi square test the null hypothesis that the two variables were unrelated was used. A comparison of the expected and observed frequencies (in parentheses) of the cells of Table 3 shows their relative proportion to the marginal totals of the rows and columns. The obtained value of chi square is 9.79, while the necessary value to reject the null hypothesis at the .05 level is 12.59. Since the null hypothesis cannot be rejected, it would be concluded from this that there is no significant association between the degree of interest in music at the elementary school level and sight-reading ability at the beginning college level. Although the chi

square test does not show a significant relationship between the amount of music enjoyment in the elementary grades and sight-reading ability, the correlation coefficients for these two variables is .168 and is significant at the .05 level.

By junior high age, 98 percent of the students rated their enjoyment "moderate" or "much" and during the senior high years 94 percent of the students rated their enjoyment "much." When applying the chi square test to the variables, music enjoyment during junior high years and sight-reading ability, no significant association was evident. The same was true of the coefficient of correlation. No evidence of independence or association resulted when applying the two measures to the variables music enjoyment during senior high school years and sight-reading test scores. It should not be assumed that these paired variables are unrelated; rather, it should be observed that by these ages the students were all rating their amount of enjoyment the same. Thus, it is difficult to show an association when one of the variables is quantified at the same level by nearly all students.

Family Influences

When beginning to formulate this study, the influence of family music experiences was considered a potential contributor to sight-reading ability. If the parents were musically inclined, or active music consumers, the student's family environment most likely included an exposure to music. If the family was close, some aspect of music may have become

a part of the student's life. Where the parents are active musicians, professional or amateur, vocal or instrumental, the children have little choice other than to hear music and discussion of subjects related to it. Whether or not the kind of musical atmosphere in which the student lived can be associated with his sight-reading ability in later years seemed worthy of study and evaluation.

The data-gathering instrument asked two questions regarding these influences. The student was asked to rate the amount of family singing experiences and the amount of family instrumental experiences encountered in the elementary, junior and senior high school years.

Family Singing Activity

In response to the request to rate family singing activities, 59 percent of the students said they had little or no experience during elementary school. The percentage dropped slightly for the junior high years, and diminished to 46 percent during senior high school years.

To investigate the area of family singing experiences, the first hypothesis was that this kind of influence during the elementary grades could be linked to sight-reading ability. The theoretical frequencies (in parentheses) can be compared with the observed frequencies in Table 4. The obtained chi square value for the contingency table is 12.15. The necessary value of x^2 at the .05 level of significance for six degrees of freedom is 12.59, just slightly greater than the

obtained value. Although the null hypothesis of no association cannot be rejected, it should be observed that the relationship of family singing experience at the elementary age and sight-reading ability does approach significance. This finding is confirmed by the expression of the correlation coefficient of .155, which is slight but significant, at the .05 level.

Table 4

The Relationship of Family Singing in Elementary School and the Sight-Reading Test Scores.

		Amount of Family Singing				
	Score Range	None	Little	Moderate	Much	Totals
Sight-Reading Test Scores	121-175	13 (22.3)	25 (18.6)	20 (19.4)	11 (8.8)	69
	61-120	45 (39.7)	27 (33.1)	33 (34.5)	18 (15.6)	123
	1-60	26 (22.0)	18 (18.3)	20 (19.1)	4 (8.6)	68
	Totals	84	70	73	33	260

$$x^2 = 12.15$$

$$x^2_{.05} = 12.59$$

The second hypothesis in this category was that family singing experiences during the junior high school years related to sight-reading ability. The null hypothesis that these variables were unrelated was used, and the theoretical frequencies (in parentheses) were compared to the observed

frequencies and are shown in Table 5. With application of the chi square test, the obtained x^2 value is 19.86. The tabular value for x^2 at the .05 level with twelve degrees of freedom is 21.03, and for the .10 level is 18.5. Therefore, the null hypothesis may not be rejected at the .05 level, but a slight, positive relationship between family singing experiences during junior high years and sight-reading ability may exist. The correlation coefficient of .086 for this pair of variables further confirms that this relationship is negligible.

Table 5

The Relationship of Family Singing in Junior High School and the Sight-Reading Test Scores.

Sight-Reading Test Scores: Score Range	Amount of Family Singing: None	Little	Moderate	Much	Totals
145-175	5 (6.9)	12 (6.7)	5 (6.9)	3 (4.5)	25
109-144	15 (17.8)	15 (17.3)	18 (17.8)	16 (11.1)	64
73-108	26 (22.8)	17 (22.2)	25 (22.8)	14 (14.2)	82
37-72	14 (17.0)	16 (16.5)	20 (17.0)	11 (10.5)	61
1-36	12 (7.5)	10 (7.3)	4 (7.5)	1 (4.7)	27
Totals	72	70	72	45	259

$x^2 = 19.86$

$x^2_{.05} = 21.03$

In testing for an association between the sight-reading test scores and family singing experiences during the senior high grades, neither the chi square test nor the correlation coefficient gave evidence of significant relatedness.

Family Instrumental Activity

The students were asked to rate the extent of family instrumental music activities for the three periods of their life: elementary school, junior high, and senior high school. This question and the associated responses are treated in like manner to the singing experience inquiry. Interestingly, nearly 70 percent of the students reported little or no experience during elementary years, and 54 percent said they had little or no activity in junior high years. This pattern continued with 45 percent having little or no family instrumental music activity during senior high school. As recorded on the correlation matrix in Appendix D, the coefficients for these three variables, namely, family instrumental activity in elementary, junior high and senior high grades with sight-reading test scores are .082, .064 and .024, respectively. There is no evidence of significant relationships between the student's family instrumental experiences and his sight-reading score.

It appears that a slightly stronger relationship exists between family singing experiences and the sight-reading scores than between family instrumental activities and the sight-reading scores. However, this finding is somewhat

minimized by the fact that a greater percentage of students reportedly had little or no family instrumental experience, compared to those having family singing activities.

Listening Experiences

Music is an art expressed in sound. For most listeners it is heard but never seen. Yet the production of music involves the interpretation of the printed page of music symbols. In most instances, listening to music is hearing the translation of the symbols. It seemed worthwhile to investigate the question, "Does becoming more familiar with musical sounds relate to the recognition and reading of the symbols representing these sounds?" In other words, does the listening experience of both "live" and mechanically reproduced music affect sight-reading ability?

Sound Recording Listening

The subjects were asked to rate the amount of time spent listening to sound recordings during elementary, junior high and senior high grades. Apparently most of the students had access to reproduction equipment and recordings, for nearly 80 percent indicated some experience in elementary grades, and all but two percent reported listening experiences in high school years.

The hypothesis is that the ratings of the amount of sound recording listening experiences and the sight-reading scores are related. Using the null hypothesis of no

relationship, the experimental and theoretical frequencies (in parentheses) are tabulated in Table 6. The chi square test was calculated for each cell of the table, and the obtained x^2 value was 7.14. This is considerably less than the x^2 value necessary for rejection of the null hypothesis at the .05 level of significance, which is 12.59. It would be concluded from this that there is no evidence of relationship between sound recording listening experiences during the elementary school years and sight-reading ability by the freshman year in college. However, comparison of these variables by the correlation method shows a slight relationship, expressed as a correlation coefficient of .128, which is slightly significant at the .05 level.

Table 6

The Relationship of Sound Recording Listening in Elementary School Years and the Sight-Reading Test Scores.

		Amount of Sound Recording Listening				
	Score Range	None	Little	Moderate	Much	Totals
Sight-Reading Test Scores	121-175	10 (14.6)	37 (36.6)	18 (13.0)	4 (4.8)	69
	61-120	26 (26.0)	65 (65.3)	21 (23.2)	11 (8.5)	123
	1-60	19 (14.4)	36 (36.1)	10 (12.8)	3 (4.7)	68
	Totals	55	138	49	18	260

$x^2 = 7.14$

$x^2_{.05} = 12.59$

Both the amount of junior high and senior high sound recording listening experiences were tested for association with the sight-reading test scores. There was no evidence of a significant relationship in either case.

Radio Listening

The second area of listening experiences was radio listening. The subjects were asked to rate the amount of time spent listening to "classical" or "good" music on the radio during the three age levels: elementary, junior high and senior high school. Eighty-six percent rated their elementary experiences as "little" or "none," with twelve percent checking "moderate" and two percent "much." This evaluation of their listening may well show the lack of opportunity to hear good music via radio. When applying the two measures for testing for relationship, there were no significant correlations or chi square values. This was the case for radio listening on all three levels: elementary, junior high, and senior high. In the tests for the association of the junior high and senior high school experiences, negative correlations were obtained; however, these were at insignificant levels. It may be concluded that, in this study, listening to "good" music via radio has no significant relationship with sight-reading ability.

Concert Listening

When responding to the question regarding amount of concert or musical program listening, 48 percent checked

"little" for the elementary grades, while 42 precent checked "moderate" for junior high age, and 46 percent checked "much" for the senior high age. This tends to show an increasing interest in concert attendance and listening, although other factors could be involved. As illustrated in Tables 8 and 9, a positive relationship between concert listening and the sight-reading scores does exist at the junior and senior high school age levels.

Table 7

The Relationship of Concert Listening During Elementary School Years and the Sight-Reading Test Scores.

		Amount of Concert Listening				
	Score Range	None	Little	Moderate	Much	Totals
Sight-Reading Test Scores	121-175	14 (20.8)	38 (32.5)	13 (12.8)	3 (2.9)	68
	61-120	36 (36.9)	57 (57.6)	25 (22.7)	4 (3.8)	121
	1-60	28 (20.3)	27 (31.9)	10 (12.5)	2 (2.3)	67
	Totals	78	122	48	9	256

$x^2 = 8.00$

$x^2_{.05} = 12.59$

The three research hypotheses for testing for relationships in this category are: (1) that concert listening during the elementary grades is related to sight-reading ability; (2) that concert listening during the junior high

grades is related to sight-reading ability; and (3) that concert listening during senior high grades is related to sight-reading ability. The null hypotheses are that no relationships exist. Table 7 illustrates the observed and theoretical frequencies for the elementary experience. The calculated value for chi square test is not great enough to show significance at the .05 level. The obtained value of x^2 is 8.00 and the necessary value to reject the null hypothesis is 12.59. Therefore, the null hypothesis of no association must be accepted. The correlation measure also shows no significant relation; the coefficient of .122 is just slightly below that necessary for significance at the .05 level.

Table 8

The Relationship of Concert Listening during Junior High School Years and the Sight-Reading Test Scores.

		Amount of Concert Listening				
	Score Range	None	Little	Moderate	Much	Totals
Sight-Reading Test Scores	121-175	5 (4.4)	18 (21.0)	33 (28.5)	12 (14.1)	68
	61-120	5 (8.1)	29 (37.0)	61 (50.3)	25 (24.6)	120
	1-60	7 (4.5)	31 (20.0)	12 (27.2)	15 (13.3)	65
	Totals	17	78	106	52	253

$x^2 = 23.14$

$x^2_{.05} = 12.59$

Table 8 illustrates the second research hypothesis, which appears to be true. The obtained value of chi square is 23.14, exceeding the value of 12.59 at the .05 level of significance necessary to reject the null hypothesis. It can be concluded that there is a significant relationship between junior high age concert listening and the sight-reading test scores. However, the correlation coefficient does not indicate a significant relationship. The correlation coefficient is .111 and is not significant at the .05 level.

The significant association between concert listening and sight-reading ability continues with senior high age level. Table 9 shows the frequencies, observed and theoretical, from which the chi square test was calculated. The obtained chi square value is 15.86, and the tabular value of $x^2_{.05}$ is 12.59. Since the obtained value exceeds the tabular value, the null hypothesis is rejected, and it may be concluded that there is a significant relationship between concert listening at the senior high level and sight-reading ability. This relation is further confirmed by the correlation coefficient of .165, which is significant at the .05 level.

It is apparent that, of the listening experiences of the subjects, concert listening bears the greatest and most consistent positive relationship to the sight-reading scores.

Table 9

The Relationship of Concert Listening during Senior High Years and the Sight-Reading Test Scores.

Sight-Reading Test Scores: Score Range	Amount of Concert Listening: None	Little	Moderate	Much	Totals
121-175	1 (1.1)	7 (8.4)	27 (27.2)	33 (31.3)	68
61-120	1 (1.9)	8 (14.8)	51 (48.3)	61 (56.0)	121
1-60	2 (1.0)	16 (7.8)	23 (25.5)	23 (29.7)	64
Totals	4	31	101	117	253

$x^2 = 15.86$

$x^2_{.05} = 12.59$

Summary

The results found by analysis of the data pertaining to informal influences show considerable variation in their association with sight-reading ability. None of the areas seem to indicate a strong association; a number show very slight but significant relationship, and others no significant relationship at all. Those influences that appear to have the strongest relationship are early music enjoyment and concert attendance. Amount of music enjoyment in the elementary school years, amount of family singing experience in early years, and amount of sound recording listening in the elementary years all bear no significant relationship to sight-

reading scores by application of the chi square contingency method. However, each of these does show a very slight but significant relationship to sight-reading ability by the correlation coefficient method.

Both early music enjoyment and the amount of music enjoyment were seen to show a slight relationship to the sight-reading scores. Those students reporting an early interest tended to be better sight-readers than those who developed an interest later. Likewise, those who had a more intense interest scored better than those with a lesser appreciation. It is impossible to determine from the data whether or not this early and intense interest promotes a greater receptiveness to musical sounds and symbols and in turn improves sight-reading ability, or whether this interest simply motivates the student to music study and participation which may contribute to the ability to sight-read. However, high musical interest, in general, associates with improved sight-reading scores.

From this analysis it appears that family musical experiences may have only a slight bearing on sight-reading scores. The number of subjects having family instrumental music experiences were so few that an association could not be determined. However, those reporting family singing experiences scored higher on the sight-reading test. Generally, those students exposed to music through family influences tend to sight-read better.

Certain kinds of listening experiences show a slight but positive relationship to sight-reading ability. Listening to sound recordings appears to relate slightly to the ability to sight-read. There seems to be no significant relationship between radio listening and the sight-reading scores; again, over 86 percent of the subjects reported little or no listening experience via radio.

Of all the informal influences, listening experience in a "live" concert shows the strongest association with sight-reading ability. It should be observed that concert attendance, involving the listening to "live" music, shows a stronger relationship than either method of reproduced music. It is possible that interest in music motivated concert attendance, and hearing and seeing artists under favorable listening conditions brought about a motivation for learning music. The data obtained only permits theorizing at this point.

The thesis of this chapter was that musical activities of an informal nature may relate to sight-reading ability. It appears that the importance of indirect musical influences to sight-reading ability is very slight, but some such activities may create and maintain an interest in music which may lead the individual to become involved in the music learning process.

CHAPTER IV

FORMAL INFLUENCES

Academic activities in which the music student engages himself for the purpose of improving musicianship might be expected to exhibit a closer relationship to sight-reading ability than the less formal and indirect factors. The informal factors may be participated in purely for enjoyment or entertainment purposes, while the formal experiences include selected courses of study designed to improve musicianship. The purpose of this chapter is to investigate these relationships.

In some areas the study will consider general aspects of these relationships while in other areas specific influences which seem to show a more significant relationship will be given considerable attention. A number of areas needing further investigation will be evident.

The data for this second general area of influences is divided into six parts for presentation and analysis. The six divisions are: (1) Aliferis Music Achievement Test, (2) College Theory Grade, (3) Ratings in Music Performance Areas and Contests, (4) American College Testing Program (ACT) Scores, (5) Formal Music Study, and (6) Music Participation Activities.

The data obtained in each area are analyzed and presented in narrative expressions of correlation coefficients, figures, and contingency tables within the context of each division. At the end, a summary is given relative to the hypothesis at the beginning of the chapter.

Aliferis Music Achievement Test

The Aliferis Test was designed to measure achievement in auditory-visual discrimination at the college entrance level. The test has an overall reliability coefficient of .88. Aliferis suggests that this measure, coupled with other student profile measures, may serve to give proper counsel and guidance to the music student.[29] The faculty counselor would find the test scores of value in comparing his students with national norms. The national mean for a group of 1,768 students entering college in the fall of 1950 was 31.13. As illustrated in Figure 3, the mean score for the students in this study was 28.57, somewhat lower than the national average.

The Aliferis test is in three parts: (1) melodic, having a possible raw score of 26, (2) rhythmic, having a possible raw score of 20, and (3) harmonic, with a possible raw score of 18. These sub-test scores, as well as the total score, are used in the analysis.

Aliferis furnishes some statistics regarding his use of

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[29]Aliferis, op. cit., p. 3

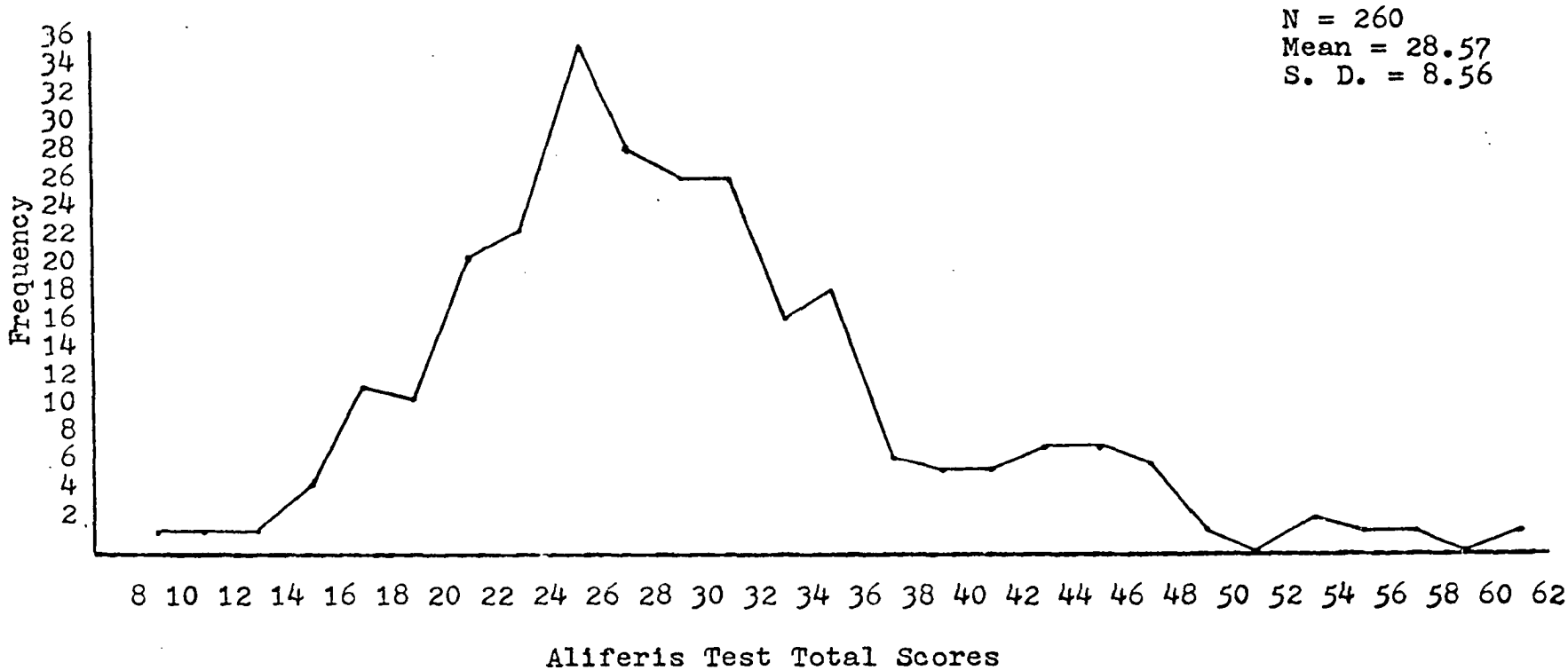

Figure 3 -- Distribution of the Aliferis Test Total Scores

the Music Achievement Test on a national basis in the test manual. Table 10 shows the means and standard deviations of the part and total scores as published in the test manual. When comparing the means and standard deviations of the students' scores in this study, it is interesting to note that their performance on the rhythmic portion of the test is very close to the national norms.

Table 10

A Comparison of the National and Oklahoma Means and Standard Deviations on the Aliferis Music Achievement Test for Entering Freshmen.

	National Sample[30]		Oklahoma Sample	
Test Scores	Mean	S.D.	Mean	S.D.
Melodic	12.47	5.40	10.97	4.39
Harmonic	7.06	3.47	6.23	2.79
Rhythmic	11.61	3.57	11.40	3.70
Total	31.13	10.15	28.57	8.56

Under the research hypothesis that the melodic scores on the Aliferis test and the sight-reading test are mutually related, the scores were placed in a contingency table. The null hypothesis is that the two score distributions are independent. Table 11 illustrates the observed and expected frequencies (in parentheses) utilized for the chi square test. The obtained value of chi square is 76.72, vastly greater than the 12.59 value necessary to reject the null hypothesis at the .05 level of significance. The null

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[30] Ibid., pp.27-28.

hypothesis is strongly discredited; therefore, the research hypothesis may be regarded as true. It may be concluded that there is a significantly high relationship between the scores on the Aliferis Melodic Test and the total scores on the sight-reading test. This relationship can further be expressed by the obtained correlation coefficient of .529.

Table 11

The Relationship of the Aliferis Melodic Scores and the Total Scores on the Sight-Reading Test.

		Aliferis Melodic Score				
	Score Range	1-6	7-12	13-18	19-26	Totals
Sight-Reading Test Scores	121-175	0 (7.1)	23 (42.0)	31 (14.9)	15 (5.0)	69
	61-120	17 (12.8)	81 (74.7)	21 (26.5)	4 (9.0)	123
	1-60	10 (7.1)	54 (41.3)	4 (14.6)	0 (5.0)	68
	Totals	27	158	56	19	260

$$x^2 = 76.72$$

$$x^2_{.05} = 12.59$$

The performance on the Aliferis test and the sight-reading test was further analyzed by comparing the scores of the various parts of the tests. The hypothesis that the melodic scores of the two tests are related was assumed. The null hypothesis claims no relationship of the two variables. The contingency data can be observed in Table 12

with the theoretical frequencies in parentheses. Application of the chi square measure for each cell provides a value of 82.17. The x^2 value needed to reject the null hypothesis is 12.59, at the .05 level of significance. It may be concluded that the null hypothesis is false and the alternate hypothesis- that the scores are related - is accepted as true. This strong association is further confirmed by the correlation coefficient of .573.

Table 12

The Relationship of the Aliferis Melodic Scores and the Sight-Reading Test Melodic Scores.

		Aliferis Melodic Scores				
	Score Range	1-6	7-12	13-18	19-26	Totals
Sight-Reading Test Melodic Scores	61-86	0 (3.4)	8 (20.6)	15 (7.4)	11 (2.6)	34
	31-60	4 (8.4)	44 (50.4)	29 (18.1)	6 (6.1)	83
	1-30	22 (14.2)	104 (85.0)	12 (30.5)	2 (10.3)	140
	Totals	26	156	56	19	257

$x^2 = 82.17$

$x^2_{.05} = 12.59$

In a final comparison, the sight-reading test melodic scores were compared to the Aliferis Total Scores. The hypothesis is that these scores are related. The null hypothesis is that they are not related, and the theoretical

frequencies, shown in parentheses in Table 13, are the frequencies we could expect if the null hypothesis were true. The observed frequencies differ greatly in several cells. The obtained chi square values of the cells total 71.97. With six degrees of freedom, the x^2 value for the .05 level of significance is 12.59. Since the obtained value is far greater, the null hypothesis is rejected. Therefore, the alternate hypothesis is accepted; the melodic scores of the sight-reading test and the Aliferis test total scores are significantly related. The results of the application of the correlation statistic parallel the x^2 test. The coefficient of correlation is .584.

Table 13

The Relationship of the Sight-Reading Test Melodic Scores and the Aliferis Test Total Scores.

		Aliferis Total Scores				
	Score Range	1-16	17-32	33-48	49-64	Totals
Sight-Reading Test Melodic Scores	61-86	0 (2.0)	12 (23.2)	18 (8.2)	4 (0.7)	34
	31-60	0 (4.5)	50 (56.5)	32 (20.0)	1 (2.0)	83
	1-30	14 (7.6)	113 (95.3)	12 (33.8)	1 (3.3)	140
	Totals	14	175	62	6	257

$x^2 = 71.97$

$x^2_{.05} = 12.59$

The rhythm scores of the sight-reading test and the Aliferis rhythm scores were paired to test for relationship. In Table 14 it can be observed that those students scoring higher on the Aliferis rhythm test also were better rhythm sight-readers. The chi square value for the contingency table (Table 14) is 59.41, while the value necessary to reject the null hypothesis of no association is 9.49, with four degrees of freedom, at the .05 level of significance. Therefore, it may be concluded that the Aliferis rhythm scores and the sight-reading test rhythm scores show significant relationship. This relationship can also be expressed by the obtained coefficient of correlation of .545.

