A COMPARATIVE STUDY OF SELECTED TESTS FOR PREDICTING PROFICIENCY IN COLLEGIATE MUSIC THEORY

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A COMPARATIVE STUDY OF SELECTED TESTS FOR PREDICTING PROFICIENCY IN COLLEGIATE MUSIC THEORY

DISSERTATION

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CHAPTER I

FORMULATION AND DEFINITION OF THE PROBLEM

Statement of the Problem

The problem in this study may be stated as an analysis of the prognostic capability of scores on selected tests for the prediction of proficiency in music theory at the collegiate freshman level. The purpose of the study was to compare certain tests as predictors of collegiate music theory proficiency scores. The subordinate purposes of the investigation were as follows:

A. To ascertain the degree of relationship between proficiency scores in collegiate music theory and scores on each of the following predictor tests selected for investigation:

1. Drake Musical Aptitude Tests (7)
   a. "Musical Memory"
   b. "Rhythm"
2. Freshman Placement Theory Examination (15)
3. Gordon Index of Musical Insight (10)
4. Kwalwasser-Dykema Music Tests (11)
   a. "Pitch Imagery"
   b. "Rhythm Discrimination"
   c. "Rhythm Imagery"
   d. "Tonal Memory"

5. Otis Quick-Scoring Mental Ability Tests (18)

6. Wing Standardised Tests of Musical Intelligence (21)

B. To ascertain the degree of relationship between scores on each predictor test and scores on each of the other predictor tests included in the study.

C. To ascertain which combination of predictor tests provides the optimum prediction of collegiate music theory proficiency scores.

Hypotheses

The basic hypothesis of this study was that scores on the selected predictor tests, when the tests are used both singly and collectively, are satisfactory predictors of collegiate music theory proficiency scores. Stated specifically, the hypotheses were as follows:

1. Scores on the Drake "Musical Memory" test are satisfactory predictors of collegiate music theory proficiency scores.

2. Scores on the Drake "Rhythm" test are satisfactory predictors of collegiate music theory proficiency scores.

3. Scores on the Freshman Placement Theory Examination are satisfactory predictors of collegiate music theory proficiency scores.

4. Scores on the Gordon Index of Musical Insight are satisfactory predictors of collegiate music theory proficiency scores.

5. Scores on the Kwalwasser-Dykema tests of "Pitch Imagery," "Rhythm Discrimination," "Rhythm Imagery," and "Tonal Memory," when summed to form a single total score for each individual, are satisfactory predictors of collegiate music theory proficiency scores.

6. Scores on the Otis Quick-Scoring Mental Ability Tests are satisfactory predictors of collegiate music theory proficiency scores.

7. Scores on the Wing Standardised Tests of Musical Intelligence are satisfactory predictors of collegiate music theory proficiency scores.

8. Scores on the various predictor tests when selected and combined to yield the maximum obtainable accuracy of prediction are satisfactory predictors of collegiate music theory proficiency scores.

Definitions

Collegiate Music Theory

As used in this study, "collegiate music theory" denotes specific college level music courses which (1) emphasize the study of sight singing, ear training, harmony (part-writing), keyboard harmony, and music fundamentals or rudiments; (2) are primarily concerned with the traditional music of the seventeenth, eighteenth, and nineteenth centuries; (3) are taught in a correlated and integrated fashion; and (4) are designed primarily for college music majors.

This does not include general music courses for the non-musician, introductory music courses which emphasize only the basic elements of musical notation, or noncredit or prefreshman-level college courses in music fundamentals. At North Texas State University in Denton, Texas, where the data for this study were gathered, the integrated music theory courses were, specifically, Music 138, Elementary Sight Singing and Ear Training, and Music 148, Elementary Harmony: Part-Writing and Keyboard (17, pp. 282-283). A description of these courses may be found in Chapter III.

Proficiency Score

The "proficiency score" in this study was the criterion of performance in collegiate music theory obtained for each individual in the sample population studied. For each individual it was the sum of his standard scores, normalized T-scores (3, pp. 223-227), earned on objective proficiency tests of the following skills:

A. Rhythmic Dictation
B. Melodic Dictation
C. Harmonic Dictation
D. Sight Singing
E. Part-Writing
F. Keyboard Recognition and Harmony
G. Music Fundamentals

The proficiency tests were constructed especially for this study. Administered near the completion of the first freshman-level, semester-length, correlated college music theory courses, the proficiency tests provided objective measures of performance in the skills taught in collegiate music theory courses. The proficiency tests are described in Chapter III. The process of test construction and the validity of the tests also are discussed in that chapter. The tests appear in the Appendix.

Satisfactory Predictors

The term "satisfactory predictors" is used to denote the existence of a particular mathematical relationship between predictor test scores and collegiate music theory proficiency test scores. In this study predictor test scores are considered "satisfactory predictors" of proficiency test scores when the value of *r* (Pearson product-moment correlation coefficient where tests are used singly) or *R* (multiple correlation coefficient where the tests are combined to yield the maximum obtainable accuracy of prediction) between predictor test scores and proficiency test scores is not significantly less than (at the 10 per cent level on a one-tailed test of significance), is equal to, or is greater than +0.60. This *a priori* value for *r* and *R* was set as the absolute minimum level of correlation acceptable for purposes of individual prediction in this study.

The +0.60 value for r and R was selected after considering the accuracy levels of predictions based on various values of r and R and after identifying a reasonable expectancy value for typical prognostic efficiency based on validity levels of tests in current usage. Because the margin of error associated with predictions based on various values of r and R increases as the value of r and R decreases, high values for these correlation coefficients are most desirable (14, pp. 131-137). When used for general screening purposes, a test under certain circumstances may appreciably improve predictive efficiency if it shows any significant correlation with the criterion variable; correlations as low as +0.20 may be useful in making group predictions. In the case of the present study, where individual prediction was the goal, only high values for r and R reduce the error of prediction to a point where the predictions have practical usefulness. These high values for r and R in prognostic applications have seldom been attained. The validity of existing tests rarely exceeds +0.60 or +0.70 according to Anastasi (2, pp. 132-133). The +0.60 value for r and R was selected as a reasonable compromise between the needed prognostic accuracy and realistically attainable test efficiency.

Background and Significance of the Study

The accurate prediction of satisfactory achievement in the study of music has been a goal of music researchers for some time. Prognostic tests are needed frequently for guidance and placement purposes, particularly at the college level. A number of tests including music aptitude and achievement tests which seem suitable for use in music prognosis has been developed, and some of these tests are used by colleges in counseling, guiding, selecting, classifying, or grouping students.

The accurate prediction of achievement in collegiate music theory courses is a particularly important area of specific concern in the total prognostic picture of an individual. The successful completion of courses in collegiate music theory is a fundamental requirement in most college music programs. Music theory courses which must include the equivalent of two years of sight singing and dictation, one year each of elementary harmony, advanced harmony, keyboard harmony, and an approach to elementary counterpoint are required in the programs of all schools that are members of the National Association of Schools of Music (16, p. 14).

At North Texas State University all entering freshmen music theory students are tested and homogeneously grouped in music theory classes. The students are grouped in particular class sections of different music theory courses

according to the scores they earn on the Freshman Placement Theory Examination. This test has been used by the theory faculty of the School of Music since 1957 for assigning entering students to the various music theory classes. At North Texas State University students are not permitted to enroll for the first two courses in collegiate music theory, Music 138 and Music 148, until they successfully complete the prerequisite course in music fundamentals, Music 126, or earn a score of sixty or above on the Freshman Placement Theory Examination (17, pp. 282-283). This examination is used as the screening device to identify the students who may omit Music 126, Music Fundamentals, and begin their college program of music theory courses with Music 138 and Music 148. Those students who earn placement scores of sixty or above demonstrate to the satisfaction of the theory faculty that they, as a result of previous musical training, high musical aptitude, or both, possess skills in music theory equivalent to the satisfactory completion of Music 126.

The Freshman Placement Theory Examination is used not only as a device for screening students but also as a device for homogeneously grouping students in particular class sections of music theory courses and as a prognostic tool. It is generally anticipated by the theory faculty that students who earn the highest scores on the placement test will show the highest level of proficiency in music theory, while

those students who earn lower scores on the test will demonstrate a lower level of proficiency in music theory.

While observation seemed to confirm the opinion that students who earned high scores on the Freshman Placement Theory Examination also were highly successful in collegiate music theory courses and that students who earned lower scores were less successful, statistical evidence was not available to support that opinion. The validity of the placement test as a screening device for admission to and grouping in Music 138 and Music 148 was not questioned. The validity of the test in this area was based on content and curricular validity. The usefulness of the instrument as a predictor of actual performance outcomes in the courses was uncertain.

The prognostic validity of the placement test was based on expert opinion which, according to Allen (1), is simply a subjective form of validity by prestige. Since objective statistical evidence of the prognostic efficiency of the test was lacking, the following questions arose regarding the prognostic usefulness of the theory placement test:

A. What is the relationship between scores on the Freshman Placement Theory Examination and proficiency in collegiate music theory?

B. Could other selected tests provide accurate prediction of performance in collegiate music theory?

C. Could a combination of selected tests be used to provide greater accuracy of prediction than that provided by a single test?

This study was undertaken to secure answers to the questions asked in the preceding paragraph. There was, as indicated, a need to identify tests which would provide satisfactory prediction of proficiency in collegiate music theory. Identified tests empirically validated for this purpose may be used at the college level in certain situations for guiding, counseling, selecting, classifying, or grouping students on the basis of anticipated performance levels in collegiate music theory courses.

Scope and Limitations of the Study

This study was limited to the problem stated previously. The investigation was limited to the comparison of the selected tests only in the area of prognostic validity for the criterion specified in the study. No other qualities of the selected tests were compared. The predictive capabilities of the selected tests were determined for music theory proficiency test scores only, and no attempt was made to generalize those relationships to include other aspects of musical achievements. The relationship between either success in music theory courses or the scores earned on the theory proficiency tests and success in other areas of music was not investigated. The specific criterion employed in this study is described in Chapter III.

The results obtained and the conclusions drawn in this study were not projected to situations where instructional emphasis and course design in collegiate music theory differ from those at North Texas State University. No attempt was made to compare music theory instruction at North Texas State University to music theory instruction at other institutions; therefore, no generalizations regarding the predictive capabilities of the selected tests for estimating performance in music theory courses of a dissimilar nature were made. The music theory courses at North Texas State University are described in Chapter III.

The results and conclusions of this study were not projected to populations dissimilar to the population studied. This population is described in Chapter III.

The precision of the research design of this study was limited by three variables which could not be controlled completely. Ideally, all of the pupils in the sample should have received identical instruction in music theory. Although the methods of teaching music theory were not under investigation, uniformity in the teaching of the courses needed to be a controlled factor in this investigation since the criterion was a measure of the skills developed or acquired in the courses and since proficiency test scores for all students were compared. The ideal design was not achieved because of the practical necessity of dividing the

total sample into a number of class units. Three problems, all related to uniformity of teaching and pupil experience, were created by this division. They were as follows:

1. All of the individuals in the population studied were not taught by the same teacher. The influence of this variable was minimized by coordinating the various theory class sections. A syllabus (20) which specified exact course materials and content was used as the course guide by each theory teacher.

2. The students participating in this study were not randomly assigned to the various teachers and music theory class sections but were grouped homogeneously in particular classes according to scores earned on the Freshman Placement Theory Examination. The uses of this test were explained previously in the "Background and Significance of the Study." Although course content was the same for all groups and all groups received similar instruction and studied the same materials, the higher scoring groups usually completed their basic work more rapidly and had more time for drill and practice exercises than the lower scoring groups. This grouping undoubtedly caused classes to differ even though effort was made to secure uniformity of teaching among the various music theory class sections.

3. The data used in this study were collected over a period of two semesters from students whose college music programs varied. As explained previously, students were

admitted to Music 138 and Music 148 upon recommendation, based on the results of the Freshman Placement Theory Examination, of the theory faculty or upon successful completion of Music 126. Students who earned scores above sixty on the Freshman Placement Theory Examination were permitted to omit Music 126 and were permitted to take Music 138 and Music 148 their first semester in school. Students who earned scores below sixty were required to take Music 126 their first semester.

The elementary course in music fundamentals was not equivalent to Music 138 and Music 148. The purpose of the testing and grouping procedures was to permit those students who already possessed a knowledge of the fundamentals of music equivalent to that required for successful completion of the prerequisite course in music fundamentals to begin their music theory study at a more advanced level.

On the basis of scores earned on the Freshman Placement Theory Examination, 73.63 per cent of the population in this study was assigned to Music 138 and Music 148, and 26.37 per cent was assigned to Music 126 during the first semester of collegiate music study. The criterion data for the first group were secured near the end of the first semester of the school year, and the criterion data for the second group were secured near the end of the second semester of the school year.

The results of this situation were as follows:

1. The individuals in the second group were 4.5 months older at the time the criterion data were secured than they would have been if they had been assigned initially to Music 138 and Music 148.

2. The individuals in the second group had benefit of 4.5 more months in an intensive musical environment at the college level than the individuals in the first group.

3. The individuals in the second group had benefit of more college instruction in music theory, although the extra instruction was at a very elementary level, than the individuals in the first group.

4. For the individuals in the second group the interval of time between prognostic testing and proficiency testing was 4.5 months longer than it was for the first group.

The advantages provided the second group, which earned low scores on the Freshman Placement Theory Examination, were designed to enable this group to be more successful in the study of collegiate music theory than it would be without benefit of extra musical training.

The time interval between administration of the predictor tests and administration of the proficiency tests was not the same for all tests or for all individuals in the sample population. Due to the length of time required to administer all of the predictor tests, these examinations

were administered in four separate sessions distributed over a period of five weeks. As indicated previously, the criterion data were secured over a period of two semesters.

The data secured in this study were obtained from individuals who were homogeneously grouped in various music theory class sections and courses according to scores earned on the Freshman Placement Theory Examination and whose college music programs and experiences varied as a result of this grouping. No attempt was made to negate the influences of these variables; therefore, no statements regarding results which could be expected from ungrouped populations were made. The results and conclusions of this study are intended to apply only to situations where the population is grouped and treated in similar fashion.

There is evidence that the limitations stated above are acceptable in the present investigation, particularly in view of the uniformity in course content and materials achieved in the music theory courses under consideration. Studies indicate that proficiency in certain skills in music theory is related to course content but is not related to the amount of time spent in practicing those skills. In a study of the aural and notational elements in music theory courses, Poland (19) reported that achievement levels in the areas measured in his sample population were directly related to music theory course content. Langsford (12) reported in his study of aural elements in music theory

courses that the amount of improvement in aural skills is not necessarily the result of or proportionate to the amount of time spent practicing those skills. He reported that no significant relationship was found to exist between the amount of time spent in dictation practice and improvement in dictation skill.

Initial Assumptions

In this study the following assumptions were made:

A. The criterion tests are valid measures of the skills they purport to measure. Justification for this assumption is presented in Chapter III.

B. The sample population used in this study was a typical sample not significantly different from populations normally found in the environment in which this study was conducted.

C. All of the students who participated in the study received similar instruction in Music 138 and Music 148. Certain limitations pertaining to this assumption were stated previously.