Table 14

The Relationship of the Sight-Reading Test Rhythm Scores and the Aliferis Test Rhythm Scores.

		Aliferis Rhythm Scores			
	Score Range	1-6	7-12	13-20	Totals
Sight-Reading Test Rhythm Scores	61-89	3 (11.0)	54 (70.4)	78 (53.6)	135
	31-60	7 (6.9)	56 (43.8)	21 (33.3)	84
	1-30	11 (3.1)	24 (19.8)	3 (15.1)	38
	Totals	21	134	102	257

$$x^2 = 59.41$$

$$x^2_{.05} = 9.49$$

A further test for association was accomplished by pairing the Aliferis rhythm scores with the sight-reading test total scores. The research hypothesis stated their mutual relationship. The null hypothesis is that the two distribution of scores are unrelated. Table 15 displays the observed and expected frequencies (in parentheses). The needed value of x^2 with four degrees of freedom is 9.49, at the .05 level of significance. The calculated value of x^2 is 68.52. The null hypothesis is rejected, and the relationship of the two variables is highly significant. The correlation coefficient for this pair of variables is .541.

Table 15

The Relationship of the Aliferis Rhythm Scores and the Sight-Reading Test Scores.

		Aliferis Rhythm Scores			
	Score Range	1-6	7-12	13-20	Totals
Sight-Reading Test Scores	121-175	0 (6.1)	28 (35.8)	41 (27.1)	69
	61-120	4 (10.9)	63 (63.9)	56 (48.2)	123
	1-60	19 (6.0)	44 (35.3)	5 (26.7)	68
	Totals	23	135	102	260

$x^2 = 68.52$

$x^2_{.05} = 9.49$

Since the Aliferis test has three sub-tests and the sight-reading test scores are divided into melodic, rhythmic, and total scores, a number of variables were available for investigation. Although the sight-reading test could not test a harmonic element, the Aliferis harmonic score was compared to the total score of the sight-reading test. The null hypothesis was that the scores were not related. As shown in Table 16, the observed frequencies differ positively from the theoretical frequencies (in parentheses) expected.

Table 16

The Relationship of the Aliferis Harmonic Scores to the Sight-Reading Test Total Scores.

		Aliferis Harmonic Scores			
	Score Range	1-6	7-12	13-18	Totals
Sight-Reading Test Scores	121-175	24 (40.7)	39 (26.6)	6 (1.7)	69
	61-120	82 (72.1)	40 (47.1)	0 (2.8)	122
	1-60	47 (40.2)	21 (26.3)	0 (1.5)	68
	Totals	153	100	6	259

$$x^2 = 32.46$$

$$x^2_{.05} = 9.49$$

The obtained chi square value for the contingency data was 32.46. A x^2 value of 9.49, with four degrees of freedom, was needed to reject the null hypothesis at the .05 level. There-

fore, the research hypothesis is accepted as strongly significant. The obtained correlation coefficient for this pair of variables is .374, and is also significant at the .05 level.

The rhythm scores of the sight-reading test were selected for comparison with the total scores of the Aliferis test. The null hypothesis again assumes that they are unrelated. After determining the observed and the theoretical frequencies (in parentheses), illustrated in Table 17, a x^2 test obtained a value of 38.89. At the .05 level of significance, a value of 12.59 was needed to discredit the null hypothesis. The hypothesis that a positive association exists between the sight-reading test rhythm scores and the Aliferis total scores is accepted as significant. This strong association is further shown by the correlation coefficient of .501.

Table 17

The Relationship of the Aliferis Test Total Scores and the Sight-Reading Test Rhythm Scores.

Sight-Reading Test Rhythm Scores: Score Range	1-16	17-32	33-48	49-64	Totals
61-89	3 (7.3)	77 (91.9)	49 (32.5)	6 (3.3)	135
31-60	5 (4.6)	67 (57.2)	12 (20.3)	0 (1.9)	84
1-30	6 (2.1)	31 (25.9)	1 (9.2)	0 (0.8)	38
Total	14	175	62	6	257

$x^2 = 38.89$

$x^2_{.05} = 12.59$

The most significant relationship of all the variables pertaining to sight-reading test scores and Aliferis test scores is found by comparing the total scores of both tests. The higher the scores on the Aliferis, the greater the sight-reading test scores. The null hypothesis of no relation was used to establish the theoretical frequencies shown in parentheses in Table 18. The computation of the x^2 test obtained a value of 87.94. To be significant at the .05 level, with six degrees of freedom, a x^2 value of 12.59 was necessary. Therefore, the null hypothesis is rejected and the alternate hypothesis accepted. The total scores of the two tests show a highly significant relationship. This relationship is also expressed by a correlation coefficient of .625.

Table 18

The Relationship of the Aliferis Total Scores and the Total Scores on the Sight-Reading Test.

		Aliferis Total Scores				
	Score Range	1-16	17-32	33-48	49-64	Totals
Sight-Reading Test Scores	121-175	0 (4.0)	28 (47.6)	36 (16.5)	5 (0.9)	69
	61-120	4 (7.1)	94 (83.1)	24 (29.3)	1 (3.5)	123
	1-60	11 (3.9)	55 (46.3)	2 (16.2)	0 (1.6)	68
	Totals	15	177	62	6	160

$x^2 = 87.94$

$x^2_{.05} = 12.59$

Intercorrelations between part and total scores of the Aliferis test are presented in Table 19. The intercorrelations published by Aliferis in his standardization of the test are shown in parentheses. Substantial correlation is found between the melodic and harmonic sections, and between each test section and the total score. Less relationship is shown between the melodic and rhythmic sections and between the harmonic and rhythmic sections. The high correlations of part scores with the total score indicate that each section is contributing toward the measurement of a common musical ability. This is the ability termed auditory-visual discrimination.

Table 19

Intercorrelations of Sub-Test and Total Scores on the Aliferis Music Achievement Test for Entering Freshmen, Fall 1966; N=260. (Aliferis Intercorrelations for Fall 1950 are in Parentheses; N=1936)[31]

Test Scores	Melodic	Harmonic	Rhythmic	Totals
Melodic		.50 (.66)	.41 (.41)	.85 (.90)
Harmonic			.32 (.32)	.72 (.81)
Rhythmic				.75 (.68)

[31] Ibid., p. 27-28.

College Theory Grade

All students in the study were classified as freshman music majors, and in all cases were officially enrolled in a basic music theory course. At the time the data were gathered, these students had received an average of four weeks of music theory instruction. It seemed worthwhile to compare the theory grade average to the sight-reading test scores, even though a limited amount of material had been covered.

Table 20

The Relationship of Theory Grades and the Sight-Reading Test Scores.

		Average Grade in Theory					
	Score Range	F	D	C	B	A	Totals
Sight-Reading Test Scores	121-175	1 (4.3)	2 (8.0)	7 (14.9)	25 (21.3)	34 (20.5)	69
	61-120	5 (8.1)	16 (14.2)	31 (26.5)	34 (37.8)	37 (36.4)	123
	1-60	12 (4.6)	12 (7.8)	18 (14.6)	21 (20.9)	6 (20.1)	68
	Totals	17	30	56	80	77	260

$$x^2 = 45.17$$

$$x^2_{.05} = 15.51$$

On the data sheet the students were asked to give the name of the instructor for the basic theory course (harmony). These instructors were then asked to provide an average grade

for each student in the study. The hypothesis was that freshmen theory grades and sight-reading test scores are related. The null hypothesis assumed no relationship. Both observed and expected frequencies (in parentheses) are shown in the cells of Table 20. The obtained value of chi square was 45.17, exceeding the value of 15.51 necessary to reject the null hypothesis at the .05 level of significance. There is evidence of a significant association of this pair of variables. The correlation coefficient of .393 is also significant at the .05 level.

Ratings in Major Performance Areas

The administrators and instructors of the music departments of the institutions whose students participated in this study were highly cooperative. The students were asked to give the name of their major instrument instructor, who in turn was asked to rate the performance ability of the students under his instruction. There were five possible ratings - Superior, Excellent, Good, Fair and Poor. This available information seemed to merit a comparison to the sight-reading test scores. The research hypothesis is that ratings in the major performance area and sight-reading test scores are mutually related. The null hypothesis is that the two variables are not related. Application of the chi square test to the frequencies in Table 21 obtained a x^2 value of 44.58. With eight degrees of freedom, the necessary x^2 value for significance at the .05 level is 20.09. Therefore, the null hypothesis is discredited,

and the alternate hypothesis may be regarded as true. A rather strong relationship is apparent, and in addition, the expressed correlation coefficient of .433 is significant at the .05 level.

Table 21

The Relationship of Performance Ratings and the Sight-Reading Test Scores.

		Performance Ratings					
	Score Range	Poor	Fair	Good	Excel-lent	Super-ior	Totals
Sight-Reading Test Scores	121-175	3 (4.2)	9 (13.9)	11 (22.5)	25 (18.7)	21 (10.2)	69
	61-120	4 (7.6)	20 (23.4)	45 (39.4)	37 (32.8)	15 (17.8)	121
	1-60	9 (4.2)	21 (13.2)	28 (22.1)	8 (18.5)	2 (10.0)	68
	Totals	16	50	84	70	38	258

$$x^2 = 44.58$$

$$x^2_{.05} = 20.09$$

Contest Ratings

The students were asked to list on the data sheet the contests they had entered as a soloist and/or small ensemble member. Along with this information they were to list the ratings received. In the early stages of planning for this study, the influence of contest participation was considered as one of the environmental experiences that should be compared to sight-reading ability for association. When

tallying data, the kinds of contests and various ratings were so multitudinous that it was almost impossible to classify them in preparation for testing for relationship. This item was so complex and unmanagable that it was omitted from the data analysis.

ACT Scores

In the United States a majority of colleges and universities require or recommend students desiring to enter to provide them scores from a battery of tests administered by The American College Testing Program (ACT) of Iowa City, Iowa.[32] These tests are designed to measure the student's ability to perform the kinds of intellectual tasks college students typically perform.[33] The ACT program administers the tests to high school seniors, then provides a student profile to the student's prospective college. In a small number of cases, students had taken a different, but similar battery of tests, and a formula for computation to the ACT scale was provided. In still a smaller number of cases, no scores were available; however, of the 260 students in this study, scores were available through the directors of testing at the selected institutions for 234 students.

The subject areas of the battery are English, mathematics, social studies, and natural sciences. Subject area scores as

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[32]"Using ACT On Your Campus," The American College Testing Program, 1965, p. 11.

[33]Ibid., p. 6.

well as a standard score are given. The standard score range is on a scale from 1 to 36, of which 20 was the national average for college-bound high school seniors in 1965.[34] The mean standard score for the students in this study (entering college in the fall of 1966) was 19.47, slightly below the national average. A distribution of scores is given in Figure 4.

This author is acquainted with several college band and choral directors who consider incoming students' ACT standard score almost as important as the audition performance when selecting new personnel for their ensembles. It seemed, therefore, appropriate to include a comparison of ACT scores to the sight-reading test scores. The research hypothesis is that the ACT scores can be associated with the sight-reading test scores. The null hypothesis is that no association exists. Table 22 shows the observed frequencies of the scores and the theoretical frequencies (in parentheses). The chi square value obtained from the contingency table equals 25.89. With eight degrees of freedom, a x^2 value of 15.51 was necessary to reject the null hypothesis and to show a significant relationship at the .05 level. The alternate hypothesis is accepted; there is evidence that the ACT scores are significantly related to the sight-reading test scores. This relationship is also expressed by a correlation coefficient of .430.

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[34] Ibid., p. 14.

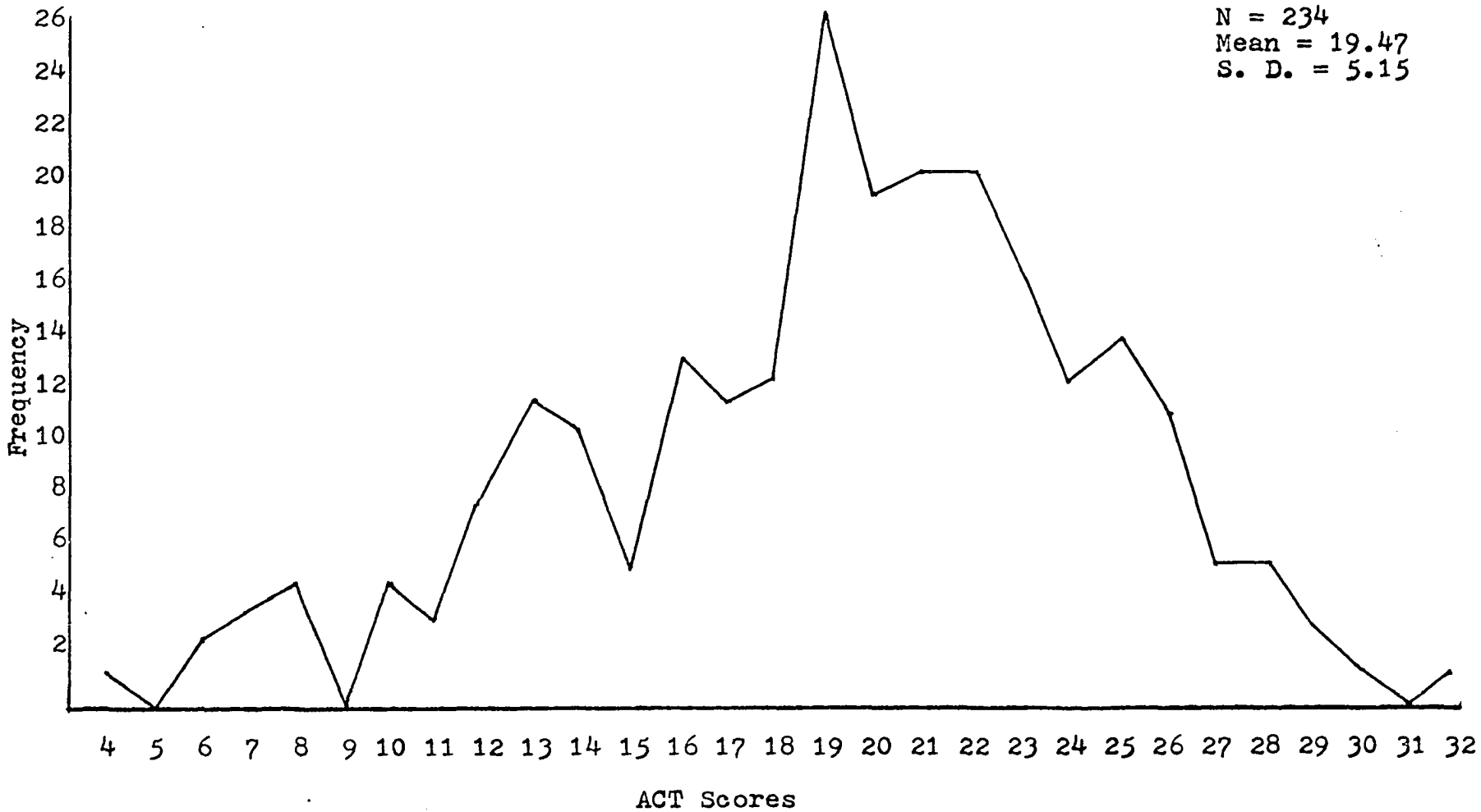

Figure -- 4 Distribution of the ACT Scores

Table 22

The Relationship of ACT Scores and the Sight-Reading Test Scores.

Sight-Reading Test Scores	ACT Standard Scores					
Score Range	6-9	10-13	14-17	18-21	22-27	Totals
121-175	0 (2.0)	1 (6.4)	8 (9.9)	21 (18.6)	27 (20.1)	57
61-120	3 (3.8)	13 (11.8)	14 (18.4)	36 (34.4)	39 (36.6)	105
1-60	5 (2.2)	11 (6.8)	17 (10.7)	16 (20.0)	12 (21.3)	61
Totals	8	25	39	73	78	223

$x^2 = 25.89$

$x^2_{.05} = 15.51$

Formal Music Study

It is generally observed that students who show an early interest in music are provided with opportunities to study the subject, both in and out of school. In elementary and secondary schools, some type of music is often a part of the curriculum; however, it may be taught by the classroom teacher on a regular or irregular basis, or it may be taught by a music specialist. In some cases, especially in the secondary grades, a course of study in music may be elected. The course might be expected to contain: (1) singing activities, (2) an elementary study of notation, (3) introductory study of musical styles and composers, (4) a study of the orchestral

instruments, and (5) a limited exposure to performing on simple musical instruments. Such a course is called "general music." Other kinds of formal music study offered in public education might include specialized courses in harmony (written theory) and/or aural theory. In conjunction with the school ensembles, some institutions may offer instruction in voice, piano, and the band and orchestral instruments. Outside the school systems, formal music instruction may be available on a limited basis.

This study examined the formal music study experiences of the 260 students involved. Whether or not the kinds and amounts of formal music training can be associated with sight-reading ability is an important objective of this study.

General Music

A large majority of the subjects had been enrolled in general music courses in all grade levels. The students were asked to indicate the number of years they had studied general music in elementary, junior high, and senior high school. Two hundred three students had from one to eight years of general music on the elementary level, with the average amount being 3.8 years. The relationship of the number of years of elementary general music and the sight-reading test scores show an insignificant correlation of .037. When applying the chi square test, there was no evidence of association of these variables.

Table 23

The Relationship of Junior High General Music and the Sight-Reading Test Scores.

Sight-Reading Test Scores	Years of Junior High General Music			
Score Range	1-2	3-4	5-6	Totals
121-175	22 (24.6)	25 (22.8)	1 (0.6)	48
61-120	39 (38.4)	35 (35.7)	1 (0.9)	75
1-60	24 (22.0)	19 (20.5)	0 (0.5)	43
Totals	85	79	2	166

$$x^2 = 1.56$$

$$x^2_{.05} = 9.49$$

The students were asked to indicate the number of years of general music study on the junior high level. Two students reported having five to six years junior high general music, which is questionable, but could be possible. The research hypothesis is that junior high general music and sight-reading ability are related. The null hypothesis is that these two variables are not related. Table 23 shows the observed and expected frequencies (in parentheses) and both show similar proportions to the marginal totals. The obtained chi square value is 1.56. With four degrees of freedom, the x^2 value of 9.49 was necessary for significance at the .05 level. The null hypothesis must be accepted since there is no

evidence that the research hypothesis is true. For the entire sample, the coefficient of correlation of these variables is .153, and is just slightly above the .05 level of significance.

The association of general music in senior high school and sight-reading scores is tested next. The null hypothesis is that there is no association. Table 24 shows the observed and expected frequencies (in parentheses). Column and row cell frequencies are proportionate to the totals. (The two students reporting five to six years of senior high general music is likely invalid.)

Table 24

The Relationship of Senior High General Music and the Sight-Reading Test Scores.

		Years of General Music in Senior High School			
	Score Range	1-2	3-4	5-6	Totals
Sight-Reading Test Scores	121-175	8 (13.4)	40 (35.0)	1 (0.6)	49
	61-120	22 (19.2)	47 (49.9)	1 (0.9)	70
	1-60	13 (10.4)	25 (27.1)	0 (0.5)	38
	Totals	43	112	2	157

$$x^2 = 5.06$$

$$x^2_{.05} = 9.49$$

Calculation of the chi square test obtained a x^2 value of 5.06, somewhat less than the value of 9.49 necessary to reject the null hypothesis. There was no evidence that the alternate hypothesis is true. However, the correlation coefficient here is the strongest of the three levels of general music study. For the entire sample, the coefficient of correlation of .194 is significant at the .05 level.

High School Theory

The students were asked to indicate the number of years they studied harmony (written theory) in high school. Of the 260 freshmen music majors in the study, only 78 had been enrolled in a theory course, 91 percent of these having only one year of study. The hypothesis is that this time spent in a written theory course can be related to the sight-reading test scores. The null hypothesis is that there is no relationship. Table 25 illustrates the frequencies, both observed and expected (in parentheses). The obtained chi square value is 6.26, and is greater than the x^2 value with two degrees of freedom (5.99) necessary to reject the null hypothesis and accept the research hypothesis. It may be concluded that the study of written theory is related to the sight-reading scores. This slightly significant relationship can also be expressed by a correlation coefficient of .236, obtained from the entire sample, which is significant at the .05 level.

Table 25

The Relationship of Written Theory and the Sight-Reading Test Scores.

Sight-Reading Test Scores: Score Range	Years of Written Theory in Junior and Senior High School: 1	2 or more	Totals
121-175	17 (20.0)	5 (2.0)	22
61-120	38 (36.4)	2 (3.6)	40
1-60	16 (14.6)	0 (0.4)	16
Totals	71	7	78

$$x^2 = 6.26$$

$$x^2_{.05} = 5.99$$

Only 41 students of the total sample stated they had instruction in aural theory. The majority of these were enrolled for only one year. No significant relationship was found between aural theory and the sight-reading test scores.

Private Study on Performing Instruments

In the data-gathering process, students were asked about the kinds and amounts of private music study they had experienced. From the 260 student population, 204 reported having from one to eleven years of private study in their major performing area. The research hypothesis is that the amount

of private study is related to sight-reading test scores. The null hypothesis states that the variables are unrelated. In Table 26, the observed and theoretical frequencies are recorded. The application of the chi square test shows a value of 7.92, while the necessary value for significance at the .05 level is 12.59. The null hypothesis is therefore accepted; no significant relationship can be shown. This conclusion is further verified by the correlation coefficient of .132, which is not significant at the .05 level.

Table 26

The Relationship of Private Study and the Sight-Reading Test Scores.

		Years of Private Study on Major Instrument				
	Score Range	1-2	4-6	7-9	10-11	Totals
Sight-Reading Test Scores	121-175	28 (29.3)	11 (14.4)	11 (8.8)	8 (5.5)	58
	61-120	40 (44.0)	25 (21.8)	13 (13.1)	9 (8.1)	87
	1-60	29 (23.7)	12 (11.8)	5 (7.1)	1 (4.4)	47
	Totals	97	48	29	18	192

$$x^2 = 7.92$$

$$x^2_{.05} = 12.59$$

Regarding private study, students were asked if they studied on more than one instrument. One hundred fifty-six

students studied a second instrument and 65 studied a third instrument. Considering all students involved, 228 had private lessons from 1 to 25 accumulated years on one, two or three instruments. The average amount of study was 8.6 years, with forty percent of the students having from 7 to 12 years of study. In testing the hypothesis that greater amounts of study on instruments is related to sight-reading test scores, the observed and expected frequencies are found in Table 27.

Table 27

The Relationship of Accumulated Private Study and the Sight-Reading Test Scores.

		Years of Private Study on all Instruments			
	Score Range	1-9	10-18	19-27	Totals
Sight-Reading Test Scores	121-175	37 (45.4)	28 (19.8)	3 (2.8)	68
	61-120	71 (70.2)	29 (30.7)	5 (4.1)	105
	1-60	43 (35.4)	9 (15.5)	1 (2.1)	53
	Totals	151	66	9	226

$$x^2 = 10.20$$

$$x^2_{.05} = 9.49$$

The obtained chi square value from the contingency table is 10.20, exceeding the x^2 value (9.49) with four degrees of freedom, required for a significant relationship

at the .05 level. It may, therefore, be concluded that a slight but significant relationship occurs between the accumulated amount of private study and the sight-reading test scores. The confirming coefficient of correlation is .183, also significant at the .05 level.

One hundred seven of the students had studied voice privately. The amount of study ranged from one to eight years, with 43 percent having only one year. No relationship was found between voice study and the sight-reading test scores. The coefficient of correlation is -.010 and is not significant.

A highly significant relationship was found to exist in one area of private study. One hundred eighty-seven students reported from one to thirteen years private piano study, with an average of 5.8 years. The research hypothesis is that private piano study and sight-reading ability are related. The null hypothesis is the opposite; that they are unrelated. In Table 28 the observed and expected frequencies are shown. The obtained chi square value is 15.46, exceeding the value needed for significance at the .05 level, with four degrees of freedom (9.49). The null hypothesis is rejected, and it may be concluded that a significant relationship exists between the amount of private piano study and sight-reading ability. This association can further be expressed as a correlation coefficient of .369, significant at the .05 level.

Table 28

The Relationship of Private Piano Study and the Sight-Reading Test Scores.