D. Any differences among the reliabilities of the various predictor tests are not significant. Except for each test's prognostic validity for the criterion specified in this study, all tests are assumed to be not significantly different on all other factors pertaining to essential qualities of satisfactory test instruments.

Sources of Data and Procedures for Collecting Data

Data for this study were obtained from a population of ninety-one freshmen music students enrolled in the School of Music at North Texas State University in Denton, Texas, during the 1961-1962 school year. This population is described in Chapter III.

Six predictor tests named previously were selected as potentially useful instruments for predicting success in music theory and were used to gather data in the form of test scores from the sample population. The tests were selected after reviewing the literature related to the problem of this study, after consulting the Mental Measurements Yearbooks (4, 5, 6), and after securing the recommendations of faculty advisors at North Texas State University.

Criterion data, proficiency scores in collegiate music theory, were secured from the sample population by means of original objective proficiency tests developed specifically for this research. Members of the music theory faculty and the music education faculty of North Texas State University assisted in the preparation of the tests. The tests were constructed after an analysis of the content of the first freshman-level music theory courses at North Texas State University was made. Extensive achievement test

materials based on that content were designed. The tests appear in the Appendix, and they are described in Chapter III.

The predictor test scores were obtained from the sample population early during the fall semester of the 1961-1962 school year. The Freshman Placement Theory Examination and the Gordon Index of Musical Insight were administered in a freshman testing program before the fall school term opened. The remaining four tests were administered in September and October of 1961 during a period of time of five weeks in a course in music orientation, Music 163 (17, p. 283), in which all of the sample population was registered. The dates and details of the administration of the predictor tests are given in Chapter III.

The music theory proficiency tests, the criterion, were administered to the individuals in the sample population as they concluded their theory courses, Music 138 and Music 148. The data were secured for one part of the sample near the conclusion of the fall semester of the 1961-1962 school year and for the remaining portion of the sample near the conclusion of the spring semester of that year. The necessity for this procedure was explained under "Scope and Limitations of the Study." Two class periods of music theory time were required in each theory class for the administration of six of the tests of the proficiency battery. The sight singing test was administered privately to each individual in the sample population two weeks before the

completion of Music 138 and Music 148 at a time selected by each student. The dates and details of the administration of these tests are given in Chapter III.

Treatment of Data

The Pearson product-moment correlation coefficient, *r*, was determined by means of scatter diagrams (13, pp. 167-175) for all possible pairs of tests administered in the research program. The Wherry-Doolittle test selection method (9, pp. 426-441) was used to determine the maximum multiple correlation coefficient, *R*, between weighted combinations of predictor tests and total proficiency test scores.

To test the stated hypotheses, Fischer's *r* to *z* transformation (3, pp. 462-463) was utilized, and the usual formula for testing a non-zero hypothesis about a population correlation coefficient was used (3, pp. 464-465). Where the obtained correlation coefficients were less than +0.60, a one-tailed test of significance was employed, since in this study only obtained correlations significantly less than the *a priori* value assigned to *r* and *R* could lead to the rejection of hypotheses. The 10 per cent level of significance was chosen in order to reject hypotheses and consequently tests with a minimum of difference between obtained correlations and the *a priori* value and to avoid the Type II error in hypothesis testing. The consequences

of rejecting a true hypothesis were not considered serious in this study, but the consequences of accepting a false hypothesis could lead to difficulty. By using the 10 per cent level rather than the 5 per cent or 1 per cent level of significance, the risk of making the more serious Type II error in this study was decreased. Where the obtained correlation coefficients, r or R, were equal to or were greater than the selected a priori value of +0.60, no tests of significance of difference were applied. Obviously, no r or R +0.60 actually obtained from a sample population could be interpreted logically in any way which could lead to the rejection of a hypothesis that the true value of r or R for the population was not less than +0.60.

Scores on the seven proficiency subtests were expressed as normalized T-scores (3, pp. 223-227). The Total Proficiency Test score of each individual was expressed as the sum of the seven T-scores earned on the total proficiency battery. The Aural Composite Test score was the sum of T-scores earned on the subtests of Melodic Dictation, Rhythmic Dictation, and Harmonic Dictation. The Nonaural Composite Test score was the sum of T-scores earned on the three subtests of Music Fundamentals, Keyboard Recognition and Harmony, and Part-Writing.

Scores on the predictor tests were expressed as follows: Drake "Musical Memory" test, percentile age norms for music students on forms A + B as provided in the test manual

(8, p. 29); Drake "Rhythm" test, percentile norms for music students on forms A + B as provided in the test manual (8, p. 23); Freshman Placement Theory Examination, subtest A raw scores, subtests B + C mean raw scores, total scores mean of subtest A plus mean of subtests B + C; Gordon Index of Musical Insight, total raw scores; Kwalwasser-Dykema Music Tests, total summed correct answer raw scores on the four subtests employed; Otis Quick-Scoring Mental Ability Tests, Intelligence Quotients; Wing Standardised Tests of Musical Intelligence, total correct answer raw scores on the first three subtests and also total correct answer raw scores on the total test.

The reliabilities of the criterion tests were estimated by means of split-half technique using raw scores on the tests and the Spearman-Brown prophecy formula (14, pp. 156-157).

Regression equations (14, p. 130) in raw score form were provided for all single satisfactory predictors and satisfactory combinations obtained in the Wherry-Doolittle test selection process. Ogives were provided for converting predicted scores to percentile ranks.

To aid in the interpretation of the obtained correlation coefficients and to aid in determining the accuracy of prediction from the regression equations, the standard error of estimate was reported for each r (9, p. 161) and

R (9, p. 439) identified as satisfactory for use in prognosis. The coefficient of forecast efficiency, E, was reported for each satisfactory test and test battery (9, p. 178).

CHAPTER BIBLIOGRAPHY

1. Allen, Robert M., Psychological Tests and Measurements, Coral Gables, Florida, University of Miami Press, 1955.

2. Anastasi, Anne, Psychological Testing, New York, Macmillan Company, 1954.

3. Blommers, Paul and E. F. Lindquist, Elementary Statistical Methods, Boston, Houghton Mifflin Company, 1960.

4. Buros, Oscar Krisen, editor, The Fifth Mental Measurements Yearbook, Highland Park, New Jersey, The Gryphon Press, 1959.

5. _____, editor, The Fourth Mental Measurements Yearbook, Highland Park, New Jersey, The Gryphon Press, 1953.

6. _____, editor, The Third Mental Measurements Yearbook, New Brunswick, Rutgers University Press, 1949.

7. Drake, Raleigh M., Drake Musical Aptitude Tests, Chicago, Illinois, Science Research Associates, Inc., 1954.

8. _____, Manual for the Drake Musical Aptitude Tests, 2nd ed., Chicago, Illinois, Science Research Associates, 1957.

9. Garrett, Henry E., Statistics in Psychology and Education, New York, Longmans, Green and Company, 1959.

10. Gordon, Roderick D., Gordon Index of Musical Insight, Denton, Texas, North Texas State University Press, 1960.

11. Kwalwasser, Jacob and Peter W. Dykema, Kwalwasser-Dykema Music Tests, Manual of Directions, New York, Carl Fisher, Inc., 1930.

12. Langsford, Harry Marble, "An Experimental Study of the Effect of Practice upon Improvement in Melodic Dictation," unpublished doctoral dissertation, School of Music, Michigan State University, East Lansing, Michigan, 1959.

13. Lindquist, E. F., A First Course in Statistics, Cambridge, Massachusetts, Houghton Mifflin Company, 1942.

14. McNemar, Quin, Psychological Statistics, New York, John Wiley and Sons, Inc., 1959.

15. Mainous, Frank D. and Robert W. Ottman, Freshman Placement Theory Examination, Denton, Texas, North Texas State University Press, 1957.

16. National Association of Schools of Music, Bylaws and Regulations, Galesburg, Illinois, National Association of Schools of Music, 1953.

17. North Texas State University, Catalog 1962-1963, Bulletin No. 332, Denton, Texas, North Texas State University, 1962.

18. Otis, Arthur S., Otis Quick-Scoring Mental Ability Tests, Yonkers-on-Hudson, New York, World Book Company, 1937.

19. Poland, Bernard William, "An Investigation of Some Aural and Notational Elements in Music Theory," unpublished doctoral dissertation, School of Music, Ohio State University, Columbus, Ohio, 1960.

20. "Theory," unpublished syllabus, School of Music, North Texas State University, Denton, Texas, 1961.

21. Wing, Herbert D., Standardised Tests of Musical Intelligence, 5th ed., London, England, National Foundation for Educational Research in England and Wales, 1961.

CHAPTER II

REVIEW OF RELATED LITERATURE

The problem of predicting success in the study of music by means of tests has received much attention since the emergence of psychological testing. One of the most widely known pioneers in the fields of psychology and music aptitude testing was Seashore. The Seashore Measures of Musical Talent (53), first published in 1919, are of historical interest to musicians and psychologists alike. Since the publication of the 1919 edition of the Measures of Musical Talent, many other tests have been developed, but according to Lundin (30, pp. 200-228) the prognostic efficiency of most of the tests is far from that which is generally desired.

In recent years the number of research projects dealing with prognostic music testing has declined markedly. As indicated in Table I, a comparison of the number of directed research studies dealing with the total area of tests and measurements in music reported in the 1932-1948 Bibliography of Research Studies in Music Education (24) and the 1949-1956 Bibliography of Research Studies in Music Education (25) revealed that during the period 1932-1948 one hundred and forty-six studies were reported while during the period

TABLE I

RESEARCH STUDIES IN TESTS AND MEASUREMENTS IN MUSIC REPORTED FROM 1932 TO 1948 AND FROM 1949 TO 1956 WITH PERCENTAGES OF INCREASE OR DECREASE FOR VARIOUS CATEGORIES DURING THE 1949 TO 1956 PERIOD

Topic or Category	Number of Projects 1932-1948	Number of Projects 1949-1956	Total Number of Projects 1932-1956	Percentage of Increase or Decrease Between 1949-1956 Period and 1932-1948 Period
Tests and Measurements--Achievement	23	12	35	-44%
Tests and Measurements--Aptitudes	41	22	63	-46%
Tests and Measurements--Attitudes and Interests	13	15	28	15%
Tests and Measurements--Comparisons of Different Groups of Students	15	10	25	-33%
Tests and Measurements--Studies Related to Well-Known Tests	33	10	43	-70%
Tests and Measurements--Miscellaneous	21	25	46	19%

1949-1956 only ninety-four studies were reported. Table I is a summary of the number of directed research projects in tests and measurements reported in those two volumes. The marked decline in the number of studies in the area of tests and measurements in music is striking, especially since the total number of studies reported during the period 1949-1956 was considerably greater than the number of studies reported during the 1932-1948 period.

Researchers have long been interested in the problem of predicting success in the study of music. The number of studies dealing with this general problem is quite large. As a result of this widespread interest, a considerable foundation of significant research dealing with music prognosis has been developed which has yielded an abundance of music research instruments, techniques, and data available to present researchers. Although the number of studies dealing with this general problem is quite large, many of the investigations in design or purpose are not closely related to the problem of this study and are not cited in this section. No attempt has been made here to be encyclopedic. The literature reviewed is placed under three main headings and is related to the problem of this study as follows:

1. Literature Pertaining to Certain Aspects of Test Validity
2. Literature Pertaining to Criteria Used in Validating Prognostic Music Tests

3. Literature Pertaining to Prognostic Measures Employed in the Study

In order to stress the relevancy of certain previous writings to this research and to clarify the presentation of this study, literature that is related to particular materials, specific procedures, or particular findings of this research is cited in other appropriate sections.

Literature Pertaining to Certain Aspects of Test Validity

It is generally recognized by authorities in the field of tests and measurements that one of the essential qualities of a good test is validity. To be of value, a test must measure that which it purports to measure, and to be of any real use in a specific situation to a particular user, it must measure that which the user desires it to measure. The validity of a test is specific, not general. A test may be valid for one purpose and invalid for another, or valid for one group and invalid for another, or valid in one situation and invalid in another (15, p. 354). Because of the specific nature of validity, it becomes, ultimately, the responsibility of each user of tests to confirm for himself the validity of the tests he uses in terms of his specific needs (10, p. 105).

The validity of tests may be determined in a number of ways. Four general kinds of validity have been distinguished by the Committees of the American Psychological

Association, the American Educational Research Association, and the National Council on Measurements Used in Education. They are as follows: (1) predictive validity, (2) concurrent validity, (3) construct validity, and (4) content validity (2). According to Wood (69, pp. 16-17) these distinctions do not mean there are really four kinds of validity; rather, they are a recognition of four basic methods of assessing validity. Some writers have recognized two basic types of validity, empirical or statistical validity and logical or curricular validity. According to Cronbach (10, p. 103), empirical or statistical validity involves the collection and analysis of data which is in contrast to the purely logical methods of determining validity.

Where the purpose for administering a test is to make a prediction of some outcome, predictive or concurrent validity are appropriate types of validity to ascertain (10, p. 108). The predictive validity of a test is determined empirically by finding the correlation coefficient between performance on the test and performance on some independent criterion secured at a later time (15, pp. 355-356). Anastasi (3) has described this type of validation procedure in detail. Concurrent validity of a test is determined by comparing the test being investigated to an established test of known prognostic validity (10, p. 109). Wheeler (61), for example, employed this general procedure

in validating a musical aptitude test of his own construction. He obtained a correlation coefficient of +0.71 between performance on his test and performance on the Seashore Measures of Musical Talents. He reported this figure as one of his validation coefficients. According to Lundin (30, pp. 197-198), this type of validation is difficult to support, since there is considerable disagreement on the validity of existing music tests.

According to Cronbach (10, p. 108), the greatest problem in prognostic validation is to obtain a suitable criterion measure. This has been particularly true in the field of music (30). Considerable energy has been expended in an effort to measure musical capacity or potential in order to predict some undefined or indistinct criterion such as "success in music." The reasons musicians experience difficulty in identifying and defining successful musical behavior are made evident in the section reviewing the literature pertaining to validation criteria used in music.

Literature Pertaining to Criteria Used in Validating Prognostic Music Tests

The problems and techniques associated with prognostic testing in music have been and are now essentially the same as those encountered with prognostic testing in many other areas. However, certain difficulties have been encountered in developing music tests which meet high standards of excellence such as those called for by the American

Psychological Association (2). The satisfactory determination of test validity has been a particularly troublesome problem with prognostic music tests. The literature of music testing is filled with disagreement in this area, specifically in regard to the suitability of the various criteria selected for use in the prediction of achievement in music.

The tests used for measuring musical behavior fall into three general categories as follows: (1) tests of musical aptitude or ability which are chiefly tests of sensory capacity, (2) tests of feeling and appreciation which seek to measure the aesthetic response to music, and (3) achievement tests of musical knowledge which seek to measure acquired musical knowledge of a factual nature (30, p. 200). All three types of tests have been used in efforts to predict success in the study of music.

According to Gordon (17, p. 1), the use of achievement tests as predictors of musical success is questionable. He pointed out that high achievement scores may be obtained on tests of this type simply by memorizing assorted facts about music. An encyclopedic knowledge of musical facts which may be the result of drive, practice, conditioning, or tutoring may not be related necessarily to future success in music.

The tests of feeling and appreciation encounter difficulty as prognostic devices because of their lack of

objectivity (30, pp. 227-228). Value judgments are involved in these tests, making them subjective rather than objective devices.

The tests of aptitude or ability make the most serious attempt to predict musical success (30, p. 227). Writers on the subject of musical aptitude are not in agreement on this subject. Some authors (50, 51) stated there is an innate capacity for music, a particular endowment of special qualities which enables a person to become successful in music study. Mursell (38) denied the existence of special unique inborn musical capacities. Spearman (55, pp. 241-242, p. 340), who was aware of the work of Seashore and his associates, was reluctant to recognize a special area of abilities related to musical accomplishment. He reported that group factors, of a sufficient breadth and degree to possess serious practical consequences educationally and vocationally, have been discovered in some areas including the ability to appreciate music. He stated, however, that group factors are astonishingly rare, and where they do exist there is a suggestion that their appearance is due to past experience rather than native aptitude. Burt (7) stated that Wing's researches (68) demonstrated rather convincingly the existence of a special factor in music. Although the problem of selecting some behavior to measure and use in making predictions has not been settled, the

basic problem is one of identifying some criterion of musical success.

A fundamental issue in prognostic music testing is the suitability of various criteria used as measures of success in music. This controversy stems from three basic problems which are as follows:

1. Musical ability is an extremely complex pattern of behavior (30, pp. 197-198).

2. The field of music is very broad, and success in different areas requires various kinds of skills and abilities in different amounts (51, pp. 287-288).

3. Musicians are not agreed on a definition or description of successful musical behavior (30).

In regard to the first problem mentioned, various authors have attempted to analyze and define musicality. Pflederer's recent article (44) concerning the nature of musicality in which she identified and described eight characteristics of musical individuals was a brief review of some basic concepts concerning the nature of musical behavior. Although her article was directed primarily to drawing educational inferences from her description of musical behavior, her summary of the characteristics of a musical individual indicated the complexity and diversity of this behavior.

In regard to the second problem, diversified profiles could be developed as test criteria for success in various

areas of music (51). Or, areas in music common to all musicians could be used for developing criteria (30).

In regard to the third problem, an acceptable definition of successful behavior could lead to the selection of a criterion. Because of the lack of agreement in a definition of successful musical behavior, music tests have been developed and validated by various researchers in accordance with their various concepts of appropriate criteria to be used in measuring success in music.

Ideally, the ultimate criterion in a general prognostic music test to be used for vocational counseling or selection, guidance, or placement purposes at the college level would be some measure of the total future musical proficiency of an individual (18). As Thorndike (58, pp. 121-122) pointed out, however, an ultimate criterion is usually unavailable, and the problem in prognosis is one of securing some immediate, accessible, partial, substitute criterion that is closely related to the ultimate criterion. Since no measure of the total musical proficiency of an individual is currently available and since musicians are not agreed on a definition of successful musical behavior, the problem for music researchers working in the area of prognosis of success in the collegiate study of music is one of securing some acceptable substitute criterion. Previous researchers have used or suggested various criteria as measures of musical behavior.

One of the earliest lines of approach taken to resolve the problem of the measurement of musical aptitude was the isolation and measurement of specific sensory capacities apparently necessary for success in music (53). The chief exponent of this approach was Seashore. His views on this problem are summarized in two books. Seashore's first book (52) is primarily a collective and elementary presentation of the results of studies by Seashore and his associates in the music psychology laboratory at the State University of Iowa. His second book (51) is a supplement to the earlier work.

Seashore, like Wundt and other pioneers in the field of psychology, tested those elements which could be defined precisely and controlled accurately in a laboratory (51). Tests of this type have an obvious content validity. This internal validity was considered adequate by Seashore. Unfortunately, the prognostic validities of tests of this type usually are negligible (10, pp. 158-159). Many investigations have found that this is generally true of the Seashore Measures of Musical Talent (6, 20, 37, 70). The highly specific character of these tests appears to recommend them as laboratory tools as well as condemn them for use in practical situations for prognosis.

The opponents of Seashore's theory of specifics have been quick to point out that his tests have never been validated satisfactorily against an external independent

criterion. Mursell, one of the chief opponents of Seashore's views, stated that the only really satisfactory way of validating the Seashore Measures or any other prognostic music test would be through the use of correlation technique using as the criterion some independent external measure of musical behavior (38, p. 294). He suggested specifically that an external criterion of musical behavior might be the ability to sight sing, perform on an instrument, or succeed in courses in music theory (39).

Saetveit, Lewis, and Seashore (47, p. 42) replied to Mursell's criticism at the time the 1919 edition of the Seashore Measures of Musical Talent was revised. In discussing the 1939 revision of the tests, which were renamed the Seashore Measures of Musical Talents (54), they stated that the validity of each measure is based only on what each measure purports to measure. They maintained that the measure of "Pitch," for example, should not be validated against musicality or musical performance but strictly against the ability to discriminate pitch differences. They pointed out that they do not assume that a good sense of pitch in itself is predictive of musical success. All that they assumed was that a person who has a good sense of pitch should be capable of controlling pitch in musical performance.

Many individuals have attempted to demonstrate the usefulness of the Seashore Measures in predicting external

musical criteria. One of the earliest and most extensive studies in the area of testing for the purpose of predicting success in collegiate music study was undertaken by Stanton (56) at the Eastman School of Music. Her ten year study employed the 1919 edition of the Seashore Measures of Musical Talent. Through an elaborate and somewhat complicated system of individual profiles, students were placed in various categories representing levels of success or failure in completing college music curricula. The student profiles were based on five of the measures in the Seashore battery, a musical performance audition, a mental ability test (Iowa Comprehension Test), a test of tonal imagery, and a case history. All of the information was combined in making the predictions. Stanton reported good success predicting completion of a four-year college course in music in the standard time. Seashore considered the prognostic validity of his tests remarkably good in commenting on Stanton's validation study (51, pp. 319-320). Mursell (38, pp. 297-298) pointed out that Stanton's study was not completely satisfactory as a validation study of the Seashore Measures because the categories into which students were grouped were not formed using only those tests in the Seashore battery. Mursell pointed out that it was impossible to ascertain from Stanton's report just how the data were combined; her report did not separate the influence of the predictor

variables. For this reason it is impossible to appraise the significance of Stanton's research as a validation study.

Lundin (30, pp. 204-208) summarized the findings of thirteen validation studies of the Seashore Measures based on external criteria. In these studies some of the various criteria employed to measure musical success were as follows: levels of success in completing college music programs including graduation as one criterion; teachers' ratings of musical aptitude; grades in applied music including piano and voice; grades in music theory including dictation, sight singing, and harmony; average college grades in music courses; teachers' rankings of music students; and teachers' ratings of musical performance ability. All but four correlations of the ninety-one reported in Lundin's summary fell below +0.60. An investigation of the studies cited by Lundin where correlations obtained between the Seashore Measures and external criteria reached or exceeded +0.60 revealed the following: Highsmith (20) reported r = +0.80 between the measure of "Pitch" and grades in applied music; Salisbury and Smith (48) reported r = +0.60 between "Pitch" and sight singing, and r = +0.65 between "Tonal Memory" and sight singing; and Wright (70) reported r = +0.73 between total Seashore scores and music dictation.

In another study of the validity of the Seashore Measures, McCarthy (31), using ninety-three university students and seventy-one fifth and sixth grade school children,

employed for the college group a self rating questionaire as the external criterion measure of musical ability. Music grades were used as the criterion in the children's group. Brown (6), in a study of one hundred and five junior and senior high school students, used as his criterion a ranking of the students by their teacher. Students were ranked according to the teacher's judgment of their natural or innate musical abilities. Brown reported the following low correlation coefficients between that criterion and the Seashore tests: "Pitch," $\underline{r}$ = +0.15; "Intensity," $\underline{r}$ = +0.11; "Tonal Memory," $\underline{r}$ = +0.41; "Time," $\underline{r}$ = +0.15; "Consonance," $\underline{r}$ = +0.17; "Rhythm," $\underline{r}$ = +0.17; and average score, $\underline{r}$ = +0.38.

In a more recent study, Schmitz (49) investigated the prognostic efficiency of the A and B Forms of the revised Seashore Measures and the Kwalwasser-Ruch Test of Musical Accomplishment. His criterion was a measure of success in the music education programs at Northwestern University. The criterion was based on grades earned in courses in music theory, applied music, music history, and music education. Schmitz reported that (1) grades below the mean could be predicted more accurately than grades above the mean, (2) poor grades were easier to predict than good grades, (3) the prediction of upper and lower quartile grades using upper and lower quartile test scores was not possible, (4) the two middle quartiles of test scores were devoid of any prognostic values, (5) the B Form of the Seashore test possesses

useful prognostic value, (6) the lower quartile B Form of the Seashore test can predict grades below the mean, (7) the upper quartile B Form of the Seashore test can predict grades above the mean, (8) the A Form of the Seashore test is not as good as the B Form for prognostic purposes, and (9) the score range on the Kwalwasser-Ruch Test of Musical Accomplishment is too narrow for discrimination of individual differences in achievement at the college level.

Chadwick (8), in his study of the revised Seashore Measures, Teachers College Achievement Test, and the American Council Psychological Examination as predictors of success in sight singing, employed an objective sight singing test constructed by a sight singing class teacher as the criterion. Music students at Colorado State Teachers College were the subjects. Using the total score earned on five of the six tests of the Seashore battery, he obtained an $r = +0.75$ between test scores and the sight singing criterion. Using all the predictor test scores, he obtained a multiple correlation coefficient of $R = +0.84$ between test scores and the criterion. Chadwick concluded that the musical talent test was two and one-half times more predictive than the intelligence test and twenty-five times more predictive than the test of general knowledge about school subjects. In regard to the selection of sight singing as a criterion measure, Chadwick stated that sight singing is recognized as one subject which is uniquely

musical, and that success in sight singing indicates broad musical aptitude.

In a very recent study conducted at the University of Minnesota, the prognostic capability of the revised Seashore Measures of Musical Talents, the Aliferis Music Achievement Test, the American Council on Education Psychological Examination, and the University of Minnesota English Test were ascertained by Roby (46). He used grades in the full two-year sequence of music theory courses at that school as the measure of musical success. The correlation coefficients obtained by Roby between his selected criterion and the various predictor tests were as follows: total Seashore (N = 77), r = -0.055; Seashore "Pitch" (N = 77), r = -0.045; Seashore "Loudness" (N = 77), r = +0.038; Seashore "Time" (N = 77), r = +0.018; Seashore "Rhythm" (N = 77), r = -0.025; Seashore "Timbre" (N = 77), r = -0.134; Seashore "Tonal Memory" (N = 77), r = +0.089; total Aliferis (N = 77), r = +0.728; Aliferis "Melody" (N = 77), r = +0.643; Aliferis "Harmony" (N = 77), r = +0.662; Aliferis "Rhythm" (N = 77), r = +0.373; total Aliferis minus Aliferis "Rhythm" (N = 77), r = +0.773; American Council Examination (N = 67), r = +0.339; Minnesota English Entrance Test (N = 66), r = +0.472. In summary, Roby reported a strong relationship between scores earned on the Aliferis Music Achievement Test and grades in music theory, a fair relationship between the Minnesota English Entrance Test and grades in music theory, a fair

relationship between the American Council Examination and grades in music theory, and no relationship between the Seashore Measures of Musical Talents and grades in music theory.

The appropriateness of using grades or measures of achievement in music theory courses as indices of success in music has been recognized by outstanding authorities in the field of music psychology (30, 39). There is evidence that musicians and music educators regard competence in music theory as essential to basic musical accomplishment. Required courses in music theory are found in most college music curriculums (30, p. 184). Gray (19), in his study of subject matter testing practices in music education programs at sixty-three state universities offering a total of eight different degrees in music to prospective music teachers, was able to determine five areas of music subject matter required of all students in music education programs. Course work in music theory was identified as one of the areas. This was not surprising since music theory course work is required in the programs of all schools that are members of the National Association of Schools of Music (41).

Literature Pertaining to Prognostic Measures Employed in the Study

This section is divided in five parts as follows:

1. Drake Musical Aptitude Tests
2. Gordon Index of Musical Insight

3. Kwalwasser-Dykema Music Tests

4. Wing Standardised Tests of Musical Intelligence

5. The Relationship Between Measures of Mental Ability and Musical Ability

Literature pertaining to the general aspect of intelligence as related to musical ability was selected for review rather than literature dealing only with the Otis Quick-Scoring Mental Ability Tests. A broad rather than narrow review of literature in this area appeared reasonable and desirable.

Since no literature related to the Freshman Placement Theory Examination exists, that measure was not included in this section.

The literature dealing with the Gordon Index of Musical Insight includes a brief account of the development of the test, a description of the instrument and test procedure, an explanation of the meaning of musical insight, a summary of factors which appear to be involved in the solution of the test problems, as well as a review of findings of investigations pertaining to the test. This general information about the test is included because of the newness of the measure and the unavailability of explanatory and descriptive materials concerning the instrument.

In regard to the other measures, general descriptive material is intentionally omitted from the review of literature, since information of this type is readily available.

Drake Musical Aptitude Tests

The Drake Musical Aptitude Tests were designed for the purpose of measuring musical talent and for predicting success in musical training (11, pp. 4-13). These prognostic tests are suitable for testing college students and adults as well as elementary and high school children. Mainwaring (33, p. 380) stated that the tests rank high among existing measures of musical aptitude. Lundin (29, pp. 379-380) stated that the tests are superior to either the Seashore or Kwalwasser-Dykema tests. The tests measure musical aptitude and not musical achievement according to Drake (11, p. 13). Jenkins, however, observed in his study (22, pp. 54-56) that high school students in the upper three quartiles in mental ability who had studied music earned significantly higher scores on the Drake test of "Music Memory" than matched students who had never studied music.

Drake based all of his validation work reported in the test manual on teacher estimates or ratings of the musical ability of test subjects. He reported validity coefficients ranging from +0.31 to +0.91. With two small groups (N = 13 and N = 38) Drake obtained teacher ratings of the test subjects on two occasions and determined the reliability of the teacher ratings. In both cases the reliability was reported as +0.68. Drake suggested that his tests must be highly valid since high validity coefficients are difficult to obtain where test and criterion reliabilities are limited.

In an earlier study using another edition of his tests, Drake compared the prognostic validity of four subtests in his battery, ten subtests of the Kwalwasser-Dykema Music Tests, and six subtests of the Seashore Measures of Musical Talents (12). The population studied consisted of three hundred and ten individuals whose ages ranged from nine to twenty-five years. For one portion of the sample, teachers' ranks based on judgments of innate musical capacity were used as the criterion; for the other portion of the sample, scores on an objective examination were used as the criterion. Of the twenty tests compared in his study, only three were reported to be satisfactory as prognostic measures. They were the Drake test of "Musical Memory" and the Seashore tests of "Pitch" and "Tonal Memory."

In a study of the relationship between musicality, intelligence, and achievement, Christy (9) reported a correlation of +0.32 between the Drake test of "Musical Memory" and grades in music theory and composition. Christy considered this correlation too low for use in making individual predictions.