		Years of Private Piano Study			
	Score Range	1-4	5-8	9-13	Totals
Sight-Reading Test Scores	121-175	15 (24.8)	19 (17.2)	23 (15.0)	57
	61-120	42 (39.2)	26 (27.1)	22 (23.7)	90
	1-60	24 (17.0)	11 (11.7)	4 (10.3)	39
	Totals	81	56	49	186

$$x^2 = 15.46$$

$$x^2_{.05} = 9.49$$

In order to further analyze the data, students' scores were reclassified according to private study experience and the critical ratio test for the difference between independent sample means was applied. It was arbitrarily decided to consider three years as a "significant" amount of private study experience; the sample was therefore divided into two groups for each area of private study: those who had studied three years or more and those who had studied less than three years or none at all. Results from this type of classification and analysis are perhaps more informative. Tables 29a, 29b, and 29c show the means and standard deviations for the sight-reading test scores, classified by major instrument, piano,

and voice study, as well as the z values and probability levels.

Table 29a

Significances of Differences in Sight-Reading Scores by Types of Private Study Experiences.

	Priv.Study on Major Inst. 3 or more years N=131		None & less than 3 yrs. N=126					
Scores	Mean	S.D.	Mean	S.D.	M_1-M_2	$s_{M_1-M_2}$	z	P
Melodic	36.33	22.70	26.54	19.99	9.79	2.68	3.66	.0004*
Rhythmic	63.58	22.66	52.86	26.74	10.72	3.11	3.45	.0006*
Total	99.91	39.94	79.40	41.06	20.51	5.08	4.04	.0001*

Table 29b

Significances of Differences in Sight-Reading Scores by Types of Private Study Experiences.

	Private Piano Study 3 or more years N=136		None & less than 3 yrs. N=123					
Scores	Mean	S.D.	Mean	S.D.	M_1-M_2	$s_{M_1-M_2}$	z	P
Melodic	38.29	21.78	24.16	19.57	14.13	2.58	5.48	.0001*
Rhythmic	62.98	22.50	52.91	21.24	10.07	2.73	3.69	.0004*
Total	101.27	38.69	77.07	41.40	24.20	5.01	4.83	.0001*

*The null hypothesis is rejected. The differences are significant at this level.

Table 29c

Significances of Differences in Sight-Reading Scores by Types of Private Study Experiences.

	Private Voice Study: 3 or more years N=33		Private Voice Study: None & less than 3 yrs. N=226					
Scores	Mean	S.D.	Mean	S.D.	M_1-M_2	$s_{M_1-M_2}$	z	P
Melodic	35.88	20.74	30.96	22.03	4.92	3.95	1.25	.21
Rhythmic	59.85	20.89	57.96	25.94	1.89	4.08	0.46	.65
Total	95.73	36.00	88.91	42.49	6.82	6.97	0.98	.33

In interpreting the data presented in Tables 29a, 29b, and 29c, the null hypothesis states that there is no significant difference in vocal sight-reading ability between those students who have had three or more years private study (in major instrument, piano, and voice respectively) and those who have had none or less than three years of private study. The probability levels in Tables 29a and 29b indicate that the null hypothesis is rejected for all three scores in these areas. Students who had three or more years of private study on their major instrument scored significantly higher in melodic, rhythmic, and total vocal sight-reading than those who had studied less than three years. The same is true for private study in piano. The probability levels in Tables 29c, however, reveal that the null hypothesis must be accepted for private study in voice. Students with three or more years of private study in voice did not score significantly higher in any of the sight-reading scores than did those voice majors

without such experience.

Analysis of Scores by Major Instrument Classification

This section of formal music study concludes with the application of analysis of variance measure for the sight-reading scores. Table 30 shows the means and standard deviations of the melodic, rhythmic, and total sight-reading scores classified by the major performing areas of the students. Tables 31a, 31b, and 31c show the results of analysis of variance as applied to the data of Table 30. The analysis of variance indicates significant difference among classifications, for each the melodic, rhythmic, and total scores, at the .01 level. However, partly because the numbers of percussion and string instrument majors are so small in

Table 30

The Sight-Reading Score Means and Standard Deviations by Major Performance Area Classifications.

Performance Area	N	Melodic Mean	Melodic S.D.	Rhythmic Mean	Rhythmic S.D.	Total Mean	Total S.D.
Woodwind	25	34.08	19.68	72.64	18.16	106.72	17.85
Brass	36	23.00	17.75	61.81	26.19	84.81	38.64
Percussion	4	11.00	4.69	25.25	10.24	36.25	13.48
String	6	47.00	29.98	78.50	8.92	125.50	29.79
Keyboard	74	36.86	24.05	60.59	24.65	97.46	44.72
Voice	112	30.08	20.74	52.61	25.12	82.69	40.96
Total	257	31.53	21.38	58.32	24.12	89.85	44.29

comparison to other groups, it was deemed appropriate to apply t tests for independent sample means to determine the significance of differences between some major performance area classifications. The null hypothesis is that the sample means are not significantly different from each other.

Table 31a

Analysis of Variance for Sight-Reading Test Melodic Scores by Major Performance Area Classifications.

Source of Variance	df	Sum of Squares	Mean Squares	F Test	P
Between Groups	5	8241.54	1648.31		
Within Groups	251	109242.37	435.23		
Total	256	117483.91		3.79	.01

Table 31b

Analysis of Variance for Sight-Reading Test Rhythmic Scores by Major Performance Area Classifications.

Source of Variance	df	Sum of Squares	Mean Squares	F Test	P
Between Groups	5	16415.91	3283.18		
Within Groups	251	133074.38	530.18		
Total	256	149490.30		6.19	.01

Table 31c

Analysis of Variance for Sight-Reading Test Total Scores by Major Performance Area Classifications.

Source of Variance	df	Sum of Squares	Mean Square	F Test	P
Between Groups	5	37174.00	7434.80		
Within Groups	251	467061.67	180.80		
Total	256	504236.67		4.00	.01

The t test results are shown in Tables 32a, 32b, 32c, 32d, 32e, 32f, 32g, 32h. (t tests were not applied to all possible pairs of classifications because of the wide differences in the N's of some pairs.) Means and standard deviations are given in addition to s' (the best estimate of the standard deviation provided by the two samples being tested), the t value, the degrees of freedom, and the probability level.

Table 32a

The t Test of Differences Between Woodwind and Brass Majors in Vocal Sight-Reading.

	Woodwind N=25		Brass N=36					
Scores	Mean	S.D.	Mean	S.D.	s'	t	df	P
Melodic	34.08	19.68	23.00	17.75	18.88	2.26	59	.05*
Rhythmic	72.64	18.16	61.81	26.19	23.63	1.76	59	.10
Total	106.72	27.83	84.81	38.64	35.20	2.39	59	.02*

*The null hypothesis is rejected. The differences are significant at this level.

Table 32b

The t Test of Differences Between Woodwind and Keyboard Majors in Vocal Sight-Reading.

	Woodwind N=25		Keyboard N=74					
Scores	Mean	S.D.	Mean	S.D.	s'	t	df	P
Melodic	34.08	19.68	36.86	24.05	23.26	-0.52	97	.50
Rhythmic	72.64	18.16	60.59	24.65	23.42	2.23	97	.05*
Total	106.72	27.83	97.46	44.72	41.54	0.96	97	.40

Table 32c

The t Test of Differences Between Woodwind and Voice Majors in Vocal Sight-Reading.

	Woodwind N=25		Voice N=112					
Scores	Mean	S.D.	Mean	S.D.	s'	t	df	P
Melodic	34.08	19.68	30.08	20.74	20.70	0.87	135	.40
Rhythmic	72.64	18.16	52.61	25.12	24.18	3.75	135	.001*
Total	106.72	27.83	82.69	40.96	39.18	2.77	135	.01*

Table 32d

The t Test of Differences Between Brass and Voice Majors in Vocal Sight-Reading.

	Brass N=36		Voice N=112					
Scores	Mean	S.D.	Mean	S.D.	s'	t	df	P
Melodic	23.00	17.75	30.08	20.74	20.19	-1.83	146	.10
Rhythmic	61.81	26.19	52.61	25.12	25.56	1.88	146	.10
Total	84.81	38.64	82.69	40.96	40.68	0.27	146	

*The null hypothesis is rejected. The differences are significant at this level.

Table 32e

The t Test of Differences Between String and Woodwind Majors in Vocal Sight-Reading.

	String N=6		Woodwind N=25					
Scores	Mean	S.D.	Mean	S.D.	s'	t	df	P
Melodic	47.00	29.98	34.08	19.68	22.80	1.25	29	.40
Rhythmic	78.50	8.92	72.64	18.16	17.34	0.74	29	
Total	125.50	29.79	106.72	27.83	29.18	1.42	29	.20

Table 32f

The t Test of Differences Between String and Brass Majors in Vocal Sight-Reading.

	String N=6		Brass N=36					
Scores	Mean	S.D.	Mean	S.D.	s'	t	df	P
Melodic	47.00	29.98	23.00	17.75	20.45	1.66	40	.20
Rhythmic	78.50	8.92	61.81	26.19	25.08	1.51	40	.20
Total	125.50	29.79	84.81	38.64	38.43	2.40	40	.05*

Table 32g

The t Test of Differences Between Keyboard and Brass Majors in Vocal Sight-Reading.

	Keyboard N=74		Brass N=36					
Scores	Mean	S.D.	Mean	S.D.	s'	t	df	P
Melodic	36.86	24.05	23.00	17.75	22.39	3.05	108	.01*
Rhythmic	60.59	24.65	61.81	26.19	25.40	-0.25	108	
Total	97.46	44.72	84.81	38.64	43.22	2.88	108	.01*

*The null hypothesis is rejected. The differences are significant at this level.

Table 32h

The t Test of Differences Between Keyboard and Voice Majors in Vocal Sight-Reading.

Scores	Keyboard N=74 Mean	S.D.	Voice N=112 Mean	S.D.	s'	t	df	P
Melodic	36.86	24.05	30.08	20.74	22.24	2.04	184	.05*
Rhythmic	60.59	24.65	52.61	25.12	25.07	2.13	184	.05*
Total	97.46	44.72	82.69	40.96	42.73	2.31	184	.05*

* The null hypothesis is rejected. The differences are significant at this level.

The reader will observe that woodwind majors scored significantly higher (at the .05 level) than brass majors in melodic and total sight-reading scores, significantly higher than keyboard majors in rhythmic scores only, and significantly higher than voice students in rhythm and total scores. Their scores were not significantly higher, at the .05 level, than brass players in rhythm sight-reading, nor were they significantly higher than voice majors in melodic sight-reading.

Although string majors achieved higher mean scores than woodwind majors in all areas of vocal sight-reading, none of the differences were significant. The total score means of string majors were significantly higher than those of brass majors but the difference was not significant for the melodic

or rhythmic score means. Because of the small number of string majors, the t test was not applied to their differences with any of the other major areas.

The t test comparison of brass and voice majors yielded no significant differences, but keyboard majors scored significantly higher than brass majors in both melodic and total vocal sight-reading scores.

It may be observed that not only is the number of the percussion group small but mean and standard deviations for this group are also quite different from those of other groups. This difference made application of the t test to the scores of percussion majors seem inappropriate.

Music Participation Activities

The musical organization experiences of the students were evaluated in order to determine whether or not participation in a performing group associates with the ability to sight-read. Performance in a choral or instrumental ensemble would seem to be closely related to sight-reading due to the necessity to comprehend and interpret music notation. Generally, the more technically advanced the performance, the greater the dependence on notation and the proper interpretation of it.

It might be expected that participation in an organization which involved itself in reading music symbols would

automatically improve sight-reading ability. It might also be expected that the improvement would be in proportion to the amount of time spent in such organizations. Further, it might be expected that participation in a school music ensemble would associate more closely with sight-reading ability than other kinds of group experiences. These expectations are investigated through the analysis of data obtained for the study.

School Choral Ensemble Participation

The students were asked to report their choral music experience in two ways. First, they were asked to give the number of years they participated in a school choral group. Second, they were requested to rate their singing experiences as "none," "little," "moderate," or "much" for three school levels - elementary, junior high and senior high.

When reporting the years of choral ensemble experience, 200 students said they had been a part of a choral organization from one to thirteen years, with the average being four and one-half years. When compared to the sight-reading test scores, no significant association is found between the amount of choral ensemble experience and sight-reading ability. These data produced a coefficient of correlation of .122, which is not significant at the .05 level.

When the students were asked to rate the amount of singing experience during their elementary school years, a slightly significant relationship occurred between their

ratings and the sight-reading test scores. The research hypothesis is that there is a relationship between the amount of singing experience during elementary grades and the sight-reading test scores. The null hypothesis states that these two variables are independent of each other. The data are illustrated in Table 33.

Table 33

The Relationship of Elementary School Singing Experience and the Sight-Reading Test Scores.

		Singing Experience in Elementary School				
	Score Range	None	Little	Moderate	Much	Totals
Sight-Reading Test Scores	121-175	7 (12.7)	32 (30.4)	23 (20.5)	6 (4.4)	68
	61-120	24 (21.9)	47 (52.7)	42 (35.4)	5 (8.0)	118
	1-60	16 (12.4)	34 (29.9)	11 (20.1)	6 (4.6)	67
	Totals	47	113	76	17	253

$$x^2 = 12.86$$

$$x^2_{.05} = 12.59$$

The observed frequencies are shown along with the expected frequencies (in parentheses). The chi square value is 12.86 and since it exceeds 12.59, the value of $x^2_{.05}$ with six degrees of freedom, the null hypothesis can be rejected. It is thus shown that a significant relationship exists between the amount of elementary school singing experience and sight-reading

ability. This relationship is further expressed by a correlation coefficient of .161, slight but significant at the .05 level.

During the junior high and senior high school periods fewer students checked little or no singing experiences. This makes it less possible to show whether or not the greater amount of singing experience relates to sight-reading ability. The chi square test shows no significant association. The correlation coefficients for these variables, .052 and -.021, respectively, are not significant at the .05 level.

School Instrumental Ensemble Participation

The students were asked to indicate the number of years they had participated in a school instrumental ensemble. One hundred fifty-three reported being a part of an instrumental organization from one to thirteen years. When applying the chi square test, analysis of the data makes it apparent that no significant association can be shown between a greater number of years of instrumental ensemble experience and high sight-reading test scores. This data produced a coefficient of correlation of .069, which is insignificant.

The students were also asked to rate the amount of instrumental experience in elementary, junior high, and senior high grades by checking "none," "little," "moderate," or "much" on the data sheet. At all three levels an important association is shown. The most significant association occurred at the junior high school level. The first research

hypothesis in testing for the associations in this area is that elementary school instrumental experience and sight-reading ability are related. The null hypothesis is that these two variables are not related.

Table 34

The Relationship of Elementary Instrumental Experience and the Sight-Reading Test Scores.

Sight-Reading Test Scores: Score Range	Instrumental Experience in Elementary School: None	Little	Moderate	Much	Totals
121-175	12 (18.7)	18 (24.4)	27 (17.2)	11 (7.7)	68
61-120	29 (31.9)	46 (41.6)	29 (29.7)	12 (12.8)	116
1-60	28 (18.4)	26 (24.0)	8 (17.1)	5 (7.5)	67
Totals	69	90	64	28	251

$x^2 = 22.73$

$x^2_{.05} = 12.59$

Table 34 illustrates the theoretical frequencies (in parentheses) and the observed frequencies. When applying the chi square test, the obtained value of x^2 is 22.73, and since this exceeds 12.59, the value of x^2 at the .05 level of significance for 6 degrees of freedom, the null hypothesis can be rejected. It may be concluded that the alternate hypothesis is true; the amount of instrumental experience during elementary school is significantly related to the

sight-reading test scores. This relationship is further expressed by the correlation coefficient of .261, significant at the .05 level.

The second hypothesis in testing for association in this area is that junior high school instrumental experience and sight-reading ability are related. The null hypothesis is that these two variables are not related.

Table 35

The Relationship of Junior High Instrumental Experience and the Sight-Reading Test Scores.

Sight-Reading Test Scores: Score Range	Instrumental Experience in Junior High School: None	Little	Moderate	Much	Totals
121-175	0 (9.2)	8 (11.7)	29 (23.1)	31 (24.0)	68
61-120	18 (15.6)	17 (19.7)	34 (38.9)	46 (40.8)	115
1-60	16 (9.2)	18 (11.6)	22 (23.0)	12 (24.2)	68
Totals	34	43	85	89	251

$$x^2 = 30.69$$

$$x^2_{.05} = 12.59$$

Table 35 illustrates the theoretical frequencies (in parentheses) and the observed frequencies. When applying the chi square test, the obtained value of x^2 is 30.69, and since this exceeds 12.59, the value of x^2 at the .05 level of significance for six degrees of freedom, the null hypothesis

is rejected. It may be concluded that the alternate hypothesis is true; the amount of instrumental experience during junior high school is significantly related to the sight-reading test scores. This relationship can further be expressed by the correlation coefficient of .338, significant at the .05 level.

The final hypothesis in testing for association in this area is that senior high school instrumental experience and sight-reading ability are related. The null hypothesis is that these two variables are not related.

Table 36

The Relationship of Senior High Instrumental Experience and the Sight-Reading Test Scores.

Sight-Reading Test Scores: Score Range	Instrumental Experience in Senior High School: None	Little	Moderate	Much	Totals
121-175	1 (8.3)	7 (8.1)	16 (15.6)	44 (36.0)	68
61-120	14 (14.3)	14 (13.8)	23 (26.7)	65 (61.2)	116
1-60	16 (8.4)	9 (8.1)	19 (15.7)	24 (35.8)	68
Totals	31	30	58	133	252

$$x^2 = 20.68$$

$$x^2_{.05} = 12.59$$

Table 36 illustrates the theoretical frequencies (in parentheses) and the observed frequencies. When applying

the chi square test, the obtained value is 20.68, and since this exceeds 12.59, the value of x^2 at the .05 level of significance for six degrees of freedom, the null hypothesis can be rejected. It may be concluded that the alternate hypothesis is true; the amount of instrumental experience during senior high school is significantly related to the sight-reading test scores. This relationship is further expressed by the correlation coefficient of .284, significant at the .05 level.

Table 37

The Relationship of Combined Ensemble Experience and the Sight-Reading Test Scores.

Sight-Reading Test Scores: Score Range	Years of Choral & Instrumental Ensemble Experience: 1-2	3-4	5-6	7 or more	Totals
121-175	9 (13.2)	39 (35.1)	13 (13.2)	8 (7.5)	69
61-120	21 (22.5)	63 (64.6)	26 (22.5)	7 (7.4)	117
1-60	18 (12.3)	32 (34.3)	9 (12.3)	5 (5.1)	64
Totals	48	134	48	20	250

$x^2 = 9.67$

$x^2_{.05} = 12.59$

In Table 37, a comparison of the combined years of choral and instrumental ensemble experience to the sight-reading test scores was made. The null hypothesis is that the years of

experience are unrelated to the sight-reading test scores. The obtained chi square value of Table 37 was 9.67. To be significant at the .05 level, for six degrees of freedom, the x^2 value must be 12.59; therefore, the null hypothesis is accepted. A significant relationship cannot be shown by the chi square test. As found in the correlation matrix in Appendix D, a slight relationship is expressed by the correlation coefficient of .163, significant at the .05 level.

Church and Non-School Participation

The music data sheet requested the respondents to give the number of years of activity in church choirs and other non-school groups. Over four-fifths of the sample had participated in such groups. In no case was there a significant association between the amount of this kind of experience and the sight-reading test scores.

Keyboard Accompanying Experience

Keyboard accompanying can be considered both a performing experience and an instructional procedure. The students were asked to report the number of years of experience in accompanying. One hundred two students had done accompanying, but no significant relationship is found between their years of accompanying experience and the sight-reading test scores. The correlation coefficient obtained was .106, which is not significant at the .05 level.

To further analyze the participation data, the sight-reading scores were also grouped by type of experience and the critical ratio test for the difference between independent sample means was applied. It was arbitrarily decided to establish three years as a "significant" amount of participation experience; therefore, the sample was divided into two groups for each type of participation: (1) those who had three or more years of experience, and (2) those who had less than three years experience. The findings from this type of analysis are perhaps more informative than in the previous treatment. Tables 38a, 38b, 38c, 38d, and 38e show the means and standard deviations for the sight-reading test scores, classified by these kinds of participation experience: (1) school instrumental ensemble, (2) school choral ensemble, (3) church choir, (4) non-school, non-church ensemble, and (5) accompanying.

Table 38a

Significance of Differences in Sight-Reading Test Scores by Types of Music Participation Experience.

	Inst. Ensemble Experience							
	3 or more years N=124		None & less than 3 yrs. N=135					
Scores	Mean	S.D.	Mean	S.D.	M_1-M_2	$s_{M_1-M_2}$	z	P
Melodic	32.06	21.18	31.14	22.60	0.92	2.73	0.34	.74
Rhythmic	62.19	25.00	54.53	25.15	7.66	3.13	2.45	.01*
Total	94.25	39.73	85.67	43.20	8.58	5.17	1.66	.10

*The null hypothesis is rejected. The differences are significant at this level.

Table 38b

	School Chorus Experience							
	3 or more years N=151		None & less than 3 yrs. N=108					
Scores	Mean	S.D.	Mean	S.D.	M_1-M_2	$s_{M_1-M_2}$	z	P
Melodic	36.46	22.29	24.77	19.46	11.69	2.62	4.47	.0001*
Rhythmic	58.15	24.15	58.26	27.00	-0.08	3.27	-0.02	.98
Total	94.61	41.78	83.03	40.86	11.58	5.22	2.22	.03*

Table 38c

	Church Choir Experience							
	3 or more years N=156		None & less than 3 yrs. N=103					
Scores	Mean	S.D.	Mean	S.D.	M_1-M_2	$s_{M_1-M_2}$	z	P
Melodic	33.29	21.42	28.99	22.44	4.30	2.81	1.53	.13
Rhythmic	57.42	25.42	59.38	25.26	-1.96	3.23	-0.61	.54
Total	90.71	41.60	88.37	42.06	2.34	5.34	0.44	.66

Table 38d

	Non-school, non-church Music Experience							
	3 or more years N=47		None & less than 3 yrs. N=212					
Scores	Mean	S.D.	Mean	S.D.	M_1-M_2	$s_{M_1-M_2}$	z	P
Melodic	33.87	20.45	31.08	22.22	2.79	3.38	0.83	.41
Rhythmic	56.91	24.57	58.48	25.54	-1.57	4.03	-0.39	.70
Total	90.79	39.06	89.56	42.37	1.23	6.46	0.19	.85

*The null hypothesis is rejected. The differences are significant at this level.

Table 38e

	Accompanying Experience: 3 or more years N=63		None & less than 3 yrs. N=196					
Scores	Mean	S.D.	Mean	S.D.	M_1-M_2	$s_{M_1-M_2}$	z	P
Melodic	41.76	22.41	28.31	20.74	13.45	3.21	4.19	.0001*
Rhythmic	67.32	23.65	55.27	25.20	12.05	3.51	3.44	.0006*
Total	109.08	40.74	83.58	40.20	25.90	5.92	4.37	.0001*

*The null hypothesis is rejected. The differences are significant at this level.

For interpreting Tables 38a, 38b, 38c, 38d and 38e, the null hypothesis states that there is no significant difference between the sight-reading ability of the students who have had three or more years of participation experience and of those students who have had less than three years experience. The probability levels in Table 38a indicate the null hypothesis must be accepted for instrumental ensemble experience, with one exception: the difference in rhythmic scores is significant. Table 38b shows that those having three or more years of school choral experience scored exceptionally higher in the melodic scores, which in turn was reflected in a significant difference in the total scores. Interestingly, the instrumental experience showed a significant difference in rhythm, whereas the choral experience had greater bearing on the melodic scores.

As illustrated in Tables 38c and 38d, neither church

choir experience nor non-school, non-church ensemble experience showed significant differences. Table 38e shows that the null hypothesis is rejected regarding accompanying experience. Those having three or more years of experience scored significantly higher on the sight-reading test in all three categories. Although only conjecture, it may be that those with more accompanying experience were the best and more experienced pianists also.

Summary

This section of the study was devoted to an analysis of the data relative to the formal influences the students experienced and whether or not these experiences can be associated with sight-reading ability. The data investigated were in six categories, namely, (1) performance on the Aliferis Music Achievement Test, (2) average grade in music theory, (3) ratings of performance on the major instrument and in contests, (4) performance on the ACT test, (5) formal music study courses, and (6) participation activities in performance groups.

The Aliferis test is designed to measure music achievement at the college entrance level. Although the scores of the students in this sample tended to be slightly lower than the national average, the scores in all three sections of the test -- melodic, harmonic, rhythmic -- showed a strong relationship to the scores on the sight-reading test. The students who scored higher on the achievement test scored considerably higher on the sight-reading test than those who were low

scorers. The relationships were expressed in highly significant chi square values and correlation coefficients. Comparison of the total scores of the Aliferis test and the sight-reading test revealed a coefficient of correlation of .625.

When the average grades in freshman music theory (after four weeks of the course) were compared to the sight-reading scores, it became evident that a strong relationship exists between achievement in a theory class and sight-reading ability.

A similar relationship was found when comparing the sight-reading scores with the instructors' ratings of the students' performance abilities in their major areas. With a correlation coefficient of .433, this relationship appeared stronger than that of the theory grade. Superior performance ability has a close association with sight-reading ability.

Somewhat foreign to music environmental experiences, yet believed to be an important comparison, was the investigation of the students' ACT standard scores. Here again, those who received higher ACT scores proved to be better sight-readers. This relationship confirms that general academic achievement has a direct relationship to sight-reading ability.

Next, the formal music study experiences of the students prior to entering college were analyzed. With regard to courses in general music, only slight relationships were found, specifically during the junior high and senior high school years.

Only seventy-eight of the 260 students in this study had been enrolled in a high school written theory course. Forty-one students reportedly had some high school instruction in aural theory, either combined with the written theory, or separate. Possibly because of the small frequency, no significant relationship was found between aural theory instruction and the sight-reading test scores. However, the influence of a high school written theory course, experienced by 78 students, did show a moderate relationship to the sight-reading scores.

The amount of private study on the major performing instrument showed a slight relationship to sight-reading test scores by application of the correlation and chi square tests. The critical ratio test results showed that those with three or more years of private study on the major instrument scored significantly higher on the sight-reading test than those with less than three years or no private study. A stronger association was found among those students who had studied up to three instruments. One hundred seven students reported having studied voice privately, yet a negative, though insignificant, correlation was found. Both the critical ratio and the chi square tests showed highly significant relationship between private piano study and the sight-reading test scores, further expressed by the correlation coefficient of .369. It would seem that piano instruction might be an important factor in improving sight-

reading ability.

The sight-reading test scores were classified by major performance areas, and the analysis of variance measure applied to the means. Differences were found and the t test was applied to determine their significance. The results showed that woodwind majors scored significantly higher than brass majors in melodic and total scores, significantly higher in rhythm than keyboard majors, and higher in rhythm and total scores than voice majors. Keyboard majors scored significantly higher than brass majors in melodic and total scores, and they scored significantly higher than voice majors in all areas. String majors scored significantly higher than brass majors in total scores only; their scores were not significantly higher than those of the woodwind majors.

When investigating the ensemble experiences of the students, the chi square test results indicated the amount of choral ensemble experience showed no significant relationship to sight-reading ability. However, the critical ratio test showed that those having three or more years of choral experience scored significantly higher in melodic and total scores. The students were asked to rate the amount of their singing experiences at the elementary, junior high and senior high school levels; a slight but significant relationship was found at the elementary level only.

The chi square test and the correlation coefficients indicate the school instrumental experiences of the students have a

significant relationship to the sight-reading test scores at all three levels -- elementary, junior high school and senior high school -- with the strongest relationship existing between junior high experience and the sight-reading test scores. The number of years' experience in an instrumental ensemble has very little association with the sight-reading test scores, but students' ratings of how much experience they had shows significant association. The critical ratio test indicated that those with three or more years experience scored significantly higher in rhythm.

Although a majority of students participated in church choirs and other non-school ensembles, no important associations were found. Those reporting three or more years of keyboard accompanying experience scored significantly higher in all three sight-reading categories.

The strongest associations found in the analysis of this data relating to formal influences were in the area of achievement in music theory courses, the Aliferis Achievement test, superior performance on the major instrument, high ACT scores, participating in instrumental school ensembles, and private piano study.

CHAPTER V

STUDENT SELF-EVALUATIONS

In addition to soliciting information about the student's past experiences in his particular music environment and relating these to his sight-reading ability, each student was asked to make self-evaluations concerning the method of sight-reading he used. He was also asked to rate how much certain factors and experiences contributed to his current sight-reading ability, thus indicating what he felt had been most beneficial in his development. It is possible that an insufficient knowledge of the various sight-reading methods and personal prejudice in self-evaluation could account for errors in judgement, yet it was expected that self-evaluation results might provide valuable information. It was also considered possible that relating the self-evaluation answers to the data derived from testing and the data sheet responses might support or qualify conclusions already reached.

Sight-Reading Methods

The students were asked to indicate which of the following method(s) they used when reading unfamiliar music: (1) perfect pitch, (2) fixed "do", (3) movable "do", (4) interval approach, (5) guessing, and (6) instrument fingering association.

Each method was defined (see Administrator's Guide in Appendix A) and the students were permitted to check more than one method if they felt they relied on more than one procedure for sight-reading.

In the analysis of this data, the first hypothesis to be tested is that the "perfect pitch" method of sight-reading is related to the scores on the sight-reading test, or in other words sight-reading ability. The theoretical frequencies (in parentheses) and observed frequencies providing a basis for the chi square computation are shown in Table 39. The null hypothesis was that this method of sight-reading is unrelated to the sight-reading test scores.

The obtained value of chi square for the relationship of the "perfect pitch" method and sight-reading scores is 15.38, which exceeds the tabular value of chi square (9.49) necessary to reject the null hypothesis at the .05 level. The null hypothesis is therefore rejected and the alternate hypothesis, that the employment of the "perfect pitch" method of sight-reading can be related to higher sight-reading test scores, is accepted. The validity of this conclusion is open to question, however, since such a small proportion of the sample indicated use of the "perfect pitch" method.

Regarding the use of the "fixed 'do'" method, only 33 out of 260 (13 percent) indicated they used this method to some degree. Application of the chi square test to a contingency table showed no significant relationship at the

.05 level of significance.

Table 39

The Relationship of the "Perfect Pitch" Method and the Sight-Reading Test Scores.

Sight-Reading Test Scores: Score Range	"Perfect Pitch" Method of Sight-Reading: No	Yes	Totals
145-175	22 (24.4)	3 (0.6)	25
109-144	61 (62.5)	3 (1.5)	64
73-108	82 (80.1)	0 (1.9)	82
37-72	62 (60.6)	0 (1.4)	62
1-36	27 (26.4)	0 (0.6)	27
Totals	254	6	260

$$x^2 = 15.38$$

$$x^2_{.05} = 9.49$$

One hundred one of the 260 student sample said they used the "movable 'do'" method. Their use of this method when related to the sight-reading test scores, showed no significant relationship to the sight-reading scores. The calculated chi square value was less than the tabular value at the .05 level of significance.

The fourth method of sight-reading listed on the data sheet was the "interval approach." Of 259 students, 139

reported using the interval approach some of the time. The number of students scoring in the various score ranges are shown in Table 40.

Table 40

The Relationship of the "Interval Approach" Method and the Sight-Reading Test Scores.

Sight-Reading Test Scores: Score Range	"Interval Approach" Method of Sight-Reading: No	Yes	Totals
145-175	7 (11.6)	18 (13.4)	25
109-144	23 (29.2)	40 (33.8)	63
73-108	34 (38.0)	48 (44.0)	82
37-72	38 (28.7)	24 (33.3)	62
1-36	18 (12.5)	9 (14.5)	27
Totals	120	139	259

$$x^2 = 16.76$$

$$x^2_{.05} = 9.49$$

The research hypothesis is that the use of the "interval approach" to sight-reading is related to the sight-reading test scores. The null hypothesis states that sight-reading test scores are independent of the use of the method. The contingency table shows both the observed and theoretical frequencies (in parentheses) utilized for the chi square test.

The obtained value of chi square is 16.76, considerably higher than the 9.49 value necessary to reject the null hypothesis at the .05 level. The null hypothesis is rejected; therefore, the alternate hypothesis is regarded as true. It may be concluded that the utilization of the "interval approach" to sight-reading is related to the sight-reading test scores.

It was anticipated that most students would check "guessing" as one of the sight-reading methods used; however, only 116 of the 260 student sample reported "guessing" at the melodic intervals and rhythmic values as a method of sight-reading. The null hypothesis for testing is that utilization of the "guessing" method bears no relation to sight-reading ability, and specifically, the sight-reading test scores. Table 41 illustrates the observed and theoretical frequencies. The chi square test was applied, and a slightly greater value, 11.97, was obtained than that required for significance at the .05 level. Thus the null hypothesis is rejected. The alternate hypothesis, that the "guessing" method of sight-reading can be associated with the sight-reading test scores, may be accepted. Observation of the values in the contingency table indicates that this is a negative relationship, that is, higher scores were achieved by those who indicated they did not use this method.

The last method listed on the data sheet was "instrument fingering association." It is a less popular approach

Table 41

The Relationship of the "Guessing" Method and the Sight-Reading Test Scores.

Sight-Reading Test Scores: Score Range	"Guessing" Method of Sight-Reading: No	Yes	Totals
145-175	18 (14.0)	7 (11.0)	25
109-144	42 (35.4)	22 (28.6)	64
73-108	38 (45.4)	44 (36.6)	82
37-72	36 (34.3)	26 (27.7)	62
1-36	10 (15.0)	17 (12.0)	27
Totals	144	116	260

$$x^2 = 11.97$$

$$x^2_{.05} = 9.49$$

to sight-reading, so the administrator of the data-gathering process was careful to define it fully (see Appendix A, Administrator's Guidelines). Ninety-five of the 260 students said they used this sight-reading method. The analysis of the sight-reading test scores of those using this method, and the application of the chi square test, showed a value less than that necessary to reject a null hypothesis at the .05 probability level. Thus it must be concluded that there is no relationship, either positive or negative, of the

"instrument fingering association" method of sight-reading with the sight-reading test scores.

The students' scores, classified by the methods of sight-reading, were further analyzed by application of the critical ratio test for the difference between independent means. Results from these tests support the findings using the chi square test. Because of the disproportion (only six of the 259 sample) no statistical test seemed appropriate for the "perfect pitch" method. However, a comparison of the means show an obvious significance. The mean for the melodic score for those using "perfect pitch" was 58.00 while the mean for those who did not was 30.96. The rhythmic score means were 84.67 and 57.57, respectively. The total score mean for those using the method was 142.67, whereas those not using "perfect pitch" had a mean of 88.53.

There were no significant differences in the tests for those using "fixed 'do'," "movable 'do'" or the "instrumental fingering association" methods. Tables 42a and 42b show the means and standard deviations for the sight-reading test scores of those using the "interval approach" and "guessing" methods, as well as the z values and probability levels.

In interpreting the data presented in Tables 42a and 42b, the null hypothesis states that there is no significant difference in sight-reading ability between those students who used the methods ("interval approach" and "guessing," respectively) and those who did not. The probability levels

Table 42a

Significance of Differences in the Sight-Reading Test Scores by Methods of Sight-Reading.

Scores	Interval Approach N=139 Mean	S.D.	Others N=129 Mean	S.D.	M_1-M_2	$s_{M_1-M_2}$	z	P
Melodic	36.54	21.35	25.84	21.19	10.7	2.61	4.10	.0001*
Rhythmic	64.73	22.98	50.63	25.89	14.1	3.01	4.68	.0001*
Total	101.27	38.43	76.47	41.57	24.8	4.92	5.04	.0001*

Table 42b

Significance of Differences in the Sight-Reading Test Scores by Methods of Sight-Reading.

Scores	Guessing N=114 Mean	S.D.	Others N=145 Mean	S.D.	M_1-M_2	$s_{M_1-M_2}$	z	P
Melodic	25.17	18.97	36.63	22.77	-11.46	2.60	-4.40	.0001*
Rhythmic	55.03	25.96	60.69	24.61	-5.66	3.19	-1.77	.08
Totals	80.19	39.19	97.32	42.22	-17.13	5.10	-3.36	.0008*

*The null hypothesis is rejected. The differences are significant at this level.

indicate that the null hypothesis is rejected for all but one score category - the rhythm score in Table 42b. Students who used the "interval approach" method received significantly higher melodic, rhythmic, and total sight-reading scores. The reader will notice that in Table 42b the z values are negative, substantiating the results of the chi square test; that those who did not employ the

"guessing" method scored significantly higher than those who stated they used the "guessing" method of sight-reading.

In this study, it appears that the sight-reading methods used most successfully by the 260 student sample are two: namely, "interval approach" and "perfect pitch." Both of these methods show significant levels of association with the sight-reading test scores. The "guessing" method,as might be expected, showed a significantly negative relationship to sight-reading test scores.

Factors Contributing to Sight-Reading Ability

The final items on the data sheet asked the students to rate fifteen influences as to the amount they felt these influences contributed to their sight-reading ability. The students were to use the rating scale - "none," "little," "moderate," and "much." The fifteen experiences were:

(1) Family music experiences
(2) Elementary school music class experiences
(3) Junior high school music class experiences
(4) Senior high school music class experiences
(5) Elementary school music ensemble experiences
(6) Junior high instrumental music ensemble experiences
(7) Senior high instrumental music ensemble experiences
(8) Junior high choral music ensemble experiences
(9) Senior high choral music ensemble experiences
(10) College music ensemble experiences
(11) College music classes experiences

(12) Church and/or community ensemble experiences

(13) Private piano study

(14) Private voice study

(15) Private study on major instrument

These items summarize the areas the students were asked about by the preceding items on the data sheet. The important difference is that their responses to these fifteen items required them to self-evaluate the influence of their environmental experiences. Subsequently, each item was paired with the total scores of the sight-reading test to find whether or not there was association. After establishing contingency tables with observed and theoretical frequencies, the degree of relationship was then tested by application of the chi square test. Only five of the fifteen variables showed a relationship significant at the .05 level of significance. The findings are reported in the tables and narration to follow.

The first hypothesis to be tested was that an association can be found between the influence of "family music experiences" and the sight-reading test scores. As shown in Table 43, a majority of the students, 234, rated this variable. In order to test for a relationship, the null hypothesis states the independence of the two variables. After establishing the observed and theoretical frequencies in a contingency table, a chi square test was calculated, and a slight relationship, significant at the .05 level, was found. The obtained x^2 value is 12.93, just slightly higher than the tabular value

(12.59) of $x^2_{.05}$, required for rejection of the null hypothesis. The null hypothesis is therefore rejected and it may be concluded that the alternate hypothesis is true: the greater the amount of family music experiences, the higher the scores on the sight-reading test.

Table 43

The Relationship of Family Music Experience and the Sight-Reading Test Scores.

		Family Music Experience				
	Score Range	None	Little	Moderate	Much	Totals
Sight-Reading Test Scores	121-175	16 (24.9)	18 (18.2)	15 (11.5)	15 (9.4)	64
	61-120	50 (42.8)	31 (31.0)	14 (19.7)	15 (16.5)	110
	1-60	25 (23.3)	17 (16.9)	13 (10.8)	5 (9.0)	60
	Totals	91	66	42	35	234

$x^2 = 12.93$

$x^2_{.05} = 12.59$

Tables 44 and 45 deal with similar comparisons; however, the findings they illustrate are important. The research hypotheses here are that the influence of Elementary Music Classes and the influence of Junior High General Music contribute to sight-reading ability. A large part of the sample rated these influences. To test these variables, the null hypothesis that these measures were unrelated to sight-reading

ability was assumed. The application of the chi square test to the frequencies in Tables 44 and 45 disprove the null hypothesis. For Table 44 the obtained x^2 value, 15.65, is higher than the tabular value of $x^2_{.05}$, which is 12.59. The obtained and tabular values of x^2 are equal in Table 45. Therefore, the null hypothesis is rejected in both cases. It may be concluded that the research hypotheses are true; the greater the rating of the influence of Elementary Music Classes and Junior High General Music Classes, the better the sight-reading test scores.

Table 44

The Relationship of Elementary Music Classes and the Sight-Reading Test Scores.

		Elementary Music Classes				
	Score Range	None	Little	Moderate	Much	Totals
Sight-Reading Test Scores	121-175	13 (19.9)	30 (32.8)	19 (11.4)	4 (1.9)	66
	61-120	35 (33.5)	60 (55.0)	15 (19.3)	1 (3.2)	111
	1-60	25 (19.6)	30 (32.2)	8 (11.3)	2 (1.9)	65
	Totals	73	120	42	7	242

$x^2 = 15.65$

$x^2_{.05} = 12.59$

Table 45

The Relationship of Junior High General Music and the Sight-Reading Test Scores.

		Junior High General Music				
	Score Range	None	Little	Moderate	Much	Totals
Sight-Reading Test Scores	121-175	7 (12.1)	18 (19.7)	23 (22.4)	12 (6.4)	60
	61-120	23 (20.8)	33 (33.7)	42 (38.3)	5 (9.8)	103
	1-60	15 (12.1)	22 (19.6)	18 (22.3)	5 (6.0)	60
	Totals	45	73	83	22	223

$x^2 = 12.59$

$x^2_{.05} = 12.59$

In this study, the students' ratings of the influence of choral ensemble experience on their sight-reading ability shows a stronger association than the ratings of the influence of instrumental ensemble experience. Specifically, the research hypothesis here is that the influence of choral ensemble experience can be associated with the sight-reading scores. Table 46 illustrates the relationship between the ratings of junior high school choral ensemble experience and sight-reading ability. The obtained x^2 value is 15.32; and the required chi square value to be significant at the .05 level is 12.59. The null hypothesis is rejected and it may be concluded that the student-rated influence of junior high

school choral ensemble experience is significantly related to the sight-reading test scores.

Table 46

The Relationship of Junior High School Choral Ensemble and the Sight-Reading Test Scores.

		Junior High School Choral Ensemble				
	Score Range	None	Little	Moderate	Much	Totals
Sight-Reading Test Scores	121-175	17 (20.9)	5 (11.0)	24 (18.0)	8 (4.1)	54
	61-120	35 (36.5)	24 (19.2)	30 (31.3)	5 (7.0)	94
	1-60	26 (20.6)	12 (10.8)	13 (17.7)	2 (3.9)	53
	Totals	78	41	67	15	201

$x^2 = 15.32$

$x^2_{.05} = 12.59$

Another hypothesis was that senior high school instrumental ensemble experience ratings can be related to sight-reading test scores. Table 47 is shown because it shows the obtained x^2 value, 12.27, to be only slightly lower than the value (12.59) required for rejection of the null hypothesis at the .05 level. Although the null hypothesis cannot be rejected in this case, the relationship between the student-rated influence of senior high instrumental ensemble experience and the sight-reading test scores approaches significance.

Table 47

The Relationship of Senior High Instrumental Ensemble and the Sight-Reading Test Scores.

Sight-Reading Test Scores: Score Range	Senior High Instrumental Ensemble: None	Little	Moderate	Much	Totals
121-175	14 (19.4)	7 (5.1)	6 (7.6)	22 (16.9)	49
61-120	35 (38.5)	10 (10.0)	17 (15.0)	35 (35.5)	97
1-60	28 (19.1)	3 (4.9)	7 (7.4)	10 (16.6)	48
Totals	77	20	30	67	194

$x^2 = 12.27$

$x^2_{.05} = 12.59$

The most significant relationship was found when testing the hypothesis that private piano study contributed to sight-reading ability. Table 48 shows the frequencies, both observed and theoretical, of each cell of the contingency table. The chi square value was calculated and found to be 27.90, while the required value of $x^2_{.05}$ is 12.59. The null hypothesis is rejected, and it can be concluded that the alternate hypothesis is true. Private piano study was rated highly by the students as a strong influence on their sight-reading ability; the greater the rated influence, the higher the sight-reading test scores.

Table 48

The Relationship of Piano Study and the Sight-Reading Test Scores (Student Evaluations).

Private Piano Study

Sight-Reading Test Scores: Score Range	None	Little	Moderate	Much	Totals
121-175	6 (12.8)	6 (11.3)	11 (11.9)	41 (28.0)	64
61-120	17 (20.7)	25 (18.4)	20 (19.3)	42 (45.6)	104
1-60	22 (11.5)	9 (10.3)	11 (10.8)	16 (25.4)	58
Totals	45	40	42	99	226

$x^2 = 27.90$

$x^2_{.05} = 12.59$

Of the fifteen influences rated by the students, only five showed a significant relationship to sight-reading test scores at the .05 level. The influences showing significant associations were: (1) family music experiences, (2) elementary music classes, (3) junior high general music classes, (4) junior high choral ensemble, and (5) private piano study. The strongest association was found between private piano study and the sight-reading test scores.

Private Study Influences

Shown in Table 49 are means and standard deviations of the sight-reading scores classified by the students' self-evaluations of those private study experiences which had the

greatest influence on their vocal sight-reading ability. Those students rating the influence as "moderate" or "much" are classified in the table by the particular type, or combination of types, of private study rated. One hundred ninety-nine of the total sample gave ratings in these areas.

Table 49

The Sight-Reading Score Means and Standard Deviations Classified by Student Evaluations of the Greatest Influence on Sight-Reading Ability.

Influences	Number	Melodic Mean	Melodic S.D.	Rhythmic Mean	Rhythmic S.D.	Total Mean	Total S.D.
Private Piano	21	36.00	26.07	54.29	24.33	90.29	46.09
Private Voice	8	21.88	19.77	44.75	29.14	66.63	45.11
Major Instrument	32	25.59	19.60	60.16	25.25	85.75	38.25
Piano and Voice	7	39.43	16.94	59.57	25.15	99.00	35.08
Piano and Major Inst.	50	39.84	21.77	68.74	20.14	108.58	37.09
Voice and Major Inst.	22	23.86	18.74	48.23	23.08	72.09	38.04
Piano, Voice & Major Inst.	59	37.15	21.49	61.71	24.49	98.86	40.75
Total	199	38.84	21.31	60.20	23.67	94.04	39.78

Tables 50a, 50b and 50c indicate the results of analysis of variance application to the self-evaluation data for melodic, rhythmic, and total scores, respectively. The reader will note that there is a significant difference among

the means of these groups, at the .01 level, for all three sight-reading scores.

Table 50a

Analysis of Variance for Melodic Sight-Reading Scores by Student Evaluations of Greatest Influence on Sight-Reading Ability.

Source of Variance	df	Sum of Squares	Mean Square	F Test	P
Between Groups	6	8276.67	1379.44		
Within Groups	192	82094.72	427.58		
Total	198	90371.39		3.23	.01

Table 50b

Analysis of Variance for Rhythmic Sight-Reading Scores by Student Evaluations of Greatest Influence on Sight-Reading Ability.

Source of Variance	df	Sum of Squares	Mean Square	F Test	P
Between Groups	6	9579.22	1596.54		
Within Groups	192	101892.74	530.69		
Total	198	111471.96		3.01	.01

Table 50c

Analysis of Variance for Total Sight-Reading Scores by Student Evaluations of Greatest Influence on Sight-Reading Ability.

Source of Variance	df	Sum of Squares	Mean Square	F Test	P
Between Groups	6	31218.11	5203.02		
Within Groups	192	283694.99	1477.58		
Total	198	314913.10		3.52	.01

In order to further interpret the "opinion" data, the t test for independent sample means was applied, specifically to determine, at least in part, where significant differences occurred. Since the "piano and major instrument" study category showed the highest mean score on the total test, it was compared with other classifications, in descending order of total test mean score, until consistent, significant differences were found. Tables 51a, 51b, 51c, 51d, and 51e show the results of these tests.

Table 51a

t Test of Differences in Sight-Reading Scores According to Evaluations of Greatest Influence on Sight-Reading Ability.

Scores	Piano & Major Inst. N=50 Mean	S.D.	Piano & Voice N=7 Mean	S.D.	s'	t	df	P
Melodic	39.85	21.77	39.43	16.94	21.62	0.05	55	
Rhythmic	68.74	20.14	59.57	25.15	21.19	1.07	55	.40
Total	108.58	37.09	99.00	35.08	37.51	0.63	55	

Table 51b

t Test of Differences in Sight-Reading Scores According to Evaluations of Greatest Influence on Sight-Reading Ability.

Scores	Piano & Major Inst. N=50 Mean	S.D.	Piano, Voice & Major Inst. N=59 Mean	S.D.	s'	t	df	P
Melodic	39.84	21.77	37.15	21.49	21.65	0.65	107	
Rhythmic	68.74	20.14	61.71	24.49	22.81	1.61	107	.20
Total	108.58	37.09	98.86	40.75	39.48	1.28	107	.40

Table 51c

t Test of Differences in Sight-Reading Scores According to Evaluations of Greatest Influence on Sight-Reading Ability.

Scores	Piano & Major Inst. N=50 Mean	S.D.	Piano N=21 Mean	S.D.	s'	t	df	P
Melodic	39.84	21.77	36.00	26.07	23.46	0.63	69	
Rhythmic	68.74	20.14	54.29	24.33	21.77	2.55	69	.02*
Total	108.58	37.09	90.29	46.09	40.54	1.74	69	.10

Table 51d

t Test of Differences in Sight-Reading Scores According to Evaluations of Greatest Influence on Sight-Reading Ability.