The Gordon Index of Musical Insight

The Gordon Index of Musical Insight was developed in an effort to explain an unexpected turn of events. In 1957 the originator of the test was invited to speak before a group of elementary school teachers in Odessa, Texas, on the

subject of "Evaluating the Child in Music." In the process of preparing for this address, Gordon decided to approach the problem of testing music reading ability in a manner which would appeal to children. He decided to construct a test which would seem more like a game than a formal examination. His idea was to take about four measures of a song the children knew well, write the musical notation on paper or cards, cut the measures apart, scramble or shuffle the measures, and then ask the children--who would not be told the name of the song--to paste the measures back together in the proper order. Gordon assumed that if the children could read music they would soon recognize the song and be able to place the measures in order. He also assumed that pasting the measures together in proper order would be fun for the children. To try out his idea, Gordon tested this procedure in a college music methods class in the School of Music at North Texas State University. To his great astonishment, some of the college music students found the puzzles unsolvable, while others encountered little or varying degrees of difficulty. The question of why some students encountered difficulty while others found the solution of the puzzles easy fun was perplexing. This unexpected turn of events led to an investigation of the problem (16).

After the initial trial of the test-game with its puzzling and unexpected results, scramble tests were developed to investigate the matter. The problems of test

construction were gradually solved, and after three years of research and development the Aa and Ba forms of the 1960 edition of the GIMI were produced.

In those forms the test consisted of a number of scrambled measures from familiar songs; the problem, as in the original test, was to arrange the scrambled measures in proper order. Pasting was replaced with a system of measure numbering so that taking the test was a simple matter of putting numbers in appropriate squares. Each scrambled song constituted one item on the test; songs were not mixed together. Form Aa was designed for precollege students and for college students not majoring in music. Form Ba was designed for graduate and undergraduate college music majors. Both forms of the instrument were designed for musically literate individuals; standard musical notation was employed for all test items. No auditory stimuli were employed (17).

The general type of approach outlined by Gordon has been employed frequently in educational situations. A recently published class method book for band instruments (23) makes considerable instructional use of procedures remarkably like those employed for test purposes by Gordon.

Gordon's test purports to measure "musical insight." The term "insight," according to Thorpe (59, p. 168), refers to the intellectual ability of an individual to perceive relationships in new or problematic situations which could

lead to the solution of a problem, the making of an adjustment, or the improvement in a skill. For Gordon (16), insight is manifest in many ways and in many situations; to him there is no single type of intelligence. "Musical insight" refers to the specific ability of an individual to perform the mental functions necessary for success in music.

The importance of purely mental functions as requisites of success in music was stressed by Gordon (16). The views of Revesz (45, p. 133) on this subject support Gordon's position.

Some of the factors which seem to be involved in the solution of the scrambled melodies have been identified. At first, melody recognition was considered a necessary requirement, but evidence has been accumulated that this is only one of the factors operating. Gordon reported two instances in which high scores were earned by individuals who recognized none of the melodies. Factors reported by Gordon (17) were as follows:

1. Interval recognition
2. Rhythmic recognition
3. Melodic recognition
4. Harmonic implication (identification of cadences)
5. Logical rhythmic sequence
6. Logical melodic sequence

According to Gordon the purpose for developing the GIMI was to aid in the prediction of success in the handling of

the theoretical aspects of music. He has secured some evidence of the validity of this instrument (17).

In one investigation approximately two hundred music students were tested. Their test scores were compared with theory teachers' ratings of the students "natural" ability or musicality; a very high relationship between the two variables was obtained (17).

Gordon reported that the GIMI was administered to all freshman music students at the University of Wisconsin. None of the students whose scores fell below the twenty-fifth percentile returned to that school the sophomore year (17).

The following correlation coefficients were obtained between the GIMI and the indicated variables in validation studies conducted by Gordon (17): mean applied music grade (N = 42), r = -0.46; melodic dictation (N = 21), r = +0.71; harmonic dictation (N = 22), r = +0.64; rhythmic dictation (N = 22), r = +0.41; sight singing (N = 23), r = +0.44; music theory grades (N = 134), r = +0.29; sight singing test using a familiar melody (N = 35), r = +0.11; sight singing test using an unfamiliar melody (N = 35), r = +0.45; the North Texas State University "Graduate Theory Proficiency Examination--Fundamentals" (N = 25), r = +0.39; the North Texas State University "Graduate Theory Proficiency Examination--Aural Perception" (N = 25), r = +0.69; Seashore test of "Pitch" (N = 24), r = +0.27; Seashore test of

"Rhythmic Discrimination" (N = 54), r = -0.02; and the Seashore test of "Tonal Memory" (N = 54), r = -0.18.

Kwalwasser-Dykema Music Tests

Although the Kwalwasser-Dykema Music Tests are quite similar to the Seashore Measures of Musical Talents, Mursell and Glenn (40) commend the Kwalwasser-Dykema tests because they use actual musical materials rather than musically meaningless sounds. Research by Wing (68) and Christy (9) indicated that music tests which contain materials of a musical nature furnish higher correlations with music achievement than do tests of purely sensory discrimination.

Of the four subtests selected for use in this study, two, "Tonal Memory" and "Rhythm Discrimination," purport to measure sensory acuity to sound, and two, "Pitch Imagery" and "Rhythm Imagery," measure learned behavior; the latter two tests can be used only with subjects who can read musical notation (30, pp. 209-211). According to Farnsworth (14) the Kwalwasser-Dykema subtest of "Tonal Memory" measures the same behavior measured by the Seashore test of "Tonal Memory." Whitley's study (62) confirmed Farnsworth's findings in regard to that subtest.

A number of investigators criticized the Kwalwasser-Dykema Music Tests because of their low reliabilities. Lundin (30, p. 212) summarized the results of six studies in which the reliabilities of the tests were determined. For

the four tests used in the present study, the reliabilities were summarized as follows: "Tonal Memory," +0.73, +0.63, +0.57, +0.55, +0.53, +0.52, +0.46, and +0.43; "Rhythm Discrimination," +0.48, +0.39, +0.30, +0.28, +0.27, +0.23, +0.21, and +0.04; "Pitch Imagery," +0.45, +0.42, +0.33, +0.28, and +0.14; and "Rhythmic Imagery," +0.40, +0.38, +0.31, +0.27, and +0.20. The reliabilities of the tests were increased recently by Holmes (21). He described certain changes in administrative directions for the tests, and provided a new weighted set of scoring keys which resulted in a substantial increase in the reliabilities. The increases were obtained without altering the actual musical stimuli presented in the tests.

Manzer and Morowitz (34) investigated the performance of five hundred college sophomores and juniors at New York University and Long Island University to determine if college students could use the Kwalwasser-Dykema tests which were designed primarily for use with younger students. The authors concluded that the results of their study indicated that the tests could be used as aids in administrative procedures at the college level. In their sample population only a few individuals made perfect scores, but there was a tendency for the scores earned by college students to be less variable than scores earned by children. The mean scores on all the tests for the college group were higher than the mean scores for younger groups. The college

students earned scores above the middle range of items on all the tests; this indicated the tests are too easy for adults. The study by Manzer and Morowits confirmed the study by Tilson (60) in which the scores of adult students were reported to cluster around the upper percentiles reported in the test manual.

Larson (26, p. 261) stated that the test norms indicate an undue proportion of difficult items in relation to discrimination in the center of the distribution. This defect did not seem to cause difficulty where the test was used for adult subjects, however, in view of the findings of Tilson, Manzer, and Morowitz.

Lehman (27) reported that the Kwalwasser-Dykema Music Tests are satisfactory measures for use in predicting success in instrumental music study at the college level. In his study, highly significant differences in performance on the tests were found to exist between students who continued in the field of music and students who discontinued music study (N = 450). The mean score for the continued group was 228.48; the mean score for the discontinued group was 202.41. This difference is significant well beyond the 1 per cent level. Significant differences well beyond the 1 per cent level were found to exist between the two groups on all of the tests of the battery; the continued group scored above the discontinued group on all tests. Chadwick (8), using grades in sight singing for two groups as the

criterion, reported the following correlations with the four tests used in his study: "Tonal Memory," +0.32 and +0.14; "Rhythm Discrimination," +0.08 and +0.17; "Pitch Imagery," +0.32 and +0.29; "Rhythm Imagery," +0.34 and +0.46. Tilson (60) also used grades in sight singing and reported the following correlations: "Tonal Memory," +0.40; "Rhythm Discrimination," +0.19; "Pitch Imagery," +0.19; "Rhythm Imagery," +0.39.

Beinstock (4) reported that the correlation between the Kwalwasser-Dykema test of "Tonal Memory" and grades in music theory earned by one hundred and twenty-two students of the Music and Art High School in New York City was only +0.19. With another group of students (N = 80) an r = +0.16 was reported between music theory grades and the "Tonal Memory" test, and an r = +0.35 was reported between music theory grades and "Rhythm Discrimination." Beinstock concluded that improvement in the reliability of the measures of "Tonal Memory" and "Rhythm Discrimination" might make those tests practical for use in pupil guidance. She did not investigate the tests of "Pitch Imagery" or "Rhythmic Imagery."

Taylor (57) investigated the prognostic ability of the Kwalwasser-Dykema Music Tests and other selected tests at the College of Music of Cincinnati. She reported, among others, the following correlations: between "Pitch Imagery" and grades in music dictation (N = 144), r = +0.593; "Pitch

Imagery" and grades in sight singing (N = 144), r = +0.348; "Pitch Imagery" and grades in harmony (N = 144), r = -0.008; "Rhythm Imagery" and dictation (N = 145), r = +0.256; "Rhythm Imagery" and sight singing (N = 145), r = +0.089; "Rhythm Imagery" and harmony (N = 145), r = +0.017; "Tonal Memory" and dictation (N = 147), r = +0.445; "Tonal Memory" and sight singing (N = 147), r = +0.286; "Tonal Memory" and harmony (N = 147), r = +0.020; "Rhythm Discrimination" and dictation (N = 147), r = +0.094; "Rhythm Discrimination" and sight singing (N = 147), r = +0.166; and "Rhythm Discrimination" and harmony (N = 147), r = -0.040. She concluded that the best tests in the Kwalwasser-Dykema battery were "Tonal Memory" and "Pitch Imagery."

Wing Standardised Tests of Musical Intelligence

The Wing Standardised Tests of Musical Intelligence were designed to identify musically bright ten or eleven year old children for the purpose of providing them the opportunity of instruction in instrumental music (64, p. 4). For that reason, the test attempts to measure sensitivity to musical performance as well as acuity of musical hearing (65, p. 39).

McLeish (32, pp. 345-346), in a review of the test, stated that the Wing battery also should be suited for older students; he indicated that it would be most suitable for surveys of groups known to be above average in musical

talent or for assessing the extent of potential ability of subjects known to be musically gifted. Papesch (67) suggested the tests might be useful for more advanced purposes.

According to McLeish (32), the tests require more concentration and cause more fatigue than other recorded tests. This element of fatigue was also noted by Bentley in his study comparing certain musical aptitude tests (5). Bentley suggested using only the first three tests of the Wing battery if a shorter test should be desired. He stated that the subtotal for the first three tests would be the best single measure of musical aptitude if only a short testing time should be available.

McLeish (32) stated that the Wing tests are much more acceptable to musicians than some music aptitude tests which are regarded as irrelevant, atomistic, and musically meaningless. Wing's tests, which strive for a close association of test materials and procedures with general musical practice, are considerably more musical than either the Seashore Measures of Musical Talents or the Kwalwasser-Dykema Music Tests. The underlying theory takes issue with Seashore's atomistic type of approach (32).

Christy reported in his study (9, p. 119) that tests which contain material of a musical nature furnish higher correlations with achievement in music, including grades in collegiate music theory, than tests of purely sensory discrimination. He stated that there was a clear pattern of

relationship evident in his study: As the musical value of the tests increased, the correlations with external musical criteria increased. The results of Christy's investigation supported the findings of Wing.

In a recent journal article (65), Wing expressed some degree of disinterest in studies using his test for prognosis in other areas than learning to play an orchestral instrument. Wing maintained that his test was designed for the field of instrumental music and not for general prognosis in other areas of music. In regard to Cleak's study (66) which investigated the relationship between grades in music and scores on the Wing battery, and in which Cleak reported substantial agreement between test scores and marks in music, Wing stated that grades include abilities, such as the capacity to sing, which his test was not designed to measure.

The validity of the Wing Standardised Tests of Musical Intelligence was ascertained in several studies. The following validation coefficients based on teachers' rankings of five different groups were reported by Wing: group 1 ($N = 45$), $r = +0.64$, group 2 ($N = 15$), $r = +0.78$; group 3 ($N = 34$), $r = +0.82$; group 4 ($N = 6$), $r = +0.90$; and group 5 ($N = 19$), $r = +0.77$ (68, pp. 60-61). In another validation study employing a population of eleven year old children, Wing reported that the validity of his test fell as low as +0.60; teacher estimates of musical ability also were used

as the criterion in his study. He explained that the validity of the test rises when the test is used with older and more varied groups (64). With a group of training college students Wing obtained a validity coefficient of +0.73 between performance on his test and performance on the Aliferis Music Achievement Test (63). A recent investigation by Newton (43) supported the previous validation studies of Wing.

No studies using the Wing tests for the prediction of success in collegiate music theory courses were found in the literature.

The Relationship Between Measures of Mental Ability and Musical Ability

The appropriateness of using measures of mental ability as predictors of musical ability was suggested by a number of writers. Seashore stated that in predicting success in music study, intelligence must be considered (51, p. 177). Stanton (56) demonstrated that intelligence measures are a valuable index for predicting musical achievement. Schoen stated that intelligence is necessary for musicianship (50). Aliferis (1, p. 3) considered the determination of intelligence to be a basic requirement in forming a reliable student profile for use in counseling and guiding music students.

Newton demonstrated in his study (43, pp. 45-46) that a measure of general intelligence used with a measure of

musical aptitude provided greater accuracy of prediction than estimates based on a musical aptitude test alone.

In a study of the relationship between music theory grades and scores on the Seashore Measures of Musical Talents, the Aliferis Music Achievement Test, the American Council Examination, and the Minnesota English Entrance Test, Roby (46) reported a correlation coefficient of +0.339 (N = 67) between grades in the full two-year sequence of music theory courses at the University of Minnesota and mental ability as measured by the American Council Examination. Roby stated that the use of intelligence test scores in the profiles of music students will raise the degree of success in predicting music theory grades.

Beinstock (4), in two predictive studies of musical achievement of one hundred and twenty-two students in the Music and Art High School in New York City, used, as one of her criteria of success in music, music theory course grades earned over a period of six semesters. The Kwalwasser-Dykema Music Tests, the Terman Group Test of Mental Ability, and the Otis Self-Administering Test of Mental Ability were among the measures used for prognosis. In the first study the correlation between mental ability and grades in music theory was +0.53; in the second study the correlation was +0.58. Beinstock concluded that the most effective measure for predicting success in music theory was mental ability.