Scores	Piano & Major Inst. N=50 Mean	S.D.	Major Inst. N=32 Mean	S.D.	s'	t	df	P
Melodic	39.84	21.77	25.59	19.60	21.21	2.97	80	.01*
Rhythmic	68.74	20.14	60.16	25.27	22.56	1.68	80	.10
Total	108.58	37.09	85.75	38.25	38.01	2.66	80	.01*

Table 51e

t Test of Differences in Sight-Reading Scores According to Evaluations of Greatest Influence on Sight-Reading Ability.

Scores	Piano & Major Inst. N=50 Mean	S.D.	Voice & Major Inst. N=22 Mean	S.D.	s'	t	df	P
Melodic	39.84	21.77	23.86	18.74	21.19	2.95	70	.001*
Rhythmic	68.74	20.14	48.23	23.08	21.38	3.75	70	.001*
Total	108.58	37.09	72.09	38.04	37.88	3.77	70	.001*

*The null hypothesis is rejected. The differences are significant at this level.

The reader will note that the t test revealed no significant differences in any of the sight-reading test mean scores between the "piano and major instrument" and "piano and voice" private study influences, nor between "piano and major instrument" and "piano, voice, and major instrument" study. Students who indicated piano and major instrument study as major influences did achieve significantly higher in the rhythmic area than those who indicated piano only. They scored significantly higher than those who indicated only major instrument study in melodic and total scores, but not in rhythmic scores, and they scored very significantly (at the .001 level) higher than those who rated voice and major instrument study as having had the greatest influence on their sight-reading ability.

These results confirm those found by the chi square method, that is, that piano study relates closely with vocal sight-reading ability, although these tests indicate that piano study combined with study on the major instrument associates more closely with superior results in the rhythmic area than piano study alone. This difference may well be due to a greater amount of ensemble experience on the part of those who included major instrument in their ratings, although this is conjecture rather than a conclusion.

Summary

This chapter reports the analysis of the student self-evaluation data. The students were asked to indicate what

methods they used for reading unfamiliar music at sight. Six methods were utilized. However, when the chi square and critical ratio tests were applied, only two methods showed significant levels of association, namely, the "interval approach" and "perfect pitch" methods.

The students also rated fifteen influences as to the amount each contributed to their ability to sight-read. When applying the chi square test, only five of the influences showed significant associations with the sight-reading test scores. Those influences were: (1) family music experiences, (2) elementary music classes, (3) junior high general music classes, (4) junior high choral ensemble, and (5) private piano study.

The students' sight-reading scores were reclassified by their ratings of their private study experiences. When applying analysis of variance, those who rated private study contributing "much" scored significantly higher in all three score categories: melodic, rhythmic, and total sight-reading scores. For further interpretation, the t test for independent sample means was applied. Piano, voice, and major instrument study were tested in pairs and paired combinations. Highest scores were achieved by those rating the combination of major instrument and piano study as the greatest influences.

CHAPTER VI

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

This study was initiated on the premise that certain environmental influences have a stronger bearing on sight-reading ability than others. The methods of investigation utilized in determining such relationships were these: (1) a survey of the musical environmental factors that were a part of each individual's life, (2) a test for music achievement at the college entrance level, (3) an evaluation of the general level of intelligence, and (4) a test for the level of sight-reading ability which established a fixed point of reference for measuring the intensities of the relationship between the various environmental influences and sight-reading ability.

A data sheet was developed and administered to 260 freshmen from twelve colleges and universities who had declared themselves music majors. The data sheet solicited information regarding formal influences such as music study and participation activities. In addition it sought to obtain extensive information relative to informal influences such as concert attendance, listening habits, the amount of music enjoyment, and family music activities. These data were in turn grouped into two general categories:

(1) formal influences, and (2) informal influences. Each influence was tested for association with sight-reading ability as represented by the sight-reading test scores.

The Aliferis Music Achievement Test, College Entrance Level, was administered to the total population. According to the author, the test measures achievement in auditory-visual discrimination. The raw scores of this test show significant relationship to the sight-reading test scores.

The sight-reading test was designed by this author and administered to the 260 students completing the data sheet and achievement test to determine the level of sight-reading ability. The test was administered privately and each student's performance was recorded for extensive evaluation. The ability to read unfamiliar music at sight (sight-reading) was evaluated in terms of melodic interval progressions and rhythm. Separate and total scores obtained on this test became the point of reference against which other influences, formal and informal, were measured to determine their degree of association.

As mentioned above, the environmental influences were classified as formal and informal influences. The formal category contained the Aliferis test scores, music theory grades, ratings in major performance area, American College Testing Program (ACT) scores, music courses and study, and music participation. The informal category comprised family music activity (both singing and instrumental), listening

experiences, the first enjoyment of music, and the degree of enjoyment at various age levels. Most of the data were further classified at three age levels -- elementary school, junior high school and senior high school.

Finally, the students were asked to make self-evaluations. They were asked to identify the method(s) of sight-reading utilized. The student also rated the factors and experiences in his environment as to the amount each contributed to the development of his sight-reading ability. These ratings were paired with the sight-reading test scores and analyzed for association.

The sight-reading test scores ranged from 1 to 175, with a mean score of 90.72 and a standard deviation of 40.69. The extremely wide range of scores indicates extreme degrees of ability among the freshmen music majors. The frequency distribution of the scores was reasonably close to normal, as might be expected for the relatively large sample of 260.

Several statistical methods were employed in testing for the relationships of the environmental influences and the sight-reading test scores: (1) the product-moment method of correlation, and (2) the chi square test of the data placed in contingency tables, (3) critical ratio test, and (4) analysis of variance and the t test. The .05 level of probability was used for the obtained values throughout the study.

Conclusions

"It is apparent that sight-reading is an accomplishment which is primarily the result of environmental influences. Musical study or other musical background must account for the differences in this ability."[35] As stated early in this study, the major question was, "Is there a greater relationship between some musical experiences and sight-reading ability than others?" Subsequent, and equally important questions were: (1) "What experiences show the closer relationship?" (2) "What implications do these relationships have for music educators and ensemble directors?" and (3) "What implications do these associations have for music students?"

Analysis of the data results in an affirmative answer to the first question. Some musical experiences show considerably stronger relationship to sight-reading ability than do others. This leads to the second question inquiring about those influences which show a close relationship. Following an outline provided by the chapter titles -- Informal Influences, Formal Influences, and Self-Evaluation -- the investigation of the associations is here evaluated.

Of the informal influences, none show highly significant relationships. The strongest relationship of significance was found between concert listening and the sight-reading test scores. The association was not significant at the

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[35]Zimmerman, op. cit., p. 29.

elementary age, but was moderately significant at both the junior high and senior high school age. Of the other kinds of listening experiences reported -- sound recording and radio listening -- only one slightly significant relationship was found between sound recording listening during the elementary school years and the sight-reading test scores.

Another slight but significant relationship was found between early interest in music and the sight-reading test scores. Those who expressed their first interest in music during pre-school and primary years demonstrated better sight-reading ability. Closely allied to the early interest association was a slight but significant correlation between the amount of music enjoyment at the elementary age and the sight-reading test scores. Those students who reported "much" enjoyment at an early age tended to score higher on the sight-reading test. By junior high age nearly all students reported much enjoyment; therefore, a significant level of association could not be found at either the junior high or senior high age.

Finally, the informal musical activities in family life showed no strong, consistent relationships. A very small percentage of the sample reported family instrumental experience, making it difficult to test for relationship. A very slight but significant relationship was found between family singing experiences at the elementary age and the sight-reading test scores. The importance of indirect musical

influences to sight-reading ability appears very slight, but these influences may tend to create and maintain an interest in music that culminates in formal study.

A large number of highly significant relationships were found to exist between the formal influences and sight-reading ability. The most significant relationships were observed when associating the Aliferis Music Achievement Test scores with the sight-reading test scores. The Aliferis test measures the student's achievement in auditory-visual discrimination. The test has a reliability coefficient of .88. In this study the population scored slightly lower than the national average. When the scores of the three sub-tests -- melodic, rhythmic, and harmonic -- were paired with the sight-reading test scores (both part and total), very high correlations were found. A comparison of the total scores of both tests yielded a correlation coefficient of .625. Comparisons of sub-test scores yielded even higher correlations. There is extensive evidence that achievement in auditory-visual discrimination and sight-reading ability relate at a highly significant level.

The average college theory grade and sight-reading test scores also show a highly significant relationship. The students' instructors rated their abilities in their major performance area. When these ratings were compared to the sight-reading test scores, a correlation coefficient of .433 was found, showing a highly significant relationship.

Performance ability is closely associated with sight-reading ability.

Although not a direct musical experience, the study included a comparison of the students' ACT standard scores with the sight-reading test scores. Both the chi square test and correlation coefficient of .430 show a highly significant relationship. General academic achievement is therefore strongly related to sight-reading ability.

The formal music study experiences of the students included courses in general music, written theory (harmony) and aural theory, and private study on the instruments and voice. General music in the elementary grades had no significant relationship to the sight-reading test scores. Only slight, but significant, relationships were found between junior high and senior high general music and sight-reading scores.

Seventy-eight of the 260 students had approximately one year of written theory during high school. Both the chi square test and the correlation coefficient showed a significant association between written theory and the sight-reading test scores. Only 41 students reported having training in aural theory. No significant association was found, possibly because of the limited sample size.

When comparing the years of private study on the major instrument or voice to the sight-reading test scores, those having three or more years of study scored significantly

higher than those with less experience. There was also slightly significant relationship when comparing accumulated years of private study on one to three instruments to the sight-reading test scores. One hundred seven students had studied voice privately for at least one year. No relationship was found between voice study and sight-reading test scores.

One area of private study was found to show a highly significant relationship. The average amount of private piano study for 187 students was 5.8 years. The critical ratio test, the chi square test, and a correlation coefficient of .369 showed a highly significant association.

When applying analysis of variance and the t test, the results showed that woodwind majors and keyboard majors scored significantly higher than brass majors in the melodic and total test scores, but not in rhythm scores. Keyboard majors scored significantly higher than voice students in all areas; woodwind players scored significantly higher than voice students in rhythm and total scores. There were no significant differences between the scores of brass and voice majors.

The final group of experiences tested for association were music participation activities. Students were asked to report both the number of years of experience and to rate the amount -- none, little, moderate, much -- of the experience they had in each activity. When investigating the ensemble experiences of the students, the chi square test results indicated the amount of choral ensemble experience showed no

relationship to sight-reading ability. However, the critical ratio test of differences of the means showed that those having three or more years of choral experience scored significantly higher in melodic and total sight-reading scores. A slight but significant relationship was found when comparing the amount of elementary school singing experience to sight-reading test scores.

The ratings of the amount of school instrumental ensemble experience showed significant relationships at all three levels -- elementary, junior high, and senior high -- when compared to the sight-reading test scores. The strongest association was found at the junior high level, with a correlation coefficient of .338. The critical ratio test indicated that those with three or more years of experience scored significantly higher in rhythm. The experiences of church and other non-school ensembles, when paired with the sight-reading test scores, showed no significant relationships. Those reporting three or more years of accompanying experience scored significantly higher on the sight-reading test.

When the students were asked to identify their method(s) of reading music, a significant relation was found between sight-reading test scores and the selection of the "perfect pitch" method; however, the validity of this conclusion is open to question since such a small percentage (two percent) of the students reported using the "perfect pitch" method. A second method showing a relationship to better sight-reading

is the "interval approach." When testing for relationship between the use of the "guessing" method and the sight-reading test scores, a significant negative relationship was found. Those who said they did not use the "guessing" method scored higher on the sight-reading test. The use of "fixed 'do'," "movable 'do'," and "instrumental fingering association" methods showed no significant relationship to the sight-reading test scores.

The students rated fifteen influences as to the amount they contributed to their ability to sight-read. (See Chapter V.) Only five of the influences rated showed significant relationship to the sight-reading test scores. Those influences were: (1) family music experiences, (2) elementary music classes, (3) junior high general music classes, (4) junior high choral ensemble participation, and (5) private piano study. An important observation here is that in only one case did the suspected contributing factors (as rated by the students) coincide with the significant findings in Chapters III and IV. Private piano study showed a significant relationship to sight-reading ability, and the students rated it as a highly contributing factor. The students who rated private study as a most important influence on sight-reading ability scored significantly higher than those who gave private study a lesser rating. Those students rating both piano study and major instrument study as "significant" influences scored the highest in the melodic and total scores. All statistical

measures used confirm this result.

Implications

Two of the questions stated earlier in this chapter had to do with the implications the relationships found in this study held for music educators, conductors and music students. Music educators are charged with the responsibility of developing musicianship, of which sight-reading ability is a part. Some vocal and instrumental conductors may not believe it is their responsibility to develop musicianship, but may regard themselves as "consumers" of well-trained musicians -- musicians who understand the music score and can reproduce it with great skill and artisty. Both educators and conductors should be interested in sight-reading improvement. In most cases in public school music, the music teacher is a "conductor-educator" and is faced with the tasks of finding good musicians and also training for improved musicianship.

The results of this study show that limited choral ensemble singing is not significantly related to sight-reading ability. However, those who had three or more years of experience scored significantly higher than those with less than three years experience. Private voice study could not be significantly related to sight-reading ability. It is inferred that vocal activity does not improve sight-reading ability to any great extent except by extended amounts of singing experience.

The implication for the choral music educator is obvious. If his singers are to become better sight-readers, he must attack

the problem directly. Either a portion of the choral rehearsal must be devoted to developing sight-reading ability, or the vocalists must be provided specific training outside rehearsal time.

The results of this study show that the general music class activities have little bearing on sight-reading ability, as might be expected; whereas courses in written theory, which seek to impart a comprehension of the printed music, show significant relationship to sight-reading ability. The Aliferis Music Achievement Test scores, and their highly significant associations, confirm that hearing is understanding the printed music. If music educators consider sight-reading ability important, establishing theory courses as part of the high school curriculum would greatly aid development of the skill among music students. It is obvious that a course designed to teach sight-reading would contribute the most to this aspect of musicianship.

An important finding in this study is the significant association instrumental ensemble experience has with sight-reading ability. If sight-reading ability is regarded as an attribute by musicians in general, the results of this study imply that all music students could benefit from instrumental ensemble experience as an aid to developing sight-reading ability. The findings of this study confirm that an early and continued experience of this kind is advantageous. It may be concluded that choir members who also have instrumental experiences would be able to read, prepare and perform better

than those singers who do not play instruments.

The relationship of private piano study and the sight-reading test scores is important. Whether one assumes the perspective of a music educator or that of a music student, keyboard training is an important experience, contributing to the development of sight-reading ability. It would not be amiss to encourage pupils to study piano, if for no other reason than to develop sight-reading ability. With regard to music curricula, instruction through the use of piano laboratories would greatly contribute to the sight-reading ability of all students.

The findings of this study indicate that those who counsel students about music study and courses in music would do well to consider the general intelligence level and capacity of the students. It may be difficult for students whose general intelligence level is below average to be successful in developing the attributes of musicianship, especially sight-reading ability.

Finally, this study shows that an early interest in music is closely related to sight-reading ability. No young person can determine his future alone. Therefore, educators must assume primary responsibility for giving students opportunity to develop knowledge and skills upon which they can build the specialization required of their occupational choices. The fostering of an interest in music during the early years may contribute greatly to the capacity of a great

musician. The evidence of association between an early enjoyment of music and sight-reading ability makes it imperative that elementary music educators make their subject attractive and meaningful to their pupils.

Suggested Research

As a result of this study, it is apparent that there are related areas which need further research. Three areas seem worthy of mention here.

The number of instrumentalists in this study were a minority of the total population. Among the instrumentalists, fifteen different instruments were represented, making the number of students performing on the same instrument a very small sample. A valuable study would be the investigation of the ability of like kinds of instrumentalists to sight-read. A large sample of students performing on the various orchestral instruments would be necessary for such a study. Such research would be of particular importance since the findings in this study showed that instrumental experience in general is significantly related to sight-reading ability.

A second problem for research, closely related to the first, is a comparative study of the levels of achievement in performance to sight-reading ability. Rather than using the number of years experience, or quantified ratings such as none, little, moderate or much, the relationships of actual performance levels and sight-reading ability would

be the problem for research.

A third area for investigation would be the relationship of the environmental influences to music achievement. The Aliferis Music Achievement Test, or a similar test, could be used as the fixed point of reference for comparisons. This kind of study might show what factors contribute most to general musicianship.

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APPENDIX A

MATERIALS USED IN OBTAINING ENVIRONMENTAL INFLUENCES

Music Data Sheet

Administrator's Guidelines for the Music Data Sheet

MUSIC DATA SHEET

Note: All of the information received will be compiled and used for research purposes. No individual's name or record will appear.

Name_____ Age_____ Date_____

School_____ Female_____ Male_____

I. When did you first enjoy music? (Check only one)

Pre-school years ____
Primary grades ____
Intermediate grades ____
Junior high ____
Senior high ____

II. Rate your degree of music enjoyment for the specified periods of your life. (Place a check in the appropriate space.)

Elementary school none__ little__ moderate__ much__
Junior high school none__ little__ moderate__ much__
Senior high school none__ little__ moderate__ much__

III. Rate the singing activities of your family while you were at home for each specified period of your life. (Place a check in the appropriate space.)

Elementary school none__ little__ moderate__ much__
Junior high school none__ little__ moderate__ much__
Senior high school none__ little__ moderate__ much__

IV. Rate the instrumental music activities of your family while you were at home for the specified periods. (Place a check in the appropriate space.)

Elementary school none__ little__ moderate__ much__
Junior high school none__ little__ moderate__ much__
Senior high school none__ little__ moderate__ much__

V. Rate the amount of time you spent listening to sound recordings. (Place a check in the appropriate space.)

Elementary school none__ little__ moderate__ much__
Junior high school none__ little__ moderate__ much__
Senior high school none__ little__ moderate__ much__

VI. Rate the amount of time you spent listening to good music on the radio. (Place a check in the appropriate space.)

Elementary school none__ little__ moderate__ much__
Junior high school none__ little__ moderate__ much__
Senior high school none__ little__ moderate__ much__

VII. Rate your attendance at concerts and musical programs for the specified periods. (Place a check in the appropriate space.)

Elementary school none__ little__ moderate__ much__
Junior high school none__ little__ moderate__ much__
Senior high school none__ little__ moderate__ much__

VIII. What is your major performance instrument (voice) as you begin college? _____ How many years of private study have you had in your major? _____

List all other instruments you play and the years of private study on each._____
_____

IX. Give the name of your present private teacher for your major instrument. _____

X. Give the name of your college theory (harmony) teacher.
_____

XI. List all the contest ratings you have received. Specify whether the rating was for solo or ensemble performance.

_____

_____

_____

XII. Give the number of years you studied piano privately. ___
Give the number of years you studied voice privately. ___

XIII. Give the number of years you participated in the following:

School band and/or orchestra ___
School choral groups ___
Church choirs ___
Independent musical groups outside of school & church ___
Accompanying on a keyboard instrument ___

XIV. Rate your singing experiences for each specified period.

Elementary school none__ little__ moderate__ much__
Junior high school none__ little__ moderate__ much__
Senior high school none__ little__ moderate__ much__

XV. Rate your instrumental experiences for each specified period.

Elementary school none__ little__ moderate__ much__
Junior high school none__ little__ moderate__ much__
Senior high school none__ little__ moderate__ much__

XVI. Indicate the number of years in each specified type of class.

Elementary school general music _____
Junior high school general music _____
Senior high school general music _____
Junior or senior high school written theory _____
Junior or senior high school aural theory _____

XVII. Indicate which of the following method(s) you use when reading unfamiliar music. (vocally)

Perfect (absolute Pitch _____
Fixed "do" _____
Movable "do" _____
Interval approach _____
Guessing _____
Instrumental fingering _____

XVIII. Rate the following as to the extent they contributed to your present ability to read music vocally. Leave blank any that do not apply to you. (Place a check in the appropriate space.)

Family music experiences none__little__moderate__much__
Elementary music classes none__little__moderate__much__
Junior high general music none__little__moderate__much__
Senior high general music none__little__moderate__much__
Elementary music ensemble none__little__moderate__much__
Junior high vocal ensemble none__little__moderate__much__
Junior high instrumental ensemble none__little__moderate__much__
Senior high vocal ensemble none__little__moderate__much__
Senior high instrumental ensemble none__little__moderate__much__
College music ensembles none__little__moderate__much__
College music classes none__little__moderate__much__
Church and community ensembles none__little__moderate__much__

Private piano study	none__little__moderate__much__
Private voice study	none__little__moderate__much__
Private study in major	none__little__moderate__much__

ADMINISTRATOR'S GUIDELINES
FOR THE
MUSIC DATA SHEET

Item	Verbal Explanation
Name:	Last name first.
Age:	Please be accurate. All information is strictly confidential.
Date:	Today's date is _____.
School:	Write the name of the college you are now attending as a freshman music major.
Sex:	Check the appropriate space.

Be careful to give an answer for each of the following questions. When you are not certain, give an estimate.

I. When did you first enjoy music?

Try to recall the first time you put aside play or work interests and on your own either listened to or attempted to produce music because you liked it.

Check only one age bracket.

II. Rate your degree of music enjoyment for the specified periods of your life. Place a check for each life period.

None is self-explanatory.

Little is defined as enjoyment that came as a result of "happen-stance" participation. This came infrequently and irregularly from such things as singing in Sunday

school or church, listening to music on records or radio when promoted by someone else, or some type of social group singing.

Moderate is defined as the amount of enjoyment which motivated you to seek opportunity to participate in music on an irregular basis. This would include activities such as listening to music on your own initiative, attending public concerts willingly, and participating in school, church or community music activities. You may have requested or agreed to some specific music instruction which required practice.

Much is defined as enjoyment sufficient to motivate you to participate in regular and special school, church and community groups. Music came first when play time or other conflicts arose. Formal training was desired and appreciated.

III. Rate the singing activities of your family while you were at home for the specified periods. Place a check for each life period.

None is self-explanatory.

Little is defined as activity with no attempt to participate in organized groups or solo performances. Generally, your participation was limited to humming, singing or whistling while doing household chores, putting the baby to sleep, singing table grace, etc.

Moderate includes the activities in the above clas-

sification, plus occasional organized solo or group performance for or with the family and friends.

Much is defined as frequent and regular family singing activities. Perhaps a parent was a musician or some family member studied music and thereby you were involved.

IV. Rate the instrumental music activities of your family while you were at home, for the specified periods.

None is self-explanatory.

Little is defined as activity with no attempt to participate in organized group or solo performances. Your participation might have taken forms such as strumming a guitar, chording or improvising melodies at the piano or investigating sound production on other instruments. Your activity was infrequent and irregular.

Moderate includes the activities in the above classification plus occasional organized solo or group performance for or with the family and friends.

Much is defined as frequent and regular family musical activities. Perhaps a parent was an instrumentalist or some family member studied an instrument privately and practiced at home and thereby you were involved.

V. Rate the amount of time you spent listening to sound recordings. Place a check for each life period.

None is self-explanatory.

Little is defined as casual listening. Only on rare occasions did you make an effort to use the record player or listen to the music played by others.

Moderate is defined as frequent listening to certain selections that you made effort to hear for your own enjoyment. This could include the choosing of records to listen to while studying or for other background purposes.

Much is defined as regular listening because you had sufficient interest to purchase, borrow or obtain records in other ways so that you could play certain compositions. You enjoyed giving full attention to your listening.

VI. Rate the amount of time you spent listening to "good" music on the radio. Place a check for each life period.

None is self-explanatory.

Little is defined as limited listening with no attempt by yourto see that good music was "tuned-in."

Moderate is defined as choosing to listen to music while doing household chores or studying, but with no attempt to get a specific program or station for their music on a regular basis.

Much is defined as seeking to hear regularly special music programs on certain stations because of the educational and entertaining value. You enjoyed stopping your work to listen attentively.

VII. Rate your attendance at concerts and musical programs for the specified periods. Place a check for each life period.

None is self-explanatory.

Little is defined as infrequently and would include only those required by parents, school or church.

Moderate is defined as including the above plus your choosing to attend a few concerts in your community by artists or special church or school productions.

Much is defined as attendance at as many of the school, church and community concerts as possible, as well as a genuine desire to hear and see artists perform whenever possible.

VIII. What is your major performance instrument (voice) as you begin college?

On what instrument or voice do you perform best and/or have played for the longest period of time?

How many years of private study have you had in your major?

Any nine-month school year may count as a year.

List all other instruments you play and the years of private study on each.

If you play an instrument but have not taken private lessons, list the instrument anyway.

IX. Give the name of your present private teacher for your major instrument.

You have recently begun private lessons here at college. Give the instructor's name.

X. Give the name of your college theory (harmony) teacher.

If you have harmony and aural theory as separate courses, give the harmony instructor's name.