A study of the literature dealing with the relationship between mental ability and musical ability indicated that researchers were not in agreement on a definition of musical ability. Two distinct types of relationships were identified. Some authors defined musical ability in terms of test scores earned on musical aptitude tests; other authors defined musical ability in terms of actual musical achievement. Mursell (36), in a summary of studies pertaining to the relationship between intelligence and musical ability, stated that where musical ability was measured by musical talent tests, little relationship between the two variables was observed, but where musical ability was measured in terms of actual musical behavior, the two variables were positively related. In studies of the first type the relationship between success in music and intelligence is difficult to assess since the relationship of most musical aptitude tests to achievement in music is subject to wide differences in interpretation. This problem was explored in previous sections of this study. In studies which employed the latter approach and which were more appropriate to the problem of this study, interpretations were also difficult to make. As Gordon (16) explained, academic intelligence as measured by standard intelligence tests is necessary for professional success in music, but high academic intelligence, in itself, may not be indicative of any musical abilities. In groups where high musical

potential is known to exist, intelligence should be related positively to musical success, but high intelligence alone may not be related to musical ability.

Studies by Highsmith (20) and Farnsworth (14) reported generally low correlations ranging from +0.58 to -0.38 between scores on mental ability tests and scores on the Seashore Measures of Musical Talent.

In a later study (13) Farnsworth compared the relationship between intelligence, as measured by the Thurstone Intelligence Test and the Iowa High School Content Test, and grades in accademic type music work and grades in tonal type music work to the relationship between music capacity, as measured by the Seashore tests of "Pitch" and "Tonal Memory," and the same academic and tonal music criteria. His subjects were three hundred and fifty-nine students at the San Jose State Teachers College. The academic criterion was grades in music history and appreciation; the tonal criterion was grades in music theory. The relationships between the academic criterion and intelligence were as follows: Thurstone test, r = +0.41; Iowa test, r = +0.32; and the multiple correlation using both intelligence tests together, R = +0.42. The relationships between the academic criterion and music capacity were as follows: Seashore "Pitch" test, r = +0.14; Seashore "Tonal Memory" test, r = +0.16; and the multiple correlation using both measures together, R = +0.17.

The multiple correlating using all four tests and the academic criterion was $R = +0.43$. The relationships between the tonal criterion and intelligence were as follows: Thurstone test, $r = +0.23$; Iowa test, $r = +0.05$; and the multiple correlation using both intelligence tests together, $R = +0.27$. The relationships between the tonal criterion and music capacity were as follows: Seashore "Pitch" test, $r = +0.21$; Seashore "Tonal Memory" test, $r = +0.25$; and the multiple correlation using both music measures together, $R = +0.28$. The multiple correlation using all four tests and the tonal criterion was $R = +0.38$. The Doolittle method was employed to compute the multiple correlations which employed all predictor tests. In this study intelligence was significantly related to academic music grades. The combined intelligence measures were significantly better than the combined music capacity measures for predicting academic music grades. For predicting the tonal criterion the combined intelligence measures and the combined music capacity measures were not significantly different.

Highsmith (20) reported that measures of intelligence were better predictors of success in music than the Seashore Measures of Musical Talent. He investigated the relationship between success in college music courses and scores earned on the Seashore tests and intelligence as determined by the Terman Group Test of Mental Ability and the Thurstone Psychological Examination. His subjects were fifty-nine

students enrolled in the School of Music, North Carolina College for Women.

In a study of twenty-three tests as predictors of success in music courses at the College of Music of Cincinnati, Taylor (57) reported the following correlation coefficients between the Detroit Advanced Intelligence Test and college course marks (N = 185): music dictation, r = +0.58; sight singing, r = +0.43; and harmony, r = +0.299.

Chadwick's study (8) of the prediction of success in sight singing employed five subtests of the Seashore Measures of Musical Talent, the Teachers College Achievement Test, and the American Council Psychological Examination. Using all predictor scores Chadwick obtained a multiple correlation coefficient of +0.84 between the test battery and an objective examination in sight singing. Chadwick reported that the music test was two and one-half times more predictive than the intelligence test. The population studied consisted of thirty-nine music students at Colorado State Teachers College.

At North Carolina College for Women, More (35) administered fifteen music tests for correlation with music theory and applied music grades. She reported that in the population studied (N = 179) intelligence test scores were better predictors of the criterion than the Seashore Measures of Musical Talent.

Jenkins, in an investigation of the relationship between music aptitude and mental ability, science aptitude, and mathematics aptitude among secondary school pupils (22), reported that for the population studied there was a substantial relationship between mental ability and music aptitude as measured by standardized tests. Scores on the Drake Music Memory Test were used in his study as the measure of music aptitude; scores on the California Short-Form Test of Mental Maturity, 1957 S-Form, or scores on the Otis Quick-Scoring Mental Ability Test were used as measures of mental ability. Jenkins reported that between the Drake Music Memory Test scores and the mental ability test scores for the total group investigated (N = 256), an r = +0.51 existed. This was in sharp contrast to the findings of Drake who found r between those two variables to range from +0.05 to +0.28 (11). When Jenkins divided his population into two groups, a music group which consisted of individuals who participated in school music programs and who received musical training (N = 128) and a nonmusic group which consisted of individuals who had not participated in school music programs and who had not received musical training (N = 128), he obtained an r = +0.60 between the two variables in the music group and an r = +0.51 between the variables in the nonmusic group. The difference in mental ability between the music and nonmusic groups was a controlled factor in Jenkins' study; there was no

significant difference in mental ability between the two groups. Jenkins concluded that tests of mental ability could be used with reasonable success to predict music aptitude.

Lehman's study (27) in which he compared four hundred and fifty instrumental musicians on the basis of the Otis Intelligence Test, the Kwalwasser-Dykema Music Tests, and other variables demonstrated that instrumental musicians who continued the study of music to the point of majoring in music at the college level or who graduated from college and were performers or teachers in the field of music were significantly different from instrumental musicians who discontinued their music study at the college level. Lehman reported that the group that continued had a significantly higher IQ than the group that discontinued. The continued group mean IQ was 112.21. The discontinued group mean IQ was 110.13. This difference is significant at the 1 per cent level.

Lehman reported in a later study (28), however, that there was no significant relationship between IQ as measured by the Otis Intelligence Test and achievement in music theory as measured by the Kwalwasser-Ruch Test of Musical Accomplishment. In this investigation, fifty unselected first-year college students at the Brockport, New York, Teachers College who were entering general elementary students were tested before and after they took a

semester-length music theory course which met two hours each week. The students were tested again one year after the completion of the course. Significant gains in achievement in music theory were reported. The relationship, r = +0.003, between the difference in achievement scores obtained before and immediately after the course and IQ was not significant. The relationship between IQ and the net gain after one year, r = +0.045, also was not significant. The mean IQ of the group was 110.52 and the standard deviation was 8.02.

A recent investigation by Neely (42) was undertaken to establish a new method of prognosis in the field of ear training. Neely reported that in the freshman ear training class at Northwestern University in Evanston, Illinois, there was a definite and positive relationship between mental ability as measured by standard intelligence tests and certain aspects of achievement in ear training.

Christy (9) investigated the relationship between musicality, intelligence, achievement, and other variables in undergraduate music students at the School of Music, Indiana University, in order to discover how students who graduated differed from those who did not graduate. There were one hundred and three graduates and fifty-two drop-outs in the population studied. Christy used the "Sense of Pitch," "Sense of Rhythm," and "Tonal Memory" tests of the revised Seashore Measures of Musical Talents, the Drake test

of "Musical Memory," and the Madison Test of Tonal Imagery as the measures of musicality. Intelligence was measured by the American Council on Education Psychological Examination (1947 edition) and the Cooperative Reading Comprehension Test (C2). Achievement was measured in terms of (1) grades earned in applied music, music theory and composition, and music history and literature, (2) total credit-point ratio, and (3) successful completion of a degree program.

Christy reported that for the population of one hundred and three graduates who completed their degree programs the relationship was r = +0.48 between the total error scores earned on the music aptitude battery and grades in music theory and composition. A correlation coefficient of +0.32 was reported between the Drake test of "Musical Memory" and grades in music theory and composition. The relationship r = +0.21 was reported between scores on the Drake test of "Musical Memory" and intelligence. A correlation coefficient of +0.34 was reported between grades in music theory and composition and intelligence. In the sample population, musicality was moderately related to achievement, musicality was slightly related to intelligence, and intelligence showed less relationship to achievement than did musicality. Christy reported no significant differences between graduates and drop-outs in regard to intelligence test scores

or music aptitude test scores. He interpreted this to mean that neither of the batteries could adequately predict performance of undergraduate music students. The correlations found by Christy were too low for use in individual prediction.

CHAPTER BIBLIOGRAPHY

1. Aliferis, James, Aliferis Achievement Test Manual (College Entrance Level), Minneapolis, University of Minnesota Press, 1954.

2. American Psychological Association, "Technical Recommendations for Psychological Tests and Diagnostic Techniques," Psychological Bulletin, Vol. LI (March, 1954), Supplement No. 2, Part 2.

3. Anastasi, Anne, Psychological Testing, New York, Macmillan Company, 1954.

4. Beinstock, S. F., "A Predictive Study of Musical Achievement," Journal of Genetic Psychology, LXI (September, 1942), 135-145.

5. Bentley, Richard R., "A Critical Comparison of Certain Musical Aptitude Tests," unpublished doctoral dissertation, School of Music, University of Southern California, Los Angeles, California, 1956.

6. Brown, A. W., "The Reliability and Validity of the Seashore Tests of Musical Talent," Journal of Applied Psychology, XII (October, 1928), 468-476.

7. Burt, C., a review of "Publications Recently Received," Tests of Musical Ability and Appreciation by Herbert Wing, British Journal of Psychology, General Section, XXXIX (December, 1948), 112-113.

8. Chadwick, J. Elbert, "Predicting Success in Sight Singing," Journal of Applied Psychology, XVII (December, 1933), 671-674.

9. Christy, Leo John, "A Study of the Relationship Between Musicality, Intelligence and Achievement," unpublished doctoral dissertation, School of Music, Indiana University, Bloomington, Indiana, 1956.

10. Cronbach, Lee J., Essentials of Psychological Testing, New York, Harper and Brothers, 1960.

11. Drake, Raleigh M., Manual for the Drake Musical Aptitude Tests, 2nd ed., Chicago, Illinois, Science Research Associates, 1957.

12. _____, "The Validity and Reliability of Tests of Musical Talent," Journal of Applied Psychology, XVII (August, 1933), 447-458.

13. Farnsworth, P. R., "Are Music Tests More Important Than Intelligence Tests in the Prediction of Several Types of Music Grades?" Journal of Applied Psychology, XIX (June, 1935), 347-350.

14. _____, "An Historical, Critical, and Experimental Study of the Seashore-Kwalwasser Test Battery," Genetic Psychology Monograph, IX (May, 1931), 291-393.

15. Garrett, Henry E., Statistics in Psychology and Education, New York, Longmans, Green and Company, 1959.

16. Gordon, Roderick D., "GIMI: A Measure of Musical Insight," unpublished paper read before the Research Council of the Music Educators National Conference Convention, Atlantic City, New Jersey, March 1960.

17. _____, "GIMI: A Measure of Musical Insight," unpublished test manual, Department of Music Education, School of Fine and Applied Arts, Boston University, Boston, Massachusetts, June 19, 1963.

18. _____, unpublished class lecture presented as a part of course Music 512, "Applied Research in Music Education," School of Music, North Texas State University, Denton, Texas, June, 1960.

19. Gray, John Justin, "Subject Matter Testing Practices in State University Music Education Curricula," unpublished doctoral dissertation, School of Music, University of Southern California, Los Angeles, California, 1960.

20. Highsmith, J. A., "Selecting Musical Talent," Journal of Applied Psychology, XIII (October, 1929), 486-493.

21. Holmes, J. A., "Increased Reliabilities, New Keys, and Norms for a Modified Kwalwasser-Dykema Test of Musical Aptitude," Journal of Genetic Psychology, LXXXV (September, 1954), 65-73.

22. Jenkins, Thomas V., "A Study of the Relationship Between Music Aptitudes and Mental Ability, Science Aptitudes, and Mathematics Aptitudes among Secondary School Pupils in Texas," unpublished doctoral dissertation, School of Education, University of Texas, Austin, Texas, 1960.

23. Laas, Bill and Fred Weber, Fun With Fundamentals, First Division Band Course, Rockville Centre, Long Island, New York, Belwin Inc., 1963.

24. Larson, William S., compiler, Bibliography of Research Studies in Music Education 1932-1948, Chicago, Illinois, The Music Education Research Council of the Music Educators National Conference, National Education Association, 1949.

25. _____, compiler, Bibliography of Research Studies in Music Education 1949-1956, Washington, D. C., The Music Education Research Council of the Music Educators National Conference, National Education Association, 1957.

26. _____, "Kwalwasser-Dykema Music Tests," The Third Mental Measurements Yearbook, Oscar K. Buros, editor, New Brunswick, Rutgers University Press, 1949.

27. Lehman, Charles F., "A Comparative Study of Instrumental Musicians on the Basis of the Otis Intelligence Test, The Kwalwasser-Dykema Music Test, and the Minnesota Multiphasic Personality Inventory," Journal of Educational Research, XLIV (September, 1950), 57.

28. _____, "An Investigation of Musical Achievement and Its Relationship to Intelligence and Musical Talent," Journal of Educational Research, XLV (April, 1952), 623.

29. Lundin, Robert W., "Drake Musical Aptitude Tests," The Fifth Mental Measurements Yearbook, Oscar K. Buros, editor, Highland Park, New Jersey, The Gryphon Press, 1959.

30. _____, An Objective Psychology of Music, New York, The Ronald Press Company, 1953.

31. McCarthy, D., "A Study of the Seashore Measures of Musical Talent," Journal of Applied Psychology, XIV (October, 1930), 437-455.

32. McLeish, John, "Wing Standardised Tests of Musical Intelligence," The Fourth Mental Measurements Yearbook, Oscar K. Buros, editor, Highland Park, New Jersey, The Gryphon Press, 1953.

33. Mainwaring, James, "Drake Musical Aptitude Tests," The Fifth Mental Measurements Yearbook, Oscar K. Buros, editor, Highland Park, New Jersey, The Gryphon Press, 1959.

24. Manzer, Charles and Samuel Morowitz, "The Performance of a Group of College Students on the K-D Tests," Journal of Applied Psychology, XIX (June, 1935), 331-348.

35. More, Grace Van Dyke, "Prognostic Testing in Music on the College Level," Journal of Educational Research, XXVI (November, 1932), 199-212.

36. Mursell, James L., "Intelligence and Musicality," Education, LIX (May, 1939), 559-562.

37. _____, "Measuring Musical Ability and Achievement: A Study of the Correlations of the Seashore Test Scores and Other Variables," Journal of Educational Research, XXV (February, 1932), 116-126.

38. _____, The Psychology of Music, New York, W. W. Norton and Co., Inc., 1937.

39. _____, "What About Music Tests?" Music Educators Journal, XXIV (October, 1937), 16-18.

40. Mursell, James L. and M. Glenn, The Psychology of School Music Teaching, Boston, Silver Burdett and Company, 1931.

41. National Association of Schools of Music, Bylaws and Regulations, Galesburg, Illinois, National Association of Schools of Music, 1953.

42. Neely, James Kilford, "An Evaluation of Tests Given to Interrelate Intelligence, Aural Acuity and Musical Achievement for Purposes of Prognosis in Ear-Training," unpublished doctoral dissertation, School of Music, Northwestern University, Evanston, Illinois, 1959.