XI. List all the contest ratings you have received. Specify whether the rating was for solo or ensemble performance.

Most of you have performed individually and in small ensembles for a variety of contests including district and state contests. List your solo performances and ratings separate from the contests and ratings for small ensemble performance. Do not include band, orchestra or choir ensembles.

XII. Give the number of years you studied piano privately.

A nine-month period may count as a year. If you have studied piano privately, whether or not it is your major instrument, give the number of years of study. Give the number of years you studied voice privately. The same instructions are followed for this part as for the first part of the question.

XIII. Give the number of years you participated in the following:

A nine-month period may count as a year. You may have participated in several of these classifications; be

sure to give the number of years for each. Do not consider singing experiences in a general music class as participation in a choral group. Any regular participation in groups other than those sponsored by the school or church should be totaled in the classification Independent Musical Groups.

XIV. Rate your singing experience for each specified period.

None is self-explanatory.

Little is defined as singing for your own private enjoyment, perhaps while doing household duties or play, with no effort to improve vocal ability or to be a part of singing groups, except as required.

Moderate is defined as singing experiences that you choose to have. This might include membership in non-selective school, church or community groups. You might have sung solos or as a part of a special ensemble for these groups.

Much is defined as regular participation in the select school, church or community groups. These groups had scheduled performances and required three to five hours practice per week. Other vocal activities such as private lessons were a part of your experiences.

XV. Rate your instrumental experiences for each specified period. Place a check for each life period.

None is self-explanatory.

Little is defined as limited investigation of a musical

instrument, with irregular periods of practice or playing, either by ear or note. You may have been shown a few fundamentals of performance on the instrument but had no formal training or required practice time.

Moderate is defined as participation with some formal training, usually in a class session such as band or orchestra. Your practice or playing time averaged two to four hours per week.

Much is defined as participation that involved a minimum of five hours per week playing time. Your experiences would include regular rehearsals, practice, performances and perhaps private study on a regular basis.

XVI. Indicate the number of years in each specified type of class.

These are regularly scheduled classes, required or elected. The number of meeting times may have varied from two to five times per week. This does not include incidental instruction received in ensemble rehearsals.

XVII. Indicate which of the following method(s) you use when reading unfamiliar music vocally:

If you use more than one method, be sure to check all methods you use.

Perfect pitch - When you see a certain pitch on the

musical staff, you "hear" it and can produce its pitch immediately.

Fixed "do" - You relate each pitch to the solfeggio syllables in the Key of C.

Movable "do" - You relate each pitch to the solfeggio syllables applied to the key or tonal center of the melodic line.

Interval approach - After you are given a pitch for the first tone, you proceed to read, relating succeeding tones to it and each other in terms of intervallic distances such as perfect fourths, minor thirds, etc.

Guessing - You have no method of knowing exact pitches without the aid of an instrument, rather you follow the direction of the melodic line, singing what you hope are the correct pitches.

Instrumental fingering - Because of your instrumental experience, you can look at a note, "feel" the correct pitch by associating the note with a specific fingering on the instrument you play.

XVIII. Rate the following as to the extent they contributed to your present ability to read music. Leave blank those that do not apply to you.

None is self-explanatory.

Little is defined as limited contribution. The experiences were so related to music reading that you considered them helpful, but there was no obvious

recognized improvement in your ability.

Moderate is defined as a definite contribution to your ability. Your knowledge of music was increased and you were aware that this experience helped you read music with a degree of accuracy greater than ever before.

Much is defined as that contribution that changed you from the "guessing" reader to a confident reader who could "hear" the written notes and produce them vocally with a high degree of accuracy. Because of these experiences, you began to enjoy being a "leader" in sight-reading activities.

APPENDIX B

MATERIALS USED IN OBTAINING ESTIMATED ABILITIES OF INDIVIDUAL STUDENTS

Request for ACT Scores

Request for Music Theory Grade

Request for Performance Rating

Director of Testing

Attached is a list of students attending your school who are enrolled as music majors. These students recently completed a "Music Data Sheet" and took a battery of tests I administered to them in the process of gathering data for my dissertation dealing with "the relationship between various music experiences and vocal music reading ability." I am also anxious to compare their Composite Score from The American College Testing Program (ACT) with their music reading ability. I will appreciate your placing the score of each student beside his name on the attached list. All information will be held in confidence.

A prepaid, self-addressed envelope is enclosed for your convenience. Please return the scores by October 28. Thank you for your time and information.

Sincerely,

Reuben E. Rodeheaver

Please return to Reuben E. Rodeheaver, Bethany Nazarene College, Bethany, Oklahoma

Name	American College Testing Program Standard Composite Score

Professor of Music Theory

The following list of students have indicated you are their music theory instructor. These students recently completed a Music Data Sheet and took a battery of tests I administered to them in the process of gathering data for my dissertation dealing with "the relationships between various music experiences and vocal music reading ability." I am also anxious to compare their present grade average in theory with their music reading ability. On the attached sheet is a list of your students. I will appreciate your taking a few minutes to place a check in the appropriate box, thereby giving me your evaluation of their abilities in music theory. All information will be held in confidence.

A prepaid, self-addressed envelope is enclosed for your convenience in returning the evaluation to me. Please return the ratings by October 28. Thank you for your time and information.

Sincerely,

Reuben E. Rodeheaver

Please return to Reuben E. Rodeheaver, Bethany Nazarene College, Bethany, Oklahoma.

Name	Present Grade Average A	B	C	D	F

Professor of Woodwinds

The following list of students have indicated you are presently giving them private instruction on their major performance instrument (voice). These students recently completed a Music Data Sheet and took a battery of tests I administered to them in the process of gathering data for my dissertation dealing with "the relationships between various music experiences and vocal music reading ability." I am also anxious to compare their performance on their major instrument with vocal music reading ability. On the attached sheet is a list of your students. I will appreciate your taking a few minutes to place a check in the appropriate box, thereby rating your student's present performing ability. All information will be held in confidence.

A prepaid, self-addressed envelope is enclosed for your convenience in returning the evaluation to me. Please return the ratings by October 28. Thank you for your time and information.

Sincerely,

Reuben E. Rodeheaver

Please return to Reuben E. Rodeheaver, Bethany Nazarene College, Bethany, Oklahoma.

Name	Inst.	Superior	Excellent	Good	Fair	Poor

APPENDIX C

TESTS USED IN OBTAINING ACHIEVEMENT LEVELS OF INDIVIDUAL STUDENTS

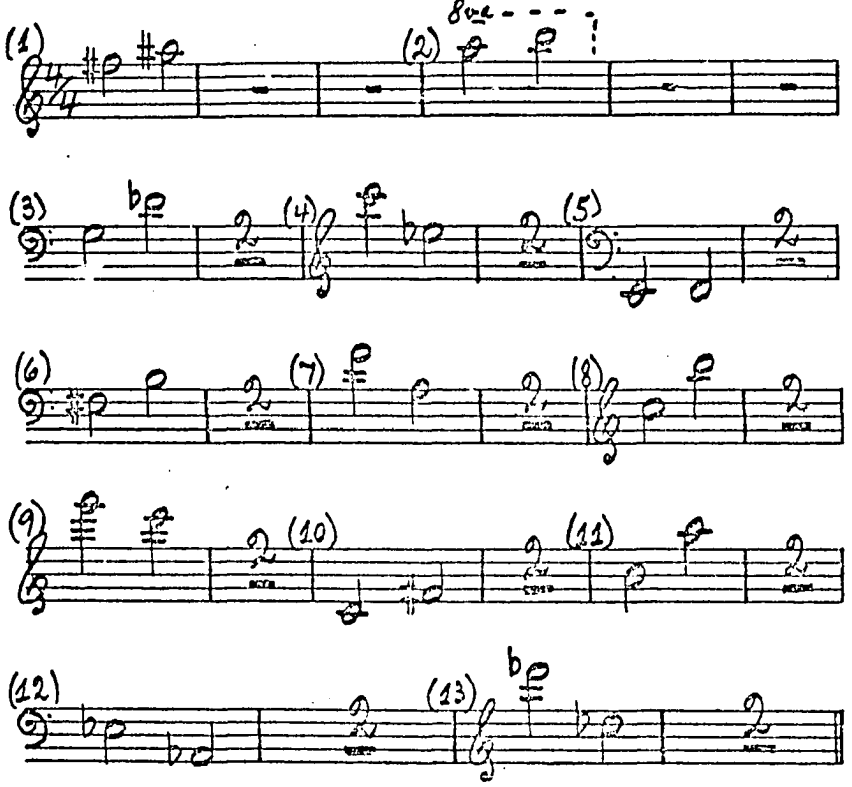
Aliferis-Music Achievement Test Items

Aliferis-Music Achievement Test Booklet

Sight-Reading Test

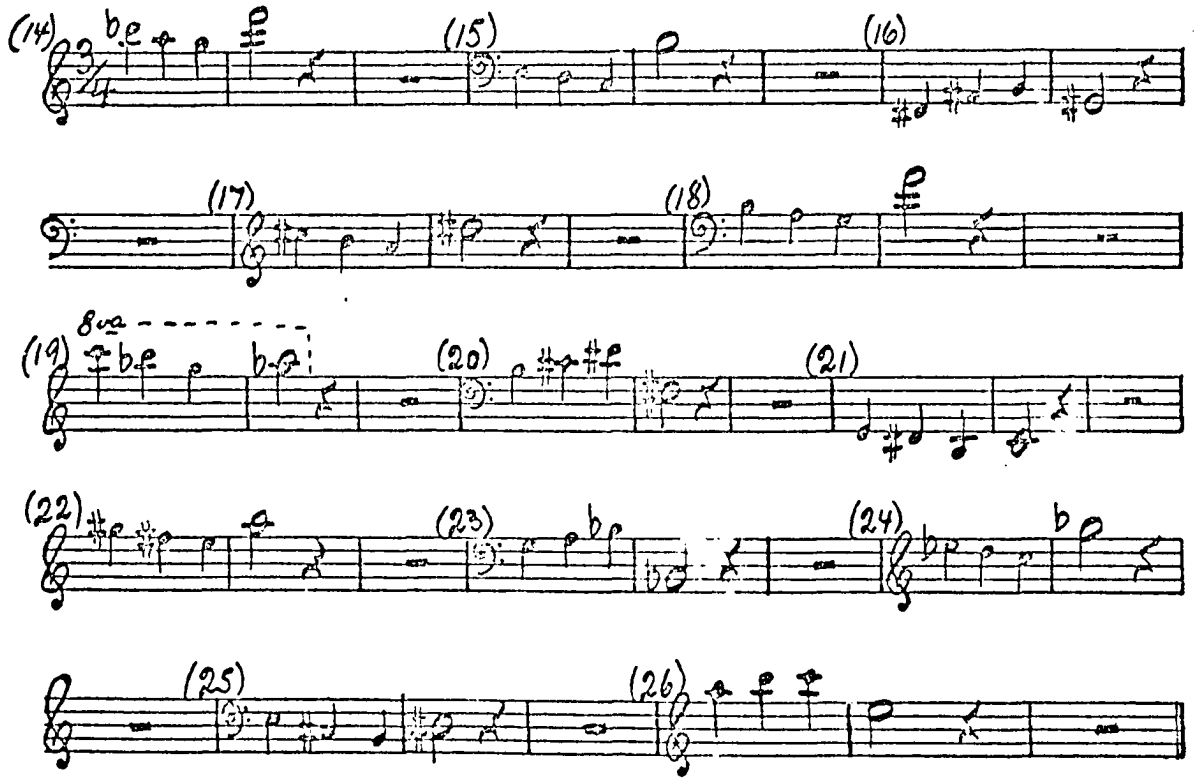
MELODIC ELEMENTS

MM♩ = 72-60



MELODIC IDIOMS

MM♩ = 58-52

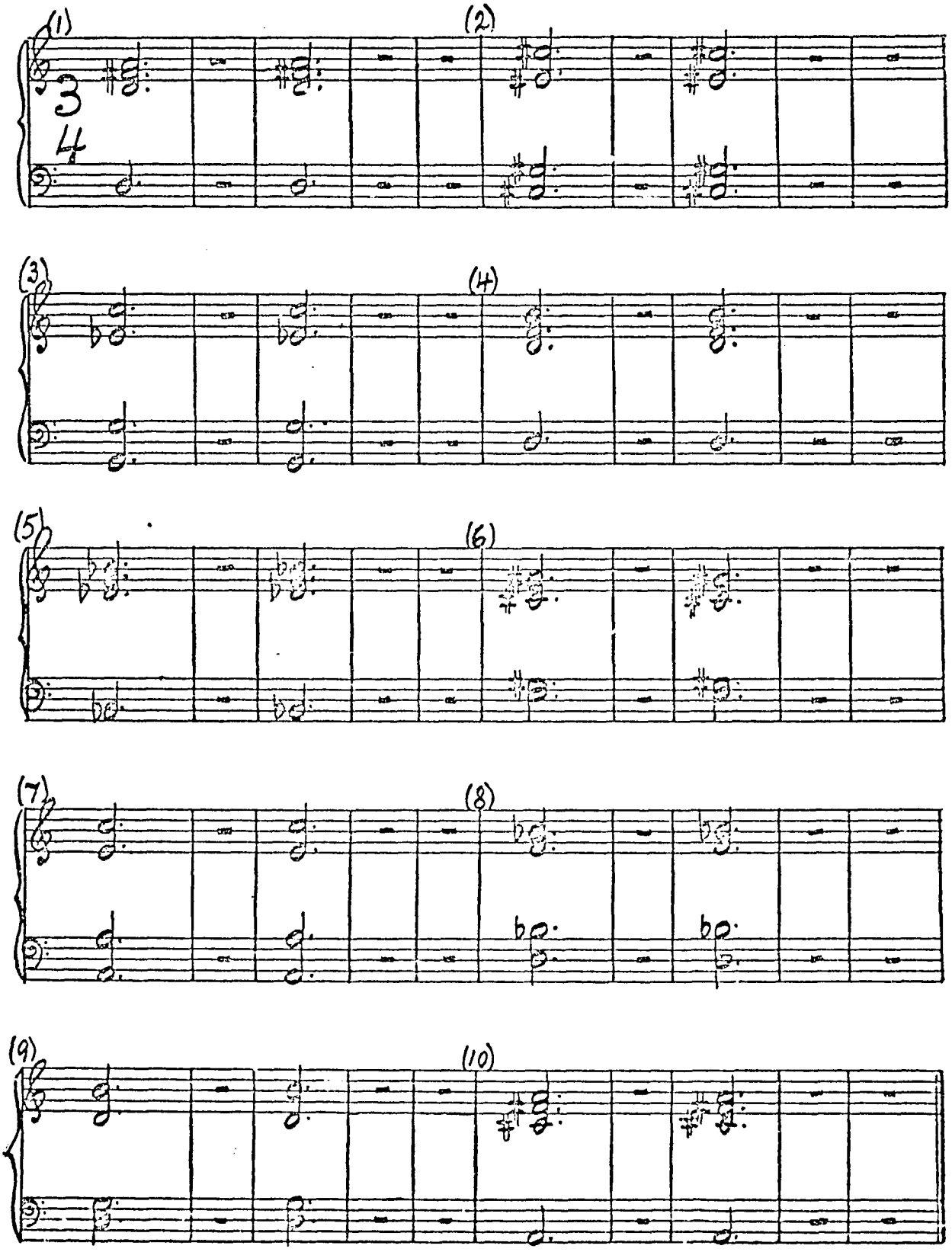


7

Aliferis, James. Aliferis Music Achievement Test. University of Minnesota Press, Minneapolis, 1954. USED BY PERMISSION

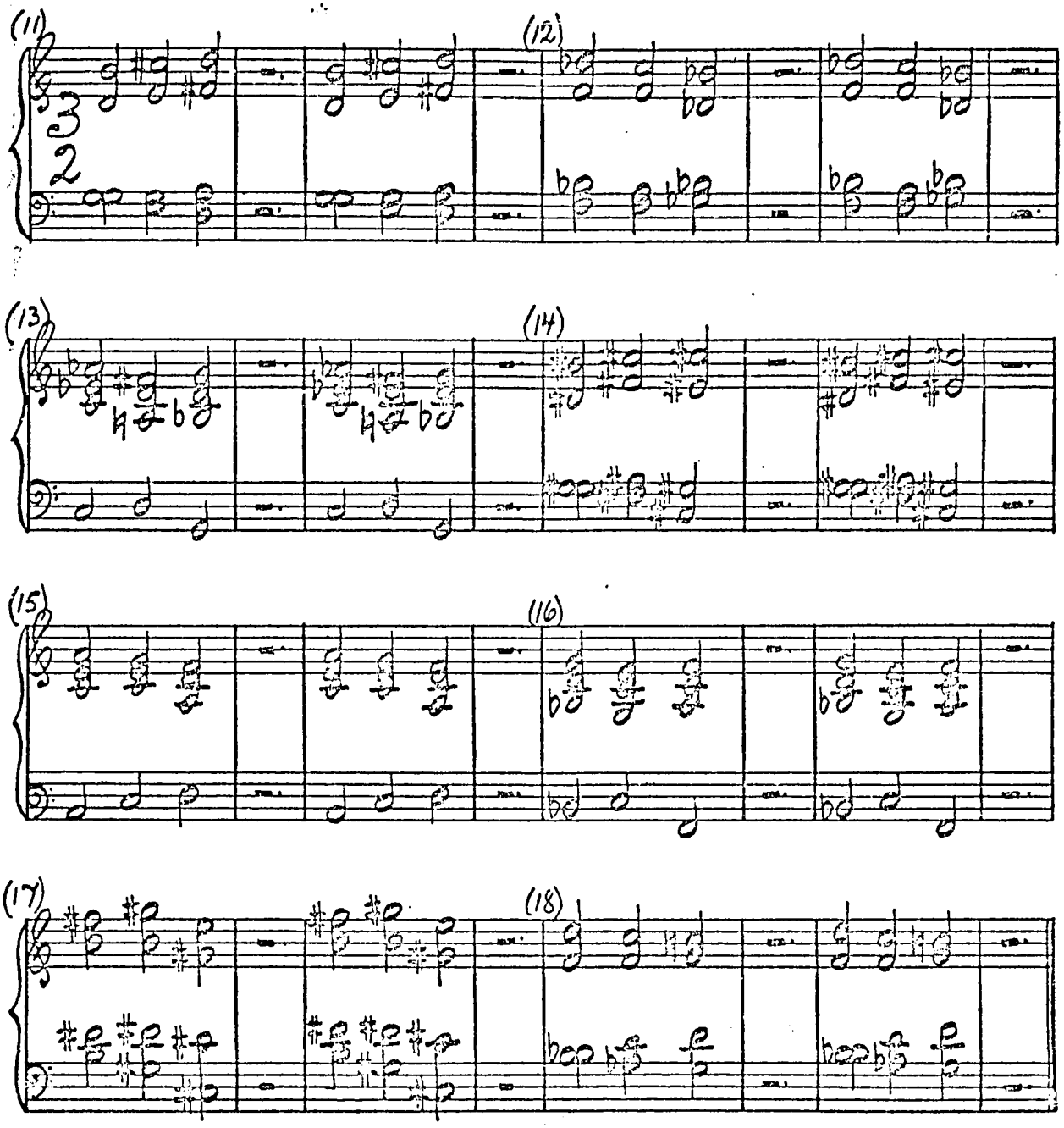
HARMONIC ELEMENTS

MM♩=68-63



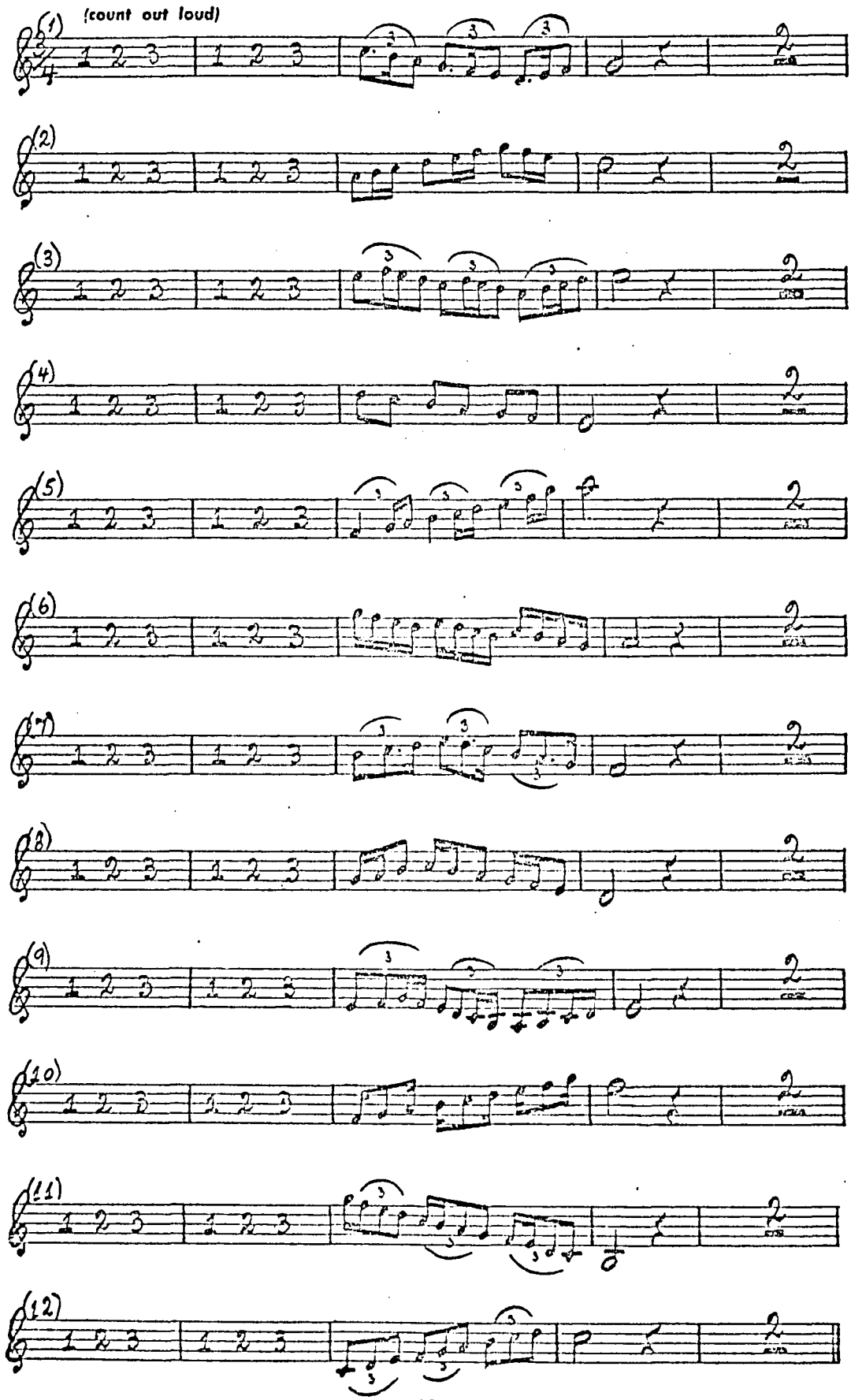
HARMONIC IDIOMS

MM♩=72-66



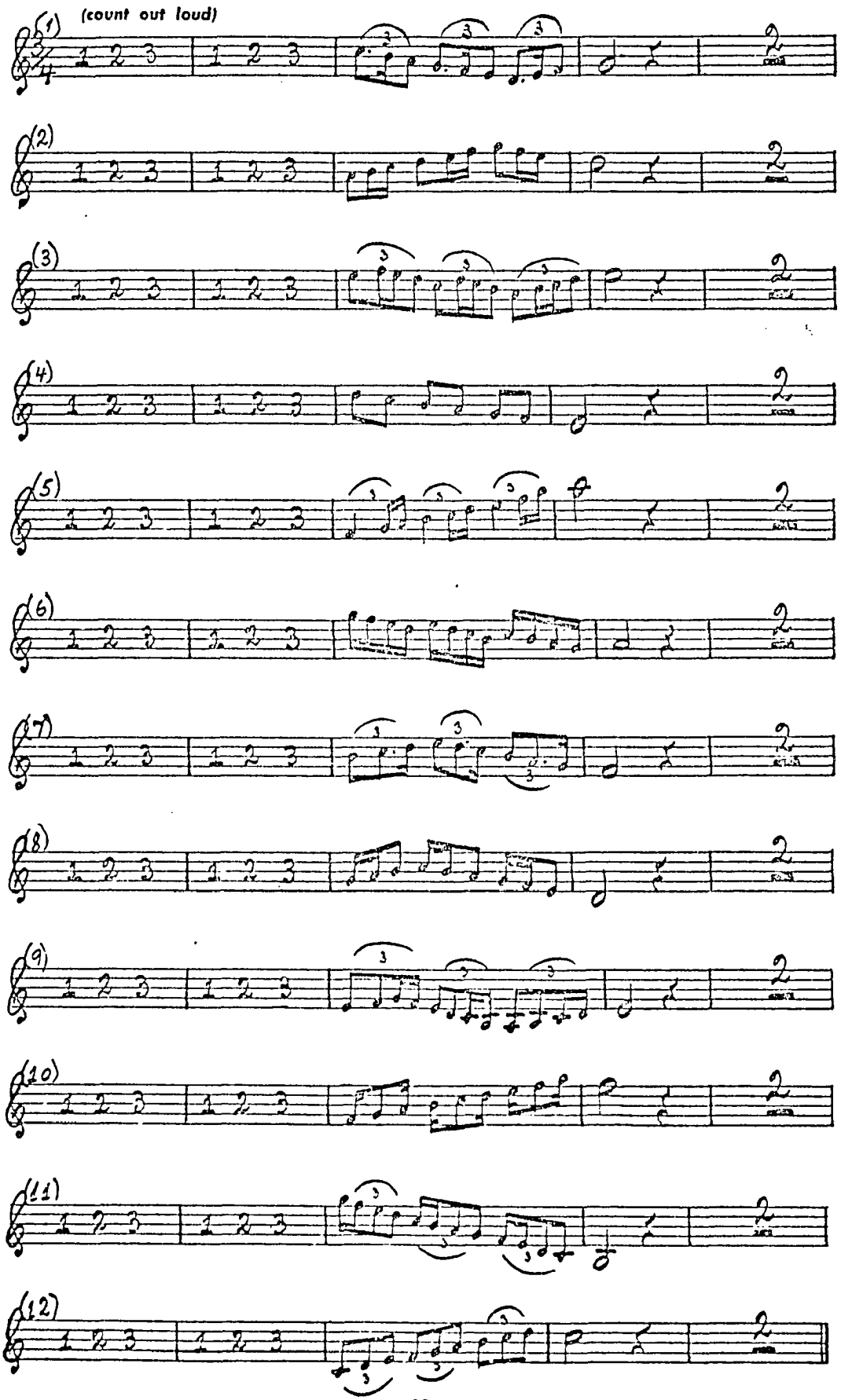
MM♩=60

RHYTHMIC MENTS



MM♩ = 60

RHYTHMIC ELEMENTS



AUDITORY-VISUAL DISCRIMINATION OF MUSICAL ELEMENTS AND IDIOMS

SECOND PRINTING 1965

ALIFERIS MUSIC ACHIEVEMENT TEST

COLLEGE ENTRANCE LEVEL

TEST BOOKLET

173

STUDENT DATA SHEET

Name_____ Date_____
last first middle month day year

College_____ Age_____
to nearest birthday

Year in College
Freshman ☐
Sophomore ☐
Junior ☐
Senior ☐
Graduate ☐
Other_____
specify

	Raw Score	"T" Score	Percentile
Total score	____	____	____
Melodic score	____	____	____
Harmonic score	____	____	____
Rhythmic score	____	____	____

Major sequence 1) Music Education Major ☐ 3) Liberal Arts, Music Major ☐ 5) Undeclared ☐
2) Music Education Minor ☐ 4) Liberal Arts, Music Minor ☐ 6) Other_____
specify

APPLIED STUDY

major instrument or voice	years of private study	amount of class instruction	minor instrument or voice	years of private study	amount of class instruction

THEORETICAL STUDY

	years	semesters	quarters		years	semesters	quarters
Elements of music				List other studies:			
Theory (ear training, sight singing, dictation)							
Harmony							
Music appreciation.							
Music history							

PERFORMING EXPERIENCE

Band: marching.			Choir, a cappella		
concert			Glee club		
Chorus.			Ensemble: vocal		
Orchestra			instrumental.		

COMMENTS

_____

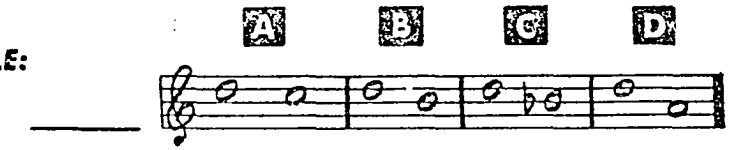
_____

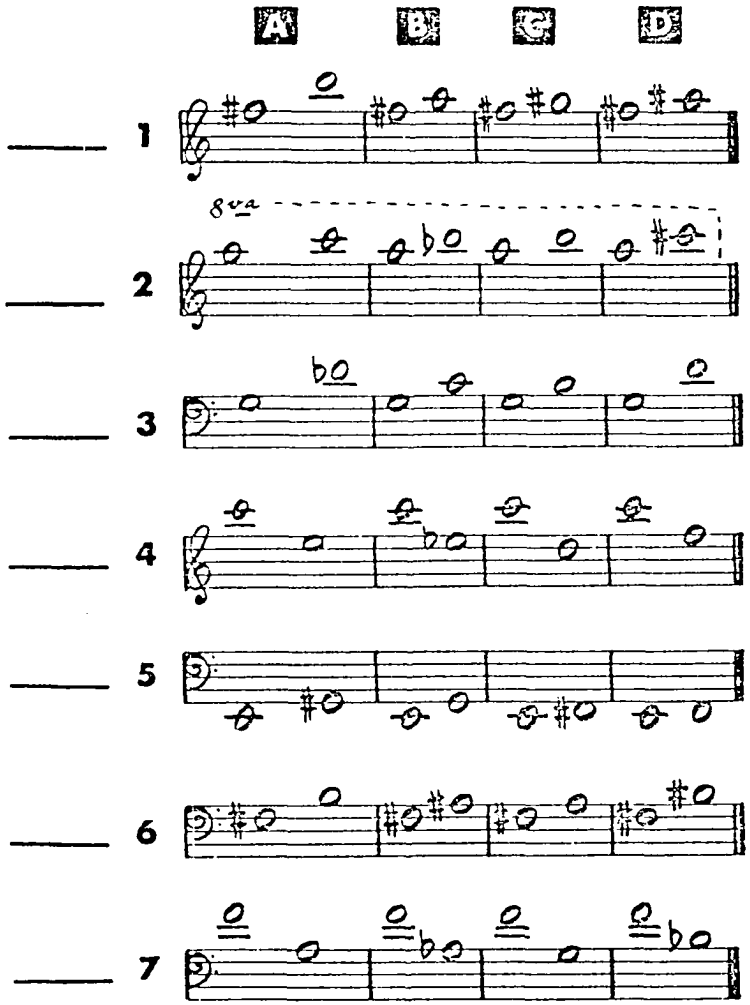
_____

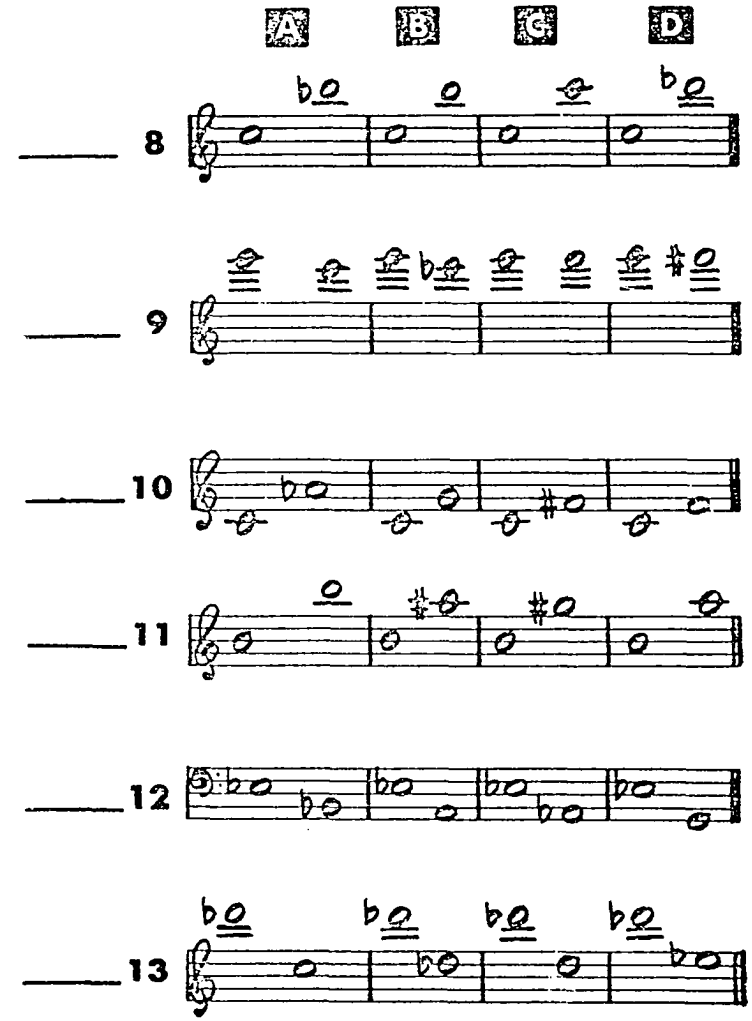
PRINTED IN U.S.A.

MELODIC ELEMENTS

EXAMPLE:







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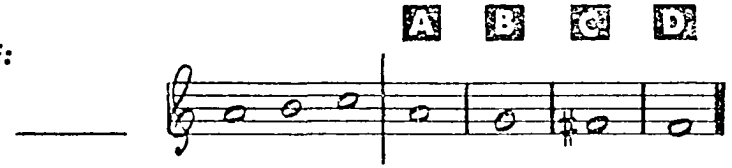

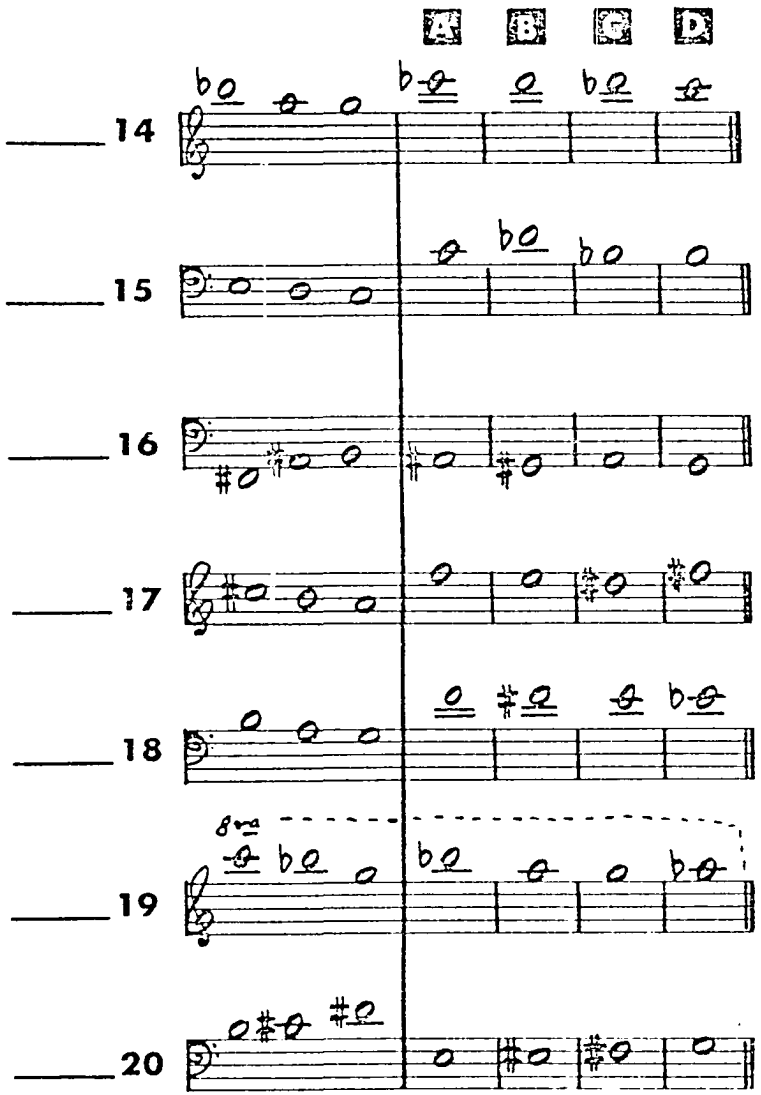

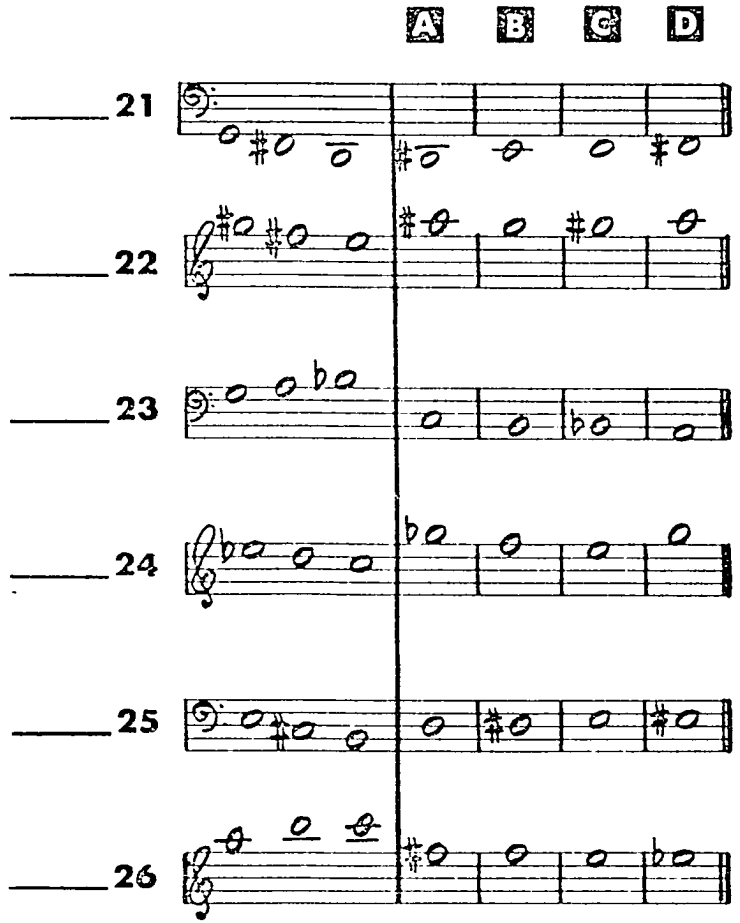

TOTAL MELODIC ITEMS 26

MINUS NUMBER WRONG . . ___

TOTAL MELODIC SCORE . . . . ___

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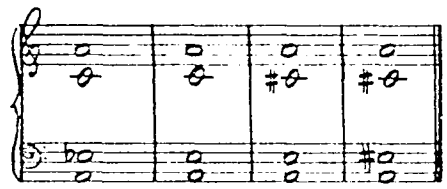
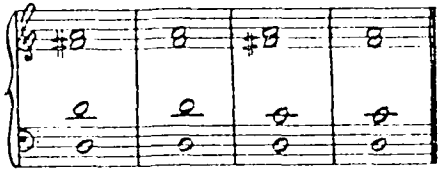
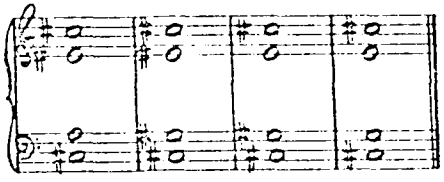
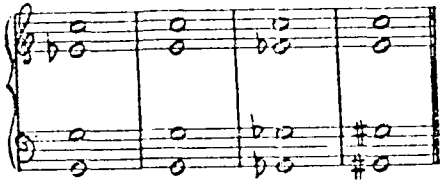
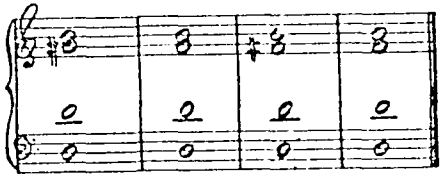


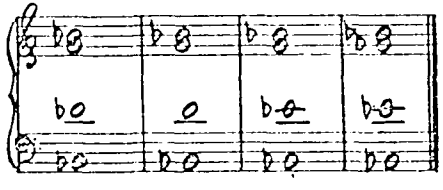
A B C D

1 

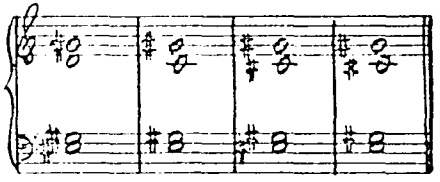
2 

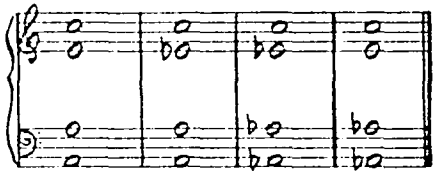
3 

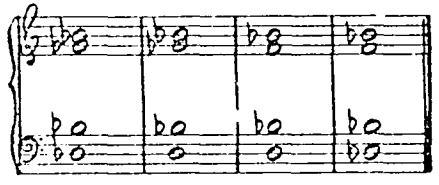
4 

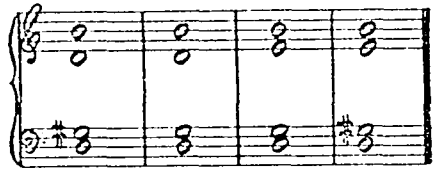
5 

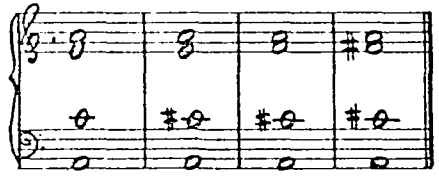
A B C D

6 

7 

8 

9 

10 

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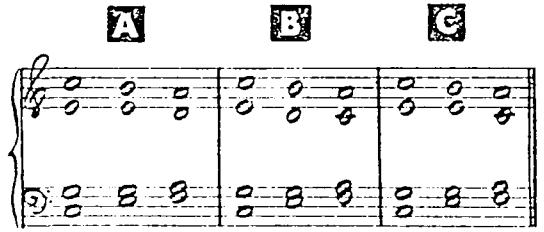

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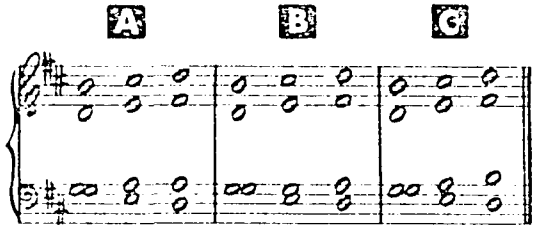

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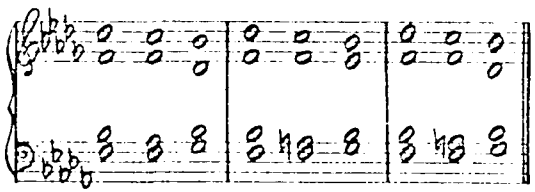

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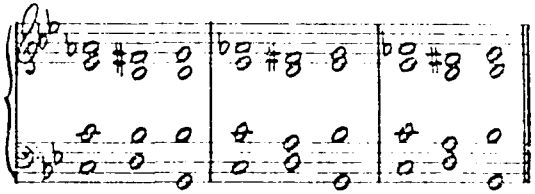

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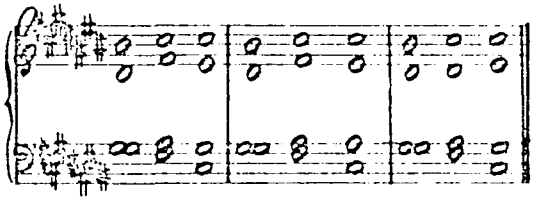

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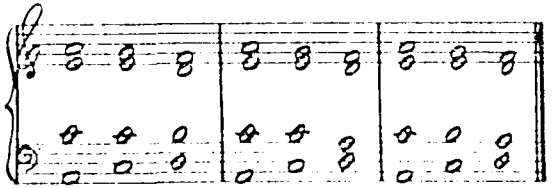

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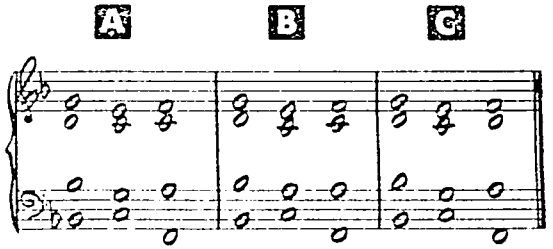

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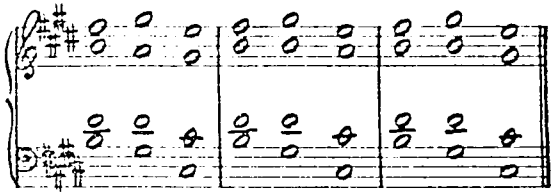

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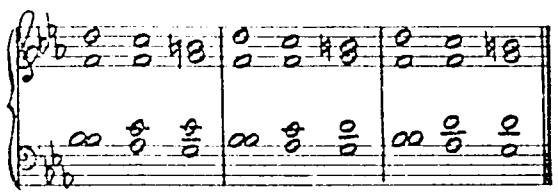