43. Newton, G., Selection of Junior Musicians for Royal Marine School of Music: An Evaluation of H. D. Wing's Test, London, England, Senior Psychologist's Department, British Admiralty, 1959, cited by Herbert D. Wing, "A Revision of the Wing Musical Aptitude Tests," Journal of Research in Music Education, X (Spring, 1962), 39-46.

44. Pflederer, Marilyn, "The Nature of Musicality," Music Educators Journal, XLIX (June-July, 1963), 49-52.

45. Revesz, G., Introduction to the Psychology of Music, Norman, Oklahoma, University of Oklahoma Press, 1954.

46. Roby, A. Richard, "A Study in the Correlation of Music Theory Grades with the Seashore Measures of Musical Talents and the Aliferis Music Achievement Tests," Journal of Research in Music Education, X (Fall, 1962), 137-142.

47. Saetveit, J. G., D. Lewis and C. E. Seashore, "Revision of the Seashore Measures of Musical Talents," University of Iowa Studies, Aims and Progress of Research, University of Iowa, Iowa City, Iowa, 1940.

48. Salisbury, F. S. and H. R. Smith, "Prognosis of Sight-Singing Ability of Normal School Students," Journal of Applied Psychology, XIII (October, 1929), 425-439.

49. Schmitz, Sylvester M., "An Investigation of the Prognostic Value of the Revised Seashore Tests and the Kwalwasser-Ruch Test of Musical Accomplishment for Academic Success in a Music Education Program," unpublished doctoral dissertation, School of Music, Northwestern University, Evanston, Illinois, 1956.

50. Schoen, Max, The Psychology of Music, New York, The Ronald Press Company, 1940.

51. Seashore, Carl E., Psychology of Music, New York, McGraw-Hill Book Company, Inc., 1938.

52. _____, The Psychology of Musical Talent, New York, Silver Burdett Company, 1919.

53. _____, Seashore Measures of Musical Talent, Chicago, Illinois, C. H. Stoelting and Company, 1919.

54. Seashore, Carl E., D. Lewis and J. G. Saetveit, Seashore Measures of Musical Talents, rev. ed., Camden, New Jersey, Department of Education, RCA Manufacturing Company, 1939.

55. Spearman, C. E., Abilities of Man, New York, Macmillan Company, 1927.

56. Stanton, Hazel M., "Measurement of Music Talent: the Eastman Experiment," University of Iowa Studies in the Psychology of Music, Vol. II, University of Iowa, Iowa City, Iowa, 1935.

57. Taylor, Elizabeth M., "A Study of the Prognosis of Musical Talent," Journal of Experimental Education, X (September, 1941), 1-28.

58. Thorndike, Robert L., Personnel Selection, New York, John Wiley and Sons, Inc., 1949.

59. Thorpe, Louis P., "Learning Theory and Music Teaching," Basic Concepts in Music Education, Fifty-seventh Yearbook of the National Society for the Study of Education, Part I, Chicago, National Society for the Study of Education, 1958.

60. Tilson, L. M., "Music Talent Tests for Teacher-Training Purposes," Music Supervisors Journal, XVIII (February, 1932), 26.

61. Wheeler, Ronald W., Jr., "A Study in the Measurement of Musical Aptitude," unpublished doctoral dissertation, School of Music, University of Oklahoma, Norman, Oklahoma, 1959.

62. Whitley, M. T., "A Comparison of the Seashore and K-D Tests," Teachers College Record, VIII (May, 1932), 731-751.

63. Wing, Herbert D., "Aliferis Music Test," The Fifth Mental Measurements Yearbook, Oscar K. Buros, editor, Highland Park, New Jersey, The Gryphon Press, 1959.

64. _____, Manual for Standardised Tests of Musical Intelligence, London, England, National Foundation for Educational Research in England and Wales, 1960.

65. _____, "A Revision of the Wing Musical Aptitude Test," Journal of Research in Music Education, X (Spring, 1962), 39-46.

66. _____, "A Revision of the Wing Musical Aptitude Tests," Journal of Research in Music Education, X (Spring, 1962), 44, citing R. Cleak, "A Study of Musical Aptitudes in Children in a Secondary School," unpublished diploma in education thesis, Department of Education, University of Bristol, Bristol, England, 1958.

67. _____, "A Revision of the Wing Musical Aptitude Test," Journal of Research in Music Education, X (Spring, 1962), 39, citing Papesch, a music teacher in New Zealand, source not indicated.

68. _____, "Tests of Musical Appreciation: An Investigation into the Measurement, Distribution, and Development of Musical Capacity," British Journal of Psychology Monograph Supplements, Vol. VIII, No. 27, Cambridge University Press, 1948

69. Wood, Dorothy Adkins, Test Construction, Columbus, Ohio, Charles E. Merrill Books, Inc., 1960.

70. Wright, F. A., "The Correlation Between Achievement and Capacity in Music," Journal of Educational Research, XVII (January, 1928), 50-56.

CHAPTER III

THE POPULATION STUDIED, THE MUSIC THEORY COURSES INVOLVED, AND THE MATERIALS AND PROCEDURES EMPLOYED TO SECURE AND ANALYZE DATA

Description of the Population Studied

The population studied consisted of fifty male (54.9 per cent) and forty-one female (45.1 per cent) freshmen music majors. This was a total sample (N = 91) of all freshmen music students who were enrolled in the School of Music at North Texas State University in Denton, Texas, during the 1961-1962 school year who were available for participation in the study. In order to be available for participation in the study, it was necessary for each freshman music student (1) to be enrolled in Music 138 and Music 148 during either the fall or spring semester of the 1961-1962 academic year, (2) to be enrolled in Music 163, Music Orientation (10, p. 289), during the fall semester of the 1961-1962 school year, and (3) to complete Music 138 and Music 148. Students who left school before completing their courses in Music 138 and Music 148 were not available for the criterion testing. Those music students who had unusual scheduling difficulties and who did not take either Music

138 and Music 148 or Music 163 were not included in the sample.

At the time they entered college in the fall of 1961, the mean age of the participating students was eighteen years and ten months. No individuals were younger than seventeen years and ten months of age. Fifteen individuals (16.5 per cent) were less than eighteen years of age. Sixty-one individuals (67 per cent) were eighteen but less than nineteen years of age. Nine individuals (9.9 per cent) were nineteen but less than twenty years of age. Three individuals (3.3 per cent) were twenty-one but less than twenty-two years of age. One individual (1.1 per cent) was twenty-three years of age. One individual (1.1 per cent) was twenty-five years and seven months of age. One individual (1.1 per cent) was forty years and seven months of age.

All of the participating students were working for the Bachelor of Music degree. Sixty-three individuals were music education majors; ten individuals were dance band majors; seventeen individuals were applied music majors; and one individual was a composition major. Of the seventeen applied music majors, two were trumpet majors, six were piano majors, seven were voice majors, one was a bassoon major, and one was an organ major. The principal performance instruments or applied concentrations for the sample population are indicated in Table II.

TABLE II

THE PRINCIPAL PERFORMANCE INSTRUMENTS OR APPLIED CONCENTRATIONS FOR THE INDIVIDUALS IN THE SAMPLE POPULATION

Area	Instrument	Instrument Total	Area Total
Keyboard			21
	Piano	19	
	Organ	2	
Voice			18
String			8
	Violin	4	
	Viola	1	
	Cello	1	
	String Bass	2	
Woodwind			22
	Flute	3	
	Clarinet	8	
	Bassoon	3	
	Saxophone	8	
Brass			18
	Trumpet	9	
	Trombone	6	
	Baritone	2	
	Tuba	1	
Percussion			4

As indicated in Table II, the performance medium for most of the students in the sample population was instrumental. Only eighteen individuals (19.8 per cent) were vocalists. Twenty-one individuals (23.1 per cent) were keyboard performers. The remaining fifty-two students (57.1 per cent) were performers on band or orchestra instruments.

The number of years of precollege musical training and experience varied considerably among the individuals in the sample population. The mean number of years of study reported was 7.46. Table III indicates the years of precollege music preparation for the population.

TABLE III

THE NUMBER OF YEARS OF MUSICAL TRAINING OR EXPERIENCE PRIOR TO COLLEGE ENTRANCE REPORTED IN THE SAMPLE POPULATION (N = 91)

Years Reported	Number of Individuals	Years Reported	Number of Individuals	Years Reported	Number of Individuals
1	4	6	10	11	4
2	2	7	16	12	1
3	4	8	15	13	1
4	2	9	13	14	2
5	6	10	10	15	1

Four individuals (4.4 per cent) reported only one year of musical preparation prior to college entrance. Eighteen individuals (19.8 per cent) reported five or fewer years of musical preparation prior to college entrance. Seventy-three individuals (80.2 per cent) reported more than five years of preparation prior to college entrance; of that group, nine individuals (9.9 per cent) reported more than ten years of musical training. One individual (1.1 per cent) reported fifteen years of musical preparation prior to college entrance.

The information reported in this section was obtained from the sample population during the routine course of the predictor and criterion testing programs and from an examination of college class rolls and records.

Description of the Music Theory Courses under Consideration in the Study

The music theory courses of concern to this study were Music 138, Elementary Sight Singing and Ear Training, and Music 148, Elementary Harmony: Part-Writing and Keyboard (10, pp. 288-289). The two courses were coordinated to secure an integrated approach to the study of music theory. Each student in the sample population took both freshman-level, semester-length courses as a pair. Music 138 was taught on Tuesday and Thursday, and Music 148 was taught on Monday and Wednesday. Each course met for two clock hours each week for two semester hours of college credit.

A Music 138 and Music 148 course pair was taught by the same teacher, and the class pair met the same hour each of the days involved.

Students were admitted to and homogeneously grouped in class sections of Music 138 and Music 148 pairs according to scores earned on the Freshman Placement Theory Examination. Procedures associated with this practice were explained previously under "Scope and Limitations of the Study."

According to the syllabus (15) used as the course guide at North Texas State University, the materials employed in the courses were as follows:

1. Elementary Harmony by Ottman (Chapters I through XII)
2. Music for Sight Singing by Ottman (Chapters I through VII and Chapters XI and XII correlated as directed in Elementary Harmony)
3. Music for Study by Murphy and Melcher (Chapters I through V)
4. 371 Four Part Chorales by Bach (correlated as directed in Elementary Harmony)

The sample population which participated in the study was placed in eight sections of Music 138 and Music 148. Table IV indicates the sections and student distribution in the music theory courses.

During the fall semester of the 1961-1962 school year sixty-seven students (73.6 per cent) in the sample population were assigned to five class sections of Music 138 and Music 148 as follows: Section 01, thirteen students;

TABLE IV

THE DISTRIBUTION OF THE STUDENTS IN THE SAMPLE POPULATION ACCORDING TO MUSIC THEORY CLASS SECTIONS

Class and Section Number	Period Taught	Clock Hour Taught	Number of Students
Fall Semester 1961			
Music 138 and 148			
01	1	8:00 A. M.	13
02	2	9:00 A. M.	16
03	4	11:00 A. M.	15
04	6	1:00 P. M.	6
05	1	8:00 A. M.	17
Music 126			
01	6	1:00 P. M.	6
02	1	8:00 A. M.	11
03	2	9:00 A. M.	7
Spring Semester 1962			
Music 138 and 148			
01	6	1:00 P. M.	8
02	1	8:00 A. M.	10
03	2	9:00 A. M.	6

Section 02, sixteen students; Section 03, fifteen students; Section 04, six students; and Section 05, seventeen students. The twenty-four (26.4 per cent) students of the sample population assigned to Music 126 during the fall semester were placed in three class sections as follows: Section 01, six students; Section 02, eleven students; and Section 03, seven students. During the spring semester these twenty-four students were assigned to three sections of Music 138 and Music 148 as follows: Section 01, eight students; Section 02, ten students; and Section 03, six students.

Description of the Materials and Procedures Employed in the Study

The Predictor Tests

The tests selected for comparison as predictors of proficiency in collegiate music theory were identified previously. The tests were selected after reviewing the literature related to the problem of this study, after consulting the Mental Measurements Yearbooks (2, 3, 4), and after securing the recommendations of faculty advisors at North Texas State University.

The specific forms of the predictor tests administered in the investigation are identified below. They were as follows:

1. Both the A and B Forms of the "Musical Memory" test of the second edition (July, 1957) of the Drake Musical

Aptitude Tests were administered. Both the A and B Forms of the "Rhythm" test of the same edition of the Drake Musical Aptitude Tests were administered. The aural materials were obtained on a twelve inch microgrove record, item number 7-911 of Science Research Associates, Inc.

2. The complete 1957 edition of the Freshman Placement Theory Examination was administered. Only one form is available.

3. Form Ba of the 1960 edition of the Gordon Index of Musical Insight was administered.

4. For the Kwalwasser-Dykema Music Tests, the "Pitch Imagery" test aural materials presented were obtained on RCA record 306-A. The "Rhythm Discrimination" test aural materials presented were obtained on RCA record 304-B. The "Rhythm Imagery" test aural materials presented were obtained on RCA record 306-B. The "Tonal Memory" test aural materials presented were obtained on RCA record 302-A. Only one form of each subtest is available.

5. The Gamma Test (Form AM) of the Otis Quick-Scoring Mental Ability Tests was administered.

6. The standard tape version (Edition V, 1961) of the Wing Standardised Tests of Musical Intelligence was administered.

Scores on the selected tests were obtained for the population studied during the fall semester of the 1961-1962 academic year. Two of the tests, the Freshman Placement

Theory Examination and the Gordon Index of Musical Insight, were administered as a routine part of the freshman testing program which preceded registration for the fall school term. The other tests were administered during the fall semester in Music Orientation, Music 163, in which the students of the sample population were registered. This class met at 10:00 A. M. on Monday of each school week scheduled for the fall semester of 1961.

All of the predictor tests were administered in the Recital Hall of the School of Music at North Texas State University in Denton, Texas. The Recital Hall provided an environment eminently suited to music testing purposes. The room provided (1) excellent acoustical properties, (2) beautiful and spacious surroundings, (3) comfortable seating, (4) adequate lighting and ventilation, (5) temperature and humidity control, and (6) acoustical and visual isolation from events taking place outside the hall.

The Freshman Placement Theory Examination and the Gordon Index of Musical Insight were administered by members of the music theory faculty of North Texas State University on September 19, 1961. Members of the music education faculty of North Texas State University administered the Drake Musical Aptitude Tests on October 2, 1961, the Kwalwasser-Dykema Music Tests on October 9, 1961, the Otis Quick-Scoring Mental Ability Tests on October 16, 1961,

and the Wing Standardised Tests of Musical Intelligence on October 23, 1961.

The Gordon Index of Musical Insight and the Otis Quick-Scoring Mental Ability Tests were presented in accordance with the instructions for administration provided with the tests; no aural presentation was required except for the verbal instructions. The Freshman Placement Theory Examination required the live performance of some materials at the piano in addition to spoken instructions. The Drake Musical Aptitude Tests, the Wing Standardised Tests of Musical Intelligence, and the Kwalwasser-Dykema Music Tests required spoken instructions and the audio reproduction of recorded musical materials. The Wing Standardised Tests of Musical Intelligence, supplied originally on tape, was reproduced using an Ampex 600 tape recorder, a Bogen DB-20 audio amplifier, and an Electro-Voice SP-12 speaker mounted in a bass reflex enclosure. The disc recordings of the Kwalwasser-Dykema Music Tests and the Drake Musical Aptitude Tests were transcribed to tape using professional transcription equipment working under laboratory conditions; the tape copy of each test was reproduced on the equipment identified above. The discs were transcribed to tape because high quality disc reproduction facilities were not available at the testing site, but quality tape reproduction facilities were available.

The tests were administered in accordance with instructions provided in the test manuals. In some cases the size of the Music 163 class was larger than the test group size recommended in the directions for administering particular tests.

Student attitude during the testing sessions was satisfactory. The students were told at the beginning of Music Orientation that a number of tests would be administered during the semester. They were advised that their scores would be recorded on profile sheets which would be used for guidance purposes. The students were encouraged to use this testing and counseling service provided by the School of Music. Many of the students did inquire about their test scores. For those students who desired this information, their scores on the tests were discussed and interpreted in private counseling sessions with faculty members at North Texas State University.

The tests were all hand-scored. In this study, test performance was indicated as follows:

1. On the Drake "Musical Memory" tests raw scores were converted to percentile age norms for music students for combined forms A + B as provided by Figure 6 on page twenty-nine in the test manual.

2. On the Drake "Rhythm" tests raw scores were converted to percentile norms for forms A + B for music

students as provided by Table 14 on page twenty-three in the test manual

3. On the Freshman Placement Theory Examination subtest A, "Fundamentals," the raw scores as provided by the weighted scoring key were employed. For subtest B, "Hearing Test," plus subtest C, "Dictation," the arithmetic means of the summed raw scores on each test as provided by the weighted scoring key were employed. The total score was the mean of subtest A plus the mean of subtests B + C. Each individual's total score was obtained by (1) adding his raw score on subtest A to the mean of his summed raw scores on subtests B and C and (2) dividing the obtained total by two.

4. On the Gordon Index of Musical Insight raw scores were employed.

5. On the Kwalwasser-Dykema Music Tests the total correct answer raw scores on the four subtests were summed.

6. On the Otis Quick-Scoring Mental Ability Tests the raw scores were converted to Intelligence Quotients.

7. On the Wing Standardised Tests of Musical Intelligence the total scores were the total correct answer raw scores. The correct answer scores on the first three subtests were summed to form the scores for the shortened version of the test.

The Proficiency Measures

The types of criteria employed in validating tests used for prognostic purposes in music were indicated in Chapter II. After consideration of many of the methods of obtaining criterion data of sufficient objectivity, validity, and reliability for use in the present study, proficiency tests based on music theory course content were selected as the most desirable means for measuring the skills and abilities requisite for successful completion of those courses.

Music theory courses at North Texas State University, in keeping with the recommendations of the National Association of Schools of Music (14), are directed toward seven basic areas. Those areas include rhythmic dictation, melodic dictation, harmonic dictation, sight singing, part-writing, keyboard recognition and harmony, and music fundamentals. These seven areas may be grouped into three larger areas which include (1) aural work or ear training, (2) sight singing, and (3) harmony. In keeping with this pattern, proficiency tests in each of the seven areas were constructed, and scores were obtained for each area; also, the appropriate area scores were combined to yield composite scores in aural work and in harmony. The rhythmic, melodic, and harmonic dictation test scores were combined to yield a composite aural dictation score. The fundamentals test score, the part-writing test score, and the keyboard harmony test score were combined to yield a composite

harmony score. In addition, the scores on all seven proficiency tests were combined to yield a total criterion score.

The proficiency tests were designed to measure the students' performances in the seven areas in a manner that approached the normal classroom method of assessing those performances. The scope of the criterion testing involved, the time limitations imposed, and the level of objectivity desired made some departures from the usual classroom testing routine desirable.

The variations in procedure may be ascertained by comparing the methods suggested by Ottman (11) to those employed in the proficiency tests which appear in the Appendix of this study. The chief differences in procedures were those related to objectivity of measurement. For criterion testing, the aural portions of the tests were presented by means of high fidelity tape recordings rather than live performances. For written portions of the test, students were provided with carefully prepared tests and answer sheets; students usually provide only ruled or music notebook paper for class written work.

The recordings were made on an Ampex 600 tape recorder. A Shure 556S microphone was employed. The melodic and harmonic dictation exercises were performed on an Everett piano. The rhythmic dictation exercises were performed on an electrically powered portable Estey reed organ. The organ

tone was selected in preference to the piano tone because an even, sustained tone was desired. The end of the piano tone, which decays exponentially, is much more difficult to perceive accurately than the end of a sustained organ tone which does not decay so long as a key is depressed. The recordings were made at night in an acoustically treated music studio. The recordings were distinct in sound and were free from distracting noises.

The validity of each of the criterion tests is based on two facts. First, the tests were designed to measure skills in only the seven areas specified in the music theory course content. The tests cover the full scope of the course, but they lie within the limitations stated in the materials employed in the course. Each test was made sufficiently long and varied enough in content to provide an adequate sampling of the curricular contents of the music theory courses. For this reason, content validity is claimed for the tests. Second, the tests were administered in a manner which closely resembled the actual classroom testing procedures followed by the music theory teachers themselves. For this reason, validity based on common practice and procedure is claimed for the tests. The assumption of proficiency test validity stated previously seems justified.

The proficiency tests as they appear in the Appendix and as they were used in this study were developed in three steps. First, a draft copy of the tests was prepared.

These tests were inspected by members of the theory faculty of North Texas State University. Their suggestions and comments were used to produce a revised copy of the examination. Second, the revised copy of the examination was administered privately to four sophomore music majors. The students were asked to criticize the test verbally while taking the examination. Difficulties were noted and suggestions for improvement were obtained in this manner. As a result of this trial of the test, changes in some of the test instructions were made, timing was adjusted, and test items were further refined. Third, the second revision of the test was carefully inscribed on stencils for duplication. This revision was inspected again by members of the theory faculty and by the same four sophomore music majors. No further suggestions for improvement were obtained. Additional copies of the test were prepared for the sample population.

The rhythmic, melodic, and harmonic dictation tests were presented in one class period. The sight singing examination was administered individually to each student at a private session. The part-writing, keyboard, and fundamentals tests were presented in one class period. The criterion testing required two complete music theory class periods and one private examination for each student.

Raw scores on the seven individual proficiency tests were converted to normalized T-scores (1). This conversion

was necessary in order to give all tests the same weight in the various composite scores and to make direct comparison between tests possible. The Aural Composite Test score was the sum of the T-scores earned on the subtests of Rhythmic Dictation, Melodic Dictation and Harmonic Dictation. The Nonaural Composite Test score was the sum of the T-scores on the subtests of Music Fundamentals, Keyboard Recognition and Harmony, and Part-Writing. The Total Proficiency Test score was the sum of the T-scores on the seven proficiency subtests. The two composite scores and the total proficiency score must be interpreted as abstract scores; they do not possess, in the summed form, the statistical properties of the single T-scores.

Rhythmic Dictation.--The rhythmic dictation test was designed to provide objective measurement of skill in notating rhythmic patterns perceived by auditory means only. The problem was limited to rhythmic notation.

Half of the rhythm patterns were presented in melodic contexts, and half of the patterns were presented on single repeated pitches. Exercises one, two, five, six, ten, eleven, fifteen, and sixteen consisted of rhythmic patterns performed in meaningful melodic contexts. Exercises three, four, seven, eight, nine, twelve, thirteen, and fourteen were performed as rhythmic patterns on repeated pitches so no melodic elements were present.

Half of the rhythmic patterns were presented in melodic contexts in order to provide a realistic musical setting for the exercises. In the case of this test, the desire for a "pure" test in rhythm was moderated by the demands of art. As Hindemith pointed out (6), there is a danger of dictation exercises degenerating into senseless quizzes. He stressed the need for maintaining dictation exercises on a musical and not riddle-guessing level. Since nonmelodic rhythmic dictation exercises are especially vulnerable to this type of criticism, the compromise solution was employed in the study.

Five rhythmic patterns were presented in both melodic and nonmelodic settings. The pairs were as follows: one and fourteen, two and thirteen, five and twelve, eight and fifteen, and nine and sixteen.

The rhythmic patterns were performed on an electrically powered portable Estey reed organ at a mezzo forte dynamic level at the rate of eighty-eight beats per minute in a marked but legato style. An electronic metronome was adjusted to provide a flashing light at the specified frequency; no audible sound was emitted from the metronome. The metronome was used during the recording of the exercises in order to maintain the stability of the beat throughout the test. A stop watch was used to time the pauses between the second and third repetitions and the pauses at the end of each exercise.

The test was based on music theory course content specified in the materials used in the theory classes. Rhythmic elements were restricted to include only simple meter with the division of the beat into two parts and the subdivision of the beat into four parts and compound meter with the division of the beat into three parts and the subdivision of the beat into six parts. In addition, the tie and dot were employed with these elements to provide rhythmic variety.

The examination items were completion type questions. The meter signature was provided, each exercise was started correctly, and the number of measures to be completed was indicated on the answer sheets. The beat and background division were provided aurally before each exercise was played. The procedure involved in taking the test was essentially the same as that employed by the students in rhythmic dictation exercises conducted as part of the usual class routine. The students were not required to make a conductor's beat or tap the background for examination purposes. They were instructed to omit this usual routine. Further details of the test construction and administration may be ascertained by examining the transcript of recorded rhythmic dictation materials found in the Appendix on pages 199-211.

The correct responses scored on the students' answer sheets are given in the Appendix on pages 202-211. Each

complete rhythmic exercise was treated as a single entity for scoring purposes. Each correct exercise was counted as one point credit. With all exercises correct a maximum score of sixteen was earned. Notational differences in correct rhythmic solutions of the exercises were accepted. Since the notational answer to each exercise was unstructured and since identical sounding rhythmic patterns may be notated correctly in a variety of ways, any mathematically correct notation which matched the aural patterns presented was considered correct. A student's choice in the use of the tie or dot, for example, was not contested.

Each student's raw score was determined by hand scoring his paper. After all raw scores were obtained, a frequency distribution of the scores was made. The percentile rank of each score was determined (7, pp. 29-33), and this was used to obtain the T-score value (1, pp. 219-227, p. 510). Scores on the rhythmic dictation test were expressed as T-scores at all times except for the computation of the reliability of the test.

The split-half reliability of the rhythmic dictation test was determined by correlating the raw scores earned on the even numbered exercises with the raw scores earned on the odd numbered exercises (7, pp. 153-203). The reliability of the total test was estimated by means of the Spearman-Brown prophecy formula (8, pp. 156-157; 5, pp.

339-340). The reliability was computed using the test scores of the total sample population (N = 91).

Melodic Dictation.--The melodic dictation test was designed to provide objective measurement of skill in notating a sequence of pitches perceived by auditory means only. The problem was limited to pitch notation. No rhythmic element was introduced. The twelve short melodic fragments recorded and used for the examination were performed on a piano at a mezzo forte dynamic level at the rate of seventy-two beats per minute in a cantabile legato style. All pitches were of equal duration; the motion was one pitch per beat. For the recording of the exercises, an electronic metronome was adjusted for silent operation with flashing light in order to maintain rhythmic stability throughout the test. A stop watch was used to time the pauses between test items.

The test was based on music theory course content specified in the materials used in the theory classes. Melodic movement was restricted to include only diatonic movement both major and minor, the intervals of the tonic triad in both major and minor tonalities, the intervals in the major dominant and dominant seventh triads, and the intervals of the major subdominant triad both within the subdominant triad and where a chord change employed the tones of the subdominant triad.

The exercises were completion type questions. The meter signature was given, the key signature was provided, and the tonality was provided aurally by the piano which sounded the tonic chord before each exercise was played; the beginning note or notes of the melody were provided on the answer sheets, and the number of tones to be supplied by the students was indicated for each question. The procedure involved in taking the test was essentially the same as that used by the students in melodic dictation exercises conducted as part of the usual class routine. The students were not required to make a conductor's beat or tap the background, however, since no rhythmic element was present in the exercises.

The exercises began short and easy and grew progressively longer and more difficult. Further details of the test construction and administration may be ascertained by examining the transcript of recorded melodic dictation materials which may be found in the Appendix on pages 212-220.

The correct responses scored on the students' answer sheets are given in the Appendix on pages 214-220. In the twelve exercises a total of seventy responses were required. Each student's raw score was determined by hand scoring his paper; each correct note was counted as one point credit. With all correct notes a maximum score of seventy was earned.

After each student's raw score was obtained, a frequency distribution of the scores was made. The percentile rank of each score was determined (7, pp. 29-33), and this was used to obtain the T-score value (1, pp. 219-227, p. 510). Scores on the melodic dictation test were expressed as T-scores at all times except for the computation of the reliability of the melodic dictation test.

The split-half reliability of the melodic dictation test was determined by correlating the raw scores earned on the even numbered exercises with the raw scores earned on the odd numbered exercises (7, pp. 153-203). The reliability of the total test was estimated by means of the Spearman-Brown prophecy formula (8, pp. 156-157; 5, pp. 339-340). The reliability was computed using the test scores of the total sample population (N = 91).

Harmonic Dictation.--The harmonic dictation test was designed to provide objective measurement of skill in notating the types and inversions of chords performed in chorale-like progressions perceived by auditory means only. The problem was limited to the notation of chord symbols only. No notation of music was required. The harmonic progressions were performed on a piano at a *mezzo forte* dynamic level at the rate of fifty-two beats per minute in *legato* style. All chords were of equal duration and moved at the rate of one chord per beat. For the recording of

the exercises, an electronic metronome was adjusted for flashing light and silent operation in order to maintain rhythmic stability throughout the test. A stop watch was used to time the pauses during and between the test items.

The test was based on music theory course content specified in the materials used in the music theory classes. Harmonic elements were restricted to include only major and minor tonic chords, major and minor subdominant chords, and major dominant chords. Inversions were restricted to first and second inversions of the major and minor tonic chords, first inversions of major and minor subdominant chords, and first inversions of major dominant chords.

On the answer sheets the number of chords in each exercise was indicated by a connected series of empty squares. The students were instructed to place one chord symbol in each square provided. No meter or key signatures were provided on the answer sheets since this information was not needed for the solution of the test. Rhythmic elements were not present in the test since all chords had the same duration. The tonality of each exercise was provided aurally by the piano which sounded the tonic chord in the key of each exercise. The sounding of the tonic chord immediately preceded the performance of each set of chord progressions.

The procedure involved in taking the test was essentially the same as that used by the students in harmonic

dictation exercises conducted as part of the usual class routine. The details of test construction and administration may be ascertained by examining the transcript of recorded harmonic dictation materials which may be found in the Appendix on pages 221-230.

The correct responses scored on the students' answer sheets are given in the Appendix on pages 225-230. In the eight exercises provided, one hundred responses were required. Each student's raw score was determined by hand scoring his paper; each correct chord symbol was counted as one point credit. To be counted correct the total chord symbol placed in the appropriate square had to indicate the chord number, had to identify the chord as major or minor, and had to specify the inversions of chords not in root position. With all correct chord symbols a maximum score of one hundred was earned.