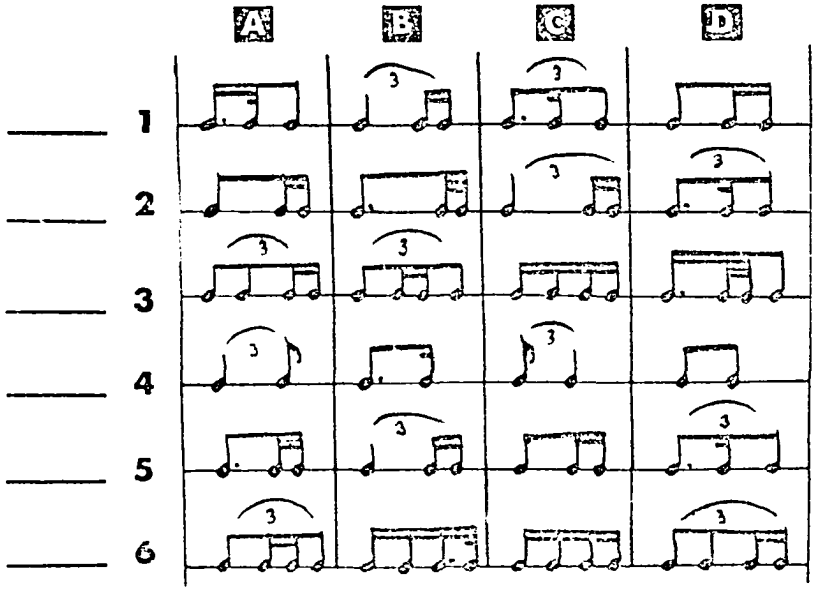
TOTAL HARMONIC ITEMS 18

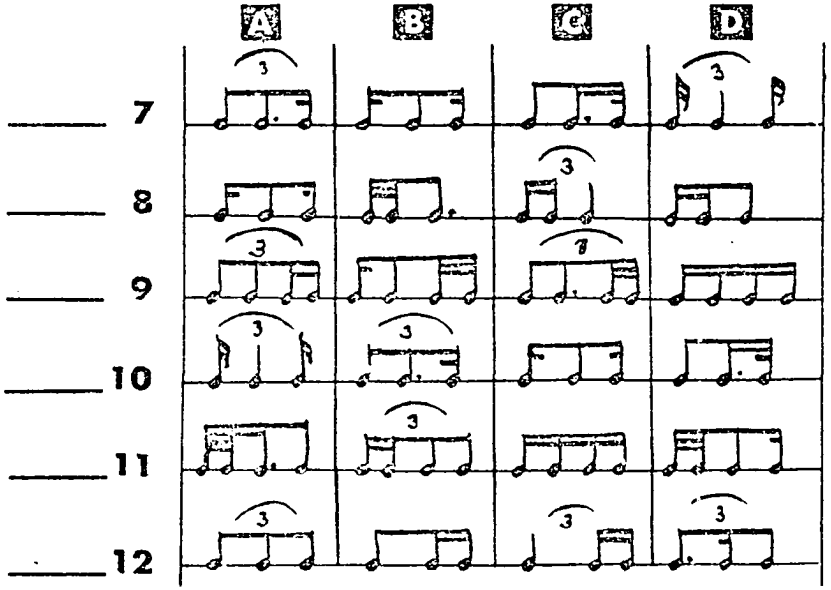
MINUS NUMBER WRONG . . ___

TOTAL HARMONIC SCORE . . . ___

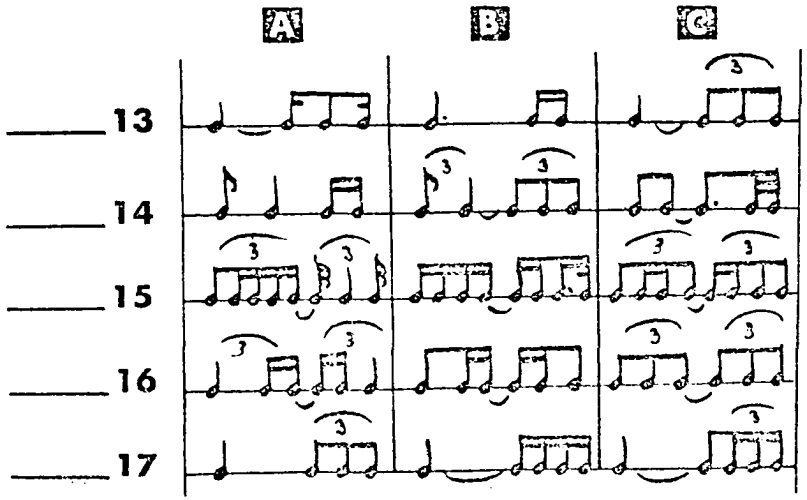
RHYTHMIC ELEMENTS

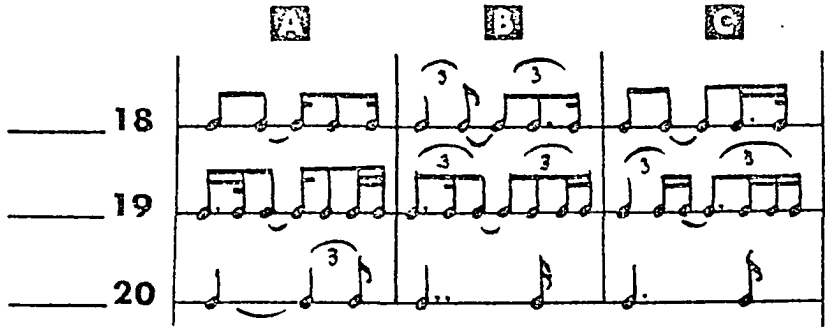
EXAMPLE: _____





RHYTHMIC IDIOMS





TOTAL RHYTHMIC ITEMS 20

MINUS NUMBER WRONG . . ___

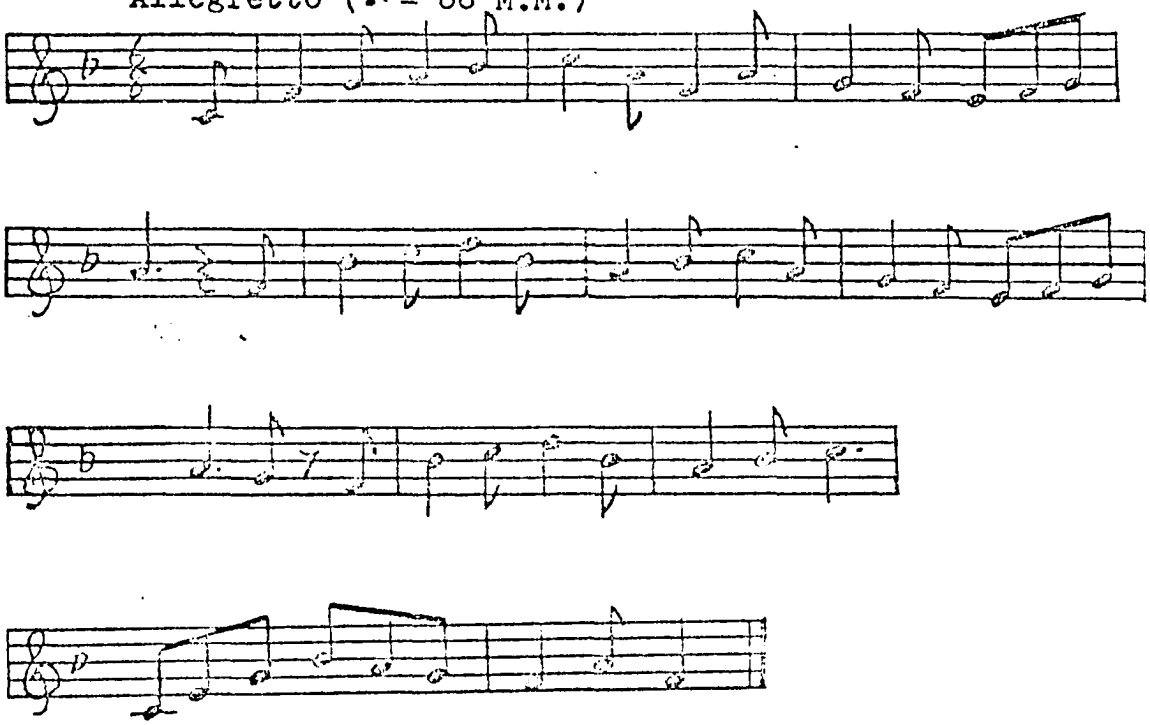
TOTAL RHYTHMIC SCORE . . . . ___

SIGHT-READING TEST

The test consists of two melodies.* You may choose either the treble or bass clef version (reverse side). After scanning Melody # 1, state your name, sound the "key" (tonic) on the piano, and sing. Keep the tempo and rhythm and do not stop. Sing the melody only once. After you have finished Melody # 1, proceed to Melody # 2, following the same instructions.

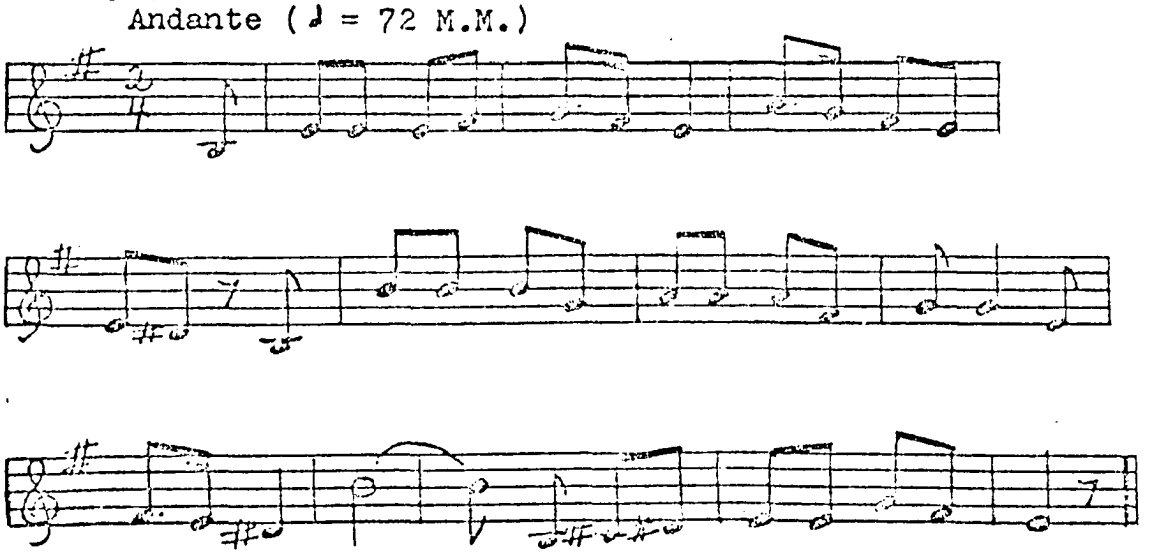
Melody # 1

Allegretto (♩. = 88 M.M.)



Melody # 2

Andante (♩ = 72 M.M.)



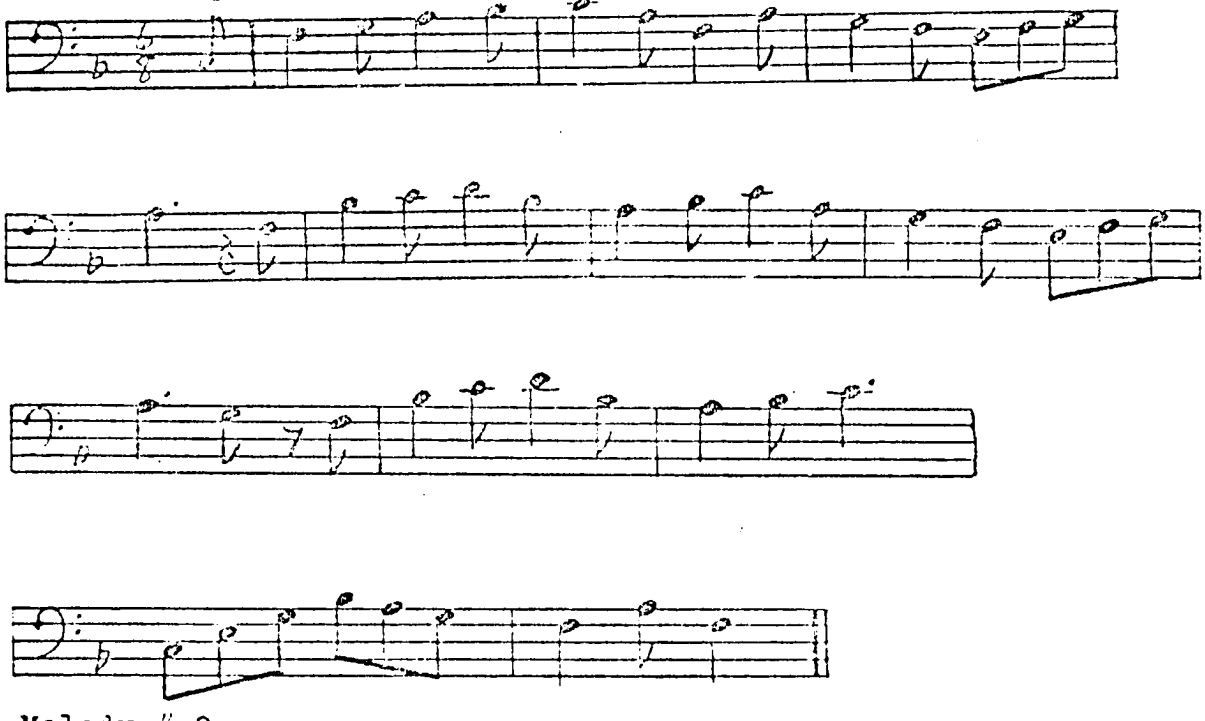
*Melodies from Berkowitz, Fontrier, and Kraft. "A New Approach to Sight Singing." New York: W. W. Norton and Company, 1960. USED BY PERMISSION.

SIGHT-READING TEST

The test consists of two melodies.* You may choose either the treble or bass clef version (reverse side). After scanning Melody # 1, state your name, sound the "key" (tonic) on the piano, and sing. Keep the tempo and rhythm and do not stop. Sing the melody only once. After you have finished Melody # 1, proceed to Melody # 2, following the same instructions.

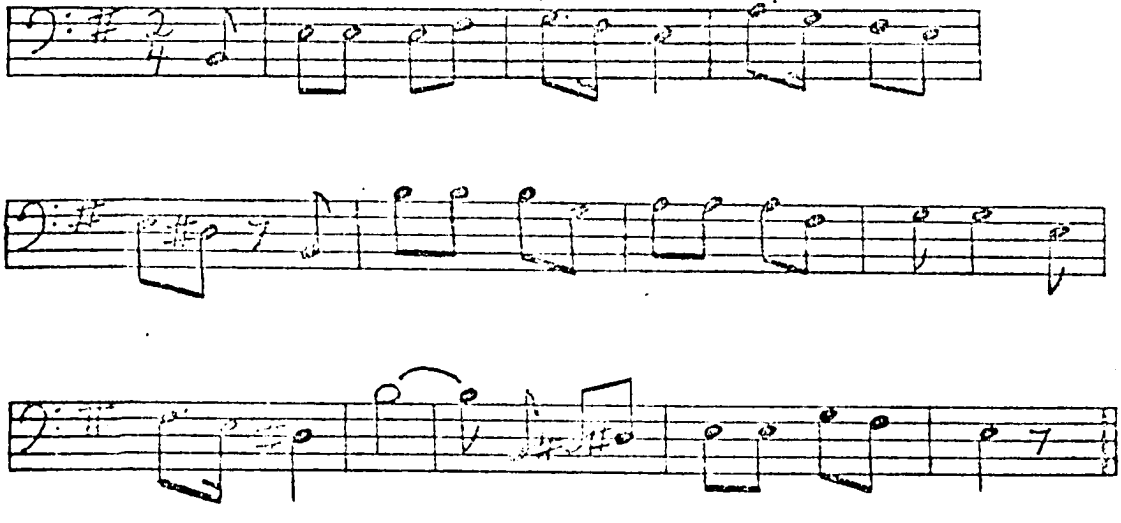
Melody # 1

Allegretto (♩. = 88 M.M.)



Melody # 2

Andante (♩ = 72 M.M.)



*Melodies from Berkowitz, Fontrier, and Kraft. "A New Approach to Sight Singing." New York: W. W. Norton and Company, 1960. USED BY PERMISSION.

APPENDIX D

INDEX OF VARIABLES AND CORRELATION MATRIX

INDEX OF VARIABLES

1. First interest in music.
2. Music enjoyment in elementary school years.
3. Music enjoyment in junior high school years.
4. Music enjoyment in senior high school years.
5. Family singing activities in elementary school years.
6. Family singing activities in junior high school years.
7. Family singing activities in senior high school years.
8. Family instrumental activities in elementary school years.
9. Family instrumental activities in junior high school years.
10. Family instrumental activities in senior high school years.
11. Sound recording listening in elementary school years.
12. Sound recording listening in junior high school years.
13. Sound recording listening in senior high school years.
14. Radio music listening in elementary school years.
15. Radio music listening in junior high school years.
16. Radio music listening in senior high school years.
17. Concert attendance in elementary school years.
18. Concert attendance in junior high school years.
19. Concert attendance in senior high school years.
20. Private study on major instrument.
21. Private study on secondary instrument.
22. Private study on third instrument.
23. Private piano study.
24. Private voice study.
25. School instrumental ensemble experience.
26. School choral ensemble experience.
27. Church choral ensemble experience.
28. Non-church, non-school ensemble experience.
29. Keyboard accompanying experience.
30. Singing experience in elementary school.
31. Singing experience in junior high school.
32. Singing experience in senior high school.
33. Instrumental experience in elementary school.
34. Instrumental experience in junior high school.
35. Instrumental experience in senior high school.
36. General music in elementary school.
37. General music in junior high school.
38. General music in senior high school.
39. Written theory in junior and senior high school.
40. Aural theory in junior and senior high school.
41. ACT Standard Composite Score.
42. Major instrument performance rating.
43. College theory grade.
44. Melodic score on Aliferis Music Achievement Test.
45. Harmonic score on Aliferis Music Achievement Test.
46. Rhythm score on Aliferis Music Achievement Test.
47. Total score on Aliferis Music Achievement Test.
48. Melodic score on Sight-Reading Exercise Number 1.
49. Rhythmic score on Sight-Reading Exercise Number 1.

50. Melodic score on Sight-Reading Exercise Number 2.
51. Rhythmic score on Sight-Reading Exercise Number 2.
52. Total melodic score on Sight-Reading Exercises.
53. Total rhythmic score on Sight-Reading Exercises.
54. Total scores on Sight-Reading Test.
55. Private study on all instruments.
56. Combined school choral and instrumental ensemble experience.

CORRELATION MATRIX (Decimals Omitted)

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1																
2	-52															
3	-25	48														
4	-12	16	30													
5	-35	34	18	11												
6	-27	23	16	11	85											
7	-24	18	13	13	75	88										
8	-25	22	15	04	55	52	47									
9	-22	14	14	05	49	46	49	74								
10	-14	07	09	06	40	41	49	64	87							
11	-27	34	17	01	30	26	21	35	25	19						
12	-23	21	20	07	15	11	09	17	18	16	64					
13	-15	07	09	13	12	16	20	14	21	22	41	68				
14	-16	26	21	-03	31	27	24	31	23	24	46	37	22			
15	-01	09	22	00	18	17	20	29	32	31	29	39	29	61		
16	03	01	11	02	10	12	14	14	21	27	23	35	41	34	63	
17	-23	40	24	10	30	28	25	32	25	21	49	35	21	46	41	21
18	-13	19	27	13	17	17	16	19	24	22	34	41	30	35	44	34
19	-04	15	18	20	14	14	12	16	21	21	25	27	28	23	29	35
20	-06	01	12	-04	-04	02	-02	03	01	-02	-01	04	05	07	00	06
21	-12	06	15	00	-14	-14	-14	08	00	-05	10	04	03	18	05	06
22	-04	-05	06	-01	06	-02	-07	15	26	25	-03	06	27	00	11	04
23	-21	16	21	04	-06	-07	-07	06	10	08	13	12	00	11	04	07
24	06	-07	00	04	09	07	01	08	05	01	-08	-05	10	-03	-05	09
25	05	05	13	11	-02	41	-11	09	12	16	-06	03	02	04	20	11
26	-14	19	08	03	13	20	16	12	13	11	14	01	06	07	00	02
27	-14	07	13	-01	21	29	25	15	17	14	15	18	10	03	05	01
28	-17	10	00	09	08	05	11	14	13	11	19	11	02	10	10	10
29	-17	07	19	14	05	05	06	-07	-16	-18	-01	-04	-05	07	03	03
30	-37	42	18	20	43	38	28	23	16	16	32	24	19	18	-02	04
31	-29	26	29	17	36	44	43	17	12	10	20	17	13	11	03	05
32	-22	22	14	22	29	36	40	08	-03	-04	10	07	07	03	-06	-03
33	-26	39	25	10	16	07	02	30	17	12	30	19	07	27	21	09
34	-03	12	25	09	07	-03	-04	15	26	24	19	23	11	21	25	15
35	01	01	18	11	02	-06	-03	17	28	33	13	19	15	19	27	20
36	-20	14	16	18	09	12	08	03	-03	-05	10	04	05	07	-02	03
37	04	09	10	10	08	09	03	03	11	11	05	02	06	09	04	05
38	-04	01	-02	13	30	28	25	03	12	11	09	11	09	06	07	14
39	-20	-02	15	-05	10	12	09	13	06	04	26	06	14	16	22	15
40	-10	20	00	00	-03	-07	06	-18	-25	-12	-28	-24	-20	-09	-26	-33
41	-18	08	-05	02	-01	-05	-21	-12	-13	-18	01	03	02	-14	-25	-22
42	05	-07	-12	-07	-05	00	09	-01	03	09	-05	-02	-05	05	09	09
43	13	-06	-12	-01	-07	00	04	-01	01	03	-04	-06	05	00	08	12
44	-14	13	-01	02	04	-02	-04	02	-02	-04	08	06	06	-01	-03	-08
45	-11	07	-07	14	02	-01	-03	-04	-04	-07	04	06	11	-06	-11	-10
46	-01	-06	04	11	-01	-10	-16	-05	-04	00	-01	02	02	-03	-02	-06
47	-11	06	03	10	02	-06	-10	-03	-04	-04	06	06	08	-04	-06	-09
48	-13	17	05	-01	12	06	03	04	01	-03	12	05	-03	00	-12	-05
49	-08	06	03	03	05	-04	-11	02	01	01	05	07	-04	-01	-05	-03
50	-19	23	11	10	17	18	15	08	10	03	14	12	10	07	05	01
51	-10	18	10	02	17	12	05	13	10	09	18	12	09	11	05	02
52	-17	21	07	03	16	11	08	06	03	-03	11	07	02	01	-08	-06
53	-11	12	06	02	10	02	-06	06	05	04	11	10	01	03	-03	-03
54	-16	17	06	04	15	09	02	08	06	02	13	10	02	01	-07	-05
55	-15	08	15	02	00	03	00	13	09	05	09	07	08	13	02	08
56	-06	15	14	14	13	10	10	19	19	21	09	11	09	14	17	13

CORRELATION MATRIX - Continued

Variable	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1																
2																
3																
4																
5																
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16																
17																
18	64															
19	47	60														
20	02	30	-08													
21	05	11	03	34												
22	06	08	06	04	05											
23	26	24	15	45	55	12										
24	10	14	09	19	-02	18	01									
25	05	11	15	-12	00	19	-09	03								
26	18	03	12	04	06	-13	15	12	-27							
27	19	14	04	05	-07	-10	05	06	-19	47						
28	19	23	20	00	02	-01	07	05	-05	13	02					
29	15	06	-09	08	-11	18	31	10	-04	19	05	10				
30	28	19	17	-07	-09	-24	01	14	-11	23	26	03	04			
31	18	17	07	03	-02	-33	07	27	-22	36	37	00	00	50		
32	09	-02	03	-07	-04	-28	-07	13	-22	29	29	06	07	38	68	
33	30	26	08	22	14	15	34	-09	19	05	-05	03	24	18	00	-10
34	23	37	28	19	17	21	38	-03	34	-06	-02	04	12	06	-12	-22
35	17	35	28	21	22	26	34	-03	28	-01	00	15	15	-05	-14	-31
36	05	03	02	14	25	10	23	13	-04	27	13	17	06	14	30	26
37	11	18	16	-03	-13	21	-17	07	36	15	-06	-12	00	03	01	00
38	02	03	18	-18	-15	01	-10	13	18	14	01	28	-11	15	09	05
39	15	21	12	00	-02	-22	15	42	-07	02	-01	22	-09	09	19	07
40	-18	-46	-38	-09	-23	-29	-09	06	-32	14	-04	20	10	17	-11	-09
41	-10	-07	07	01	-07	00	07	10	-04	11	-02	-09	06	18	01	-04
42	-10	-16	-14	-12	-12	03	-18	-19	-02	-13	02	06	-16	-06	-04	02
43	02	-03	-04	-24	-14	-05	-28	05	12	-10	05	08	-31	-07	-07	02
44	11	07	07	10	12	-09	39	09	02	11	-01	10	13	13	16	02
45	05	04	13	17	15	-02	29	-03	-10	06	-02	09	10	12	-01	03
46	02	13	18	11	12	05	27	00	23	-03	-10	-01	11	02	-05	-14
47	08	11	13	15	17	-04	41	04	08	06	-05	07	15	12	01	-04
48	12	00	07	03	09	-02	29	08	04	13	11	13	03	15	06	-01
49	06	13	18	10	07	05	27	-07	12	01	-08	-01	09	07	-06	-11
50	15	13	09	15	11	-08	29	00	-01	13	20	08	10	16	19	12
51	16	18	21	22	14	07	38	07	04	19	-01	00	19	14	-01	-08
52	11	03	07	07	11	00	29	-01	04	12	11	10	05	17	12	06
53	11	15	20	16	11	07	35	-03	10	09	-06	-02	13	12	-04	-11
54	12	11	16	13	13	04	37	-01	-07	12	02	05	11	16	05	-02
55	07	29	-01	86	62	53	52	15	-07	03	00	06	01	-04	04	-02
56	21	20	22	03	05	03	04	03	56	41	22	10	01	15	10	08

CORRELATION MATRIX - Continued

Variable	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
1																
2																
3																
4																
5																
6																
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34	52															
35	32	75														
36	-02	-08	-05													
37	01	11	09	13												
38	-14	01	05	08	40											
39	10	17	19	21	20	12										
40	-07	-37	-36	13	-14	09	34									
41	08	11	12	05	13	16	01	36								
42	-16	-13	-15	-06	-07	05	-32	06	-37							
43	-13	-23	-24	01	-04	-07	-12	00	-33	33						
44	20	19	19	04	02	00	16	10	28	-41	-31					
45	15	12	12	-05	-08	-08	25	14	26	-36	-26	50				
46	21	31	35	-04	14	09	23	-03	49	-43	-25	41	32			
47	24	27	28	-01	05	01	26	09	45	-51	-35	85	72	75		
48	17	25	17	07	06	16	13	10	29	-30	-27	54	37	33	54	
49	17	32	30	-04	12	18	23	14	39	-34	-33	32	31	53	46	42
50	20	21	16	10	24	22	17	11	22	-29	-29	45	27	28	44	57
51	29	26	26	-01	13	20	18	06	32	-38	-30	35	23	44	44	44
52	21	26	18	10	14	17	17	11	31	-34	-31	57	40	37	58	92
53	23	32	30	-02	13	20	23	13	42	-39	-36	36	25	55	50	48
54	26	34	28	04	15	19	24	14	43	-43	-39	53	37	54	63	79
55	24	18	24	24	-01	-13	-02	-16	03	-10	-19	12	16	15	18	07
56	17	26	25	13	32	36	04	-15	00	-08	00	09	-02	17	12	13

CORRELATION MATRIX - Continued

Variable	49	50	51	52	53	54	55	56
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50	35							
51	56	47						
52	46	79	46					
53	95	44	79	52				
54	83	70	73	86	89			
55	12	19	25	12	19	18		
56	11	14	15	13	14	16	10	