After the students' raw scores were obtained, a frequency distribution of the scores was made. The percentile rank of each score was determined (7, pp. 29-33), and this was used to obtain the T-score value (1, pp. 219-227, p. 510). Scores on the harmonic dictation test were expressed as T-scores at all times except for the computation of the reliability of the harmonic dictation test.

The split-half reliability of the harmonic dictation test was determined by dividing each of the eight individual exercises into two equal parts and by correlating the raw

scores earned on the combined first halves of the eight chord progressions with the raw scores earned on the combined last halves of the chord progressions (7, pp. 153-203). The reliability of the total test was estimated by means of the Spearman-Brown prophecy formula (8, pp. 156-157; 5, pp. 339-340). The reliability was computed using the test scores of the total sample population (N = 91).

Sight Singing.--The sight singing test was designed to provide objective measurement of skill in singing a series of musical intervals at first sight. The problem was limited to the singing of pitches only. The reading of rhythmic figures was not evaluated, and no rhythmic element was scored on the test. The melodic line in the examination was essentially free from rhythmic variation, although for musical meaningfulness both notes of one and two beat duration were employed. Although a measure of skill in interval singing in a setting devoid of rhythmic variation was desired, this unmusical condition was not considered acceptable. A compromise between rhythmic and nonrhythmic melodic movement was employed in the study.

The test was based on music theory course content specified in the materials used in the theory classes (11, 12, 15). Melodic movement was restricted to include only diatonic movement, the intervals of the tonic triad, the intervals in the dominant triad, and the intervals of

the subdominant triad both within the triad and where a chord change employed the tones of the subdominant triad.

The test consisted of two hundred and three tones which provided two hundred and two intervals. The following intervals were present in the examination melody the number of times indicated: perfect unison, eight; minor second, thirty-nine; major second, eight-seven; minor third, twenty-five; major third, fourteen; perfect fourth, eight; diminished fifth, one; perfect fifth, seven; minor sixth, five; major sixth, three; minor seventh, two; and perfect octave, three.

The test was administered individually to each student in the sample population. The studio in which the examination was conducted was arranged with an upright piano placed against one wall. A small table was placed at the bass end of the keyboard. An Ampex 600 tape recorder was on the table, and an attached microphone was placed on top of the piano near the treble end of the keyboard. One chair, for the test administrator, was placed at the center of the keyboard. A second chair was placed to the right of the first, also facing the keyboard, near the treble end of the piano. This chair was used by the students. A copy of the sight singing examination which was glued to a heavy piece of cardboard was on the far treble end of the piano music rack directly in front of the students' chair. An electric

metronome occupied the top of the piano next to a microphone on a desk stand.

As each student was called to enter the studio, his attention was directed to the recording equipment. He was told that recording provided a more accurate means of obtaining scores, and he was assured that the recording would not be used for blackmail purposes. These informal remarks ending with an element of humor helped to put most students more at ease and seemed to remove any apprehension concerning the use of the recording equipment.

The procedure for administering and scoring the test and a copy of the examination appear in the Appendix on pages 231-233.

The scoring of the test was done aurally. The recording of each individual's performance provided a means of carefully evaluating each examination. During the test, errors in singing the notated pitches were corrected immediately after an incorrect note was sung. Slight errors in intonation were not considered wrong pitches, but gross errors were corrected at once at the keyboard. No written record of errors was kept during the actual performance of the examination. The recordings of the performances were scored on individual copies of the sight singing examination. Each student's name was placed at the top of a copy of the sight singing exercise, the tape was played, and the errors were indicated on the musical score. A written

record of performance errors was transcribed from the tape recording to written notation. The tape recording provided for very careful appraisal of each interval. Scoring errors resulting from faulty intonation being interpreted initially as incorrect pitches were reduced by auditing questionable portions of performances several times. According to Ottman (13), faulty intonation in singing can be confused easily with incorrect singing; he reported this as a difficulty in scoring sight singing examinations. Undoubtedly, scoring accuracy was improved by the more leisurely scoring made possible by the recording.

Each student's raw score was the sum of the interval errors on the examination. A score of zero indicated a perfectly correct performance; a score of two hundred and two indicated a totally incorrect performance. After all of the raw scores were obtained on the examination, a frequency distribution of the scores was made. The percentile rank of each score was determined (7, pp. 29-33), and this was used to obtain the T-score value (1, pp. 219-227, p. 510). When the raw scores were converted to percentile ranks, the largest error score was given the lowest percentile rank, and the lowest score was given the highest percentile rank. Because of this inversion, the T-scores on the sight singing test may be interpreted in precisely the same way as the T-scores on the other six proficiency tests. Scores on the sight singing test were expressed as T-scores

at all times except for the computation of the reliability of the sight singing test.

The split-half reliability of the sight singing test was determined by correlating the raw error scores earned on the even numbered four measure groups with the raw error scores earned on the odd numbered four measure groups (7, pp. 153-203). The reliability of the total test was estimated by means of the Spearman-Brown prophecy formula (8, pp. 156-157; 5, pp. 339-340). The reliability was computed using the test scores of the total sample population (N = 91).

Part-Writing.--The part-writing test was designed to provide objective measurement of skill in writing alto and tenor voice parts to cadences and chord progressions where the soprano and bass lines and chord symbols were given. The problem involved the correct handling of harmonic musical elements only. The test was designed to measure knowledge about chord spelling and notation, the doubling of tones in chord writing, the vocal ranges used in chorale writing, the correct spacing of chord tones, the proper handling of open or close position in chord writing, and the rules pertaining to voice movement in connecting chords.

The test consisted of twenty-four written pairs of given chords which were to be completed. The chord symbols and the bass and soprano notes for each chord were provided.

The test items were presented as completion type objective questions. The students were required to supply alto and tenor voice parts to complete each given chord and to supply the voices and connect the chords in the manner specified by the music theory course materials presented in the music theory classes. The test instructions and examination items were provided in mimeographed form to each student. The Part-Writing test materials may be found in the Appendix on pages 234-240.

The test was conducted as a timed paper-and-pencil examination. The examination required twelve minutes. No aural presentation was required except the reading of the test instructions. The instructions for taking the examination were read aloud after the tests were distributed to each class. The students were instructed to read along silently while the directions were spoken. The instructions may be found in the Appendix on page 234. At the end of the twelve minute test period the students were directed to stop work, and their papers were collected.

Seven chord pairs were connected to form a chorale-like progression of chords. The remaining seventeen chord pairs were presented as individual cadences. Each chord pair was scored as an autonomous item, including the chord pairs linked in the chorale-like progression.

The test items included major and minor perfect authentic cadences, major and minor authentic half cadences, major

repeated triads in root position, major perfect plagal cadences, minor imperfect plagal cadences, and major plagal half cadences. At the recommendation of the music theory faculty, the part-writing examination was limited to include only material presented in the first ten chapters of the 1961 edition of Ottman's Elementary Harmony (11).

The procedure involved in taking the test was identical to the procedure used by the students in part-writing exercises conducted as part of the usual class routine.

The objective criteria used in scoring the examination are given in the Appendix on pages 239-240. Each chord pair was counted as one test item. Each student's raw score was obtained by hand scoring his paper. Each correct solution was counted as one point credit. With all correct responses a maximum score of twenty-four was earned.

After all raw scores were obtained, a frequency distribution of the scores was made. The percentile rank of each score was determined (7, pp. 29-33), and this was used to obtain the T-scores value (1, pp. 219-227, p. 510). Scores on the part-writing test were expressed as T-scores at all times except for the computation of the reliability of the part-writing test.

The split-half reliability of the part-writing test was determined by correlating the raw scores earned on the even numbered exercises with the raw scores earned on the odd numbered exercises (7, pp. 153-203). The reliability

of the total test was estimated by means of the Spearman-Brown prophecy formula (8, pp. 156-157; 5, pp. 339-340). The reliability was computed using the test scores of the total sample population (N = 91).

Keyboard Recognition and Harmony.--The keyboard harmony test was designed to provide objective measurement of skill in spelling and performing chords and cadences correctly in terms of the piano keyboard. Keyboard skills as measured by the test were limited to include only (1) the ability to recognize the position of tones on a keyboard, (2) the ability to spell chords correctly in terms of keys on a keyboard, (3) the application of rules regarding the doubling of triad tones in four note chords, (4) the application of rules regarding open and close position of chords in cadence progressions, and (5) the application of rules regarding voice movement in connecting chords. Motor or manipulative skills at the keyboard were not measured.

The test consisted of twenty-eight exercises. Fourteen of the test items required the performance of single chords; the remaining fourteen items required the performance of seven cadences. Each cadence consisted of two specific chords. The chords and cadences were designated in the examination, and the bass and soprano notes in the single chords were given. The soprano notes in both chords of the cadence examination items were given; the bass notes

were not given for the chords in the cadence items. In the case of perfect cadences, the root of the final chord was required to be the bass note, since the root position of the final chord is required by definition in the case of perfect cadences. In perfect cadences the bass note to appear on the final chord was, therefore, given by implication. The bass note in the first chord of perfect cadences was not specified. The bass notes in imperfect cadences were not specified either directly or indirectly for either of the two chords in each imperfect cadence examination item.

The examination was based on the contents of the first eleven chapters of the 1961 edition of Ottman's Elementary Harmony (11). The test instructions, the examination items, and the criteria used in scoring the responses may be found in the Appendix on pages 241-246.

The keyboard test was conducted as a timed paper-and-pencil examination. The examination required twelve minutes time, not including the time required to provide instructions. No aural presentation was required except the spoken instructions which were given immediately before the examination and the spoken direction to stop work which was given at the completion of the testing time period.

Each student was provided a mimeographed copy of the twenty-eight examination items, a mimeographed answer sheet, and a miniature cardboard replica of a piano keyboard. The keyboard was a top-view, two-dimensional ink drawing

of a piano keyboard. Middle C was indicated on the keyboard; the range extended downward to low A-flat one octave and a major third below middle C and upward to E-flat one octave and a minor third above middle C. The keyboard was twelve inches long and four inches wide; it was inked on heavy white cardboard, and the black keys were inked solid black. A hole was punched through each key. The holes in the white keys were punched one and one-fourth inches from the front edge of the keyboard; the holes in the black keys were punched two inches from the front edge of the keyboard. Thirty of these keyboards were constructed; the keyboards were reused for each administration of the test in the eight class sections of music theory.

The answer sheet provided to each student was a sheet of legal size mimeograph paper with mimeographed lines extending across the page parallel to the longest edge of the paper. Fourteen parallel lines one-fourth inch apart were mimeographed on both the front and back sides of the answer sheet. Each line was twelve and one-half inches long. One-fourth inch from both ends of each line a perpendicular line was drawn. The distance between the perpendicular end lines was equal to the length of the cardboard keyboards. The purpose of the lines was to provide guides for the positioning of the keyboard. During the test the front edge of the keyboard was placed on the long base line between the two shorter perpendicular end lines.

Each base line was numbered at both ends. The keyboard was placed on the answer line number corresponding to an examination item number in order to record the answer to that item. A space near the upper left corner of the answer sheet was provided for the name of the student taking the examination. The top line was four and one-eighth inches below the top edge of the answer sheet. On the reverse side of the sheet, the top line was also four and one-eighth inches below the top edge of the answer sheet.

Answers were recorded on the answer sheet by "X" marks placed through the holes punched in the keyboard. The keys to be played in solving each test item were indicated by marks placed through the holes in those keys. The solutions as they appeared on the answer sheet were a meaningless, abstract scattering of "X" marks. When the keyboard was placed over the answer sheet on each examination item number, the marks were easily observed by scanning the keyboard with the eye, and the keyboard pattern for the specified chords was readily observed. This was the manner in which the tests were hand scored.

Each single chord was scored as an autonomous item. The chords in the cadence problem were also scored individually; however, the connection of the two chords was also considered to be a part of the second chord in each cadence pair. Each correct solution was counted as one

point credit. With all correct responses a maximum score of twenty-eight was earned.

After all raw scores were obtained, a frequency distribution of the scores was made. The percentile rank of each score was determined (7, pp. 29-33), and this was used to obtain the T-score value (1, pp. 219-227, p. 510). Scores on the keyboard harmony test were expressed as T-scores at all times except for the computation of the reliability of the keyboard harmony test.

The split-half reliability of the keyboard harmony test was determined by correlating the raw scores earned on the even numbered exercises with the raw scores earned on the odd numbered exercises (7, pp. 153-203). The reliability of the total test was estimated by means of the Spearman-Brown prophecy formula (8, pp. 156-157; 5, pp. 339-340). The reliability was computed using the test scores of the total sample population (N = 91).

Music Fundamentals.--The music fundamentals test was designed to provide objective measurement of knowledge about the rudiments of music theory. The test was designed to measure skill in writing scales, notating key signatures, reading clefs, writing notation in clefs, spelling triads, and writing musical intervals. The test consisted of forty-nine completion type objective exercises. The examination was provided in mimeographed form to the students; it was

conducted as a timed paper-and-pencil examination. The examination required twelve minutes. No aural presentation was required except for the spoken instructions given immediately before the examination and the spoken direction to stop work which was given at the conclusion of the test time period. A copy of the examination, the instructions regarding the test, and the scoring key appear in the Appendix on pages 247-255.

Each student's raw score was obtained by hand scoring his paper. Each correct numbered exercise was scored as one point credit. With all correct responses a maximum raw score of forty-nine was earned.

After all raw scores were obtained, a frequency distribution of the scores was made. The percentile rank of each score was determined (7, pp. 29-33), and this was used to obtain the T-score value (1, pp. 219-227, p. 510). Scores on the fundamentals test were expressed as T-scores at all times except for the computation of the reliability.

The split-half reliability of the fundamentals test was determined by correlating the raw scores earned on the even numbered exercises with the raw scores earned on the odd numbered exercises (7, pp. 153-203). The reliability of the total test was estimated by means of the Spearman-Brown prophecy formula (8, pp. 156-157; 5, pp. 339-340). The reliability was computed using the test scores of the total sample population (N = 91).

The administration of the proficiency tests.--The proficiency tests, with the single exception of the individual sight singing examination, were administered during the usual music theory class periods in the rooms normally used by the various class sections. During the fall semester of 1961 two Music 138 and Music 148 sections, Section 01 and Section 05, met during the same hour, Period I, in adjacent rooms. This was the only period during which more than one class of Music 138 and Music 148 met. One test administrator assisted by a music education faculty member supervised all criterion testing.

For the tape recorded aural tests, a monaural tape was played through an Ampex 600 tape recorder into a Bogen DB-20 amplifier and Electro-Voice SP-12 speaker mounted in an Electro-Voice Aristocrat enclosure. For the two classes which met during the first period, the monaural tape signal was applied to a Dynakit PAS-2 stereophonic preamplifier and in turn to a Dynakit Stereo-70 stereophonic amplifier. The amplifier output was used to drive two Electro-Voice SP-12 speakers mounted in two Electro-Voice Aristocrat enclosures located in the two classrooms.

During the fall semester of the 1961-1962 school year, the aural tests were administered to five Music 138 and Music 148 class sections on January 9, 1962; the nonaural tests were administered on January 10, 1962; and the individual sight singing examinations were administered on

January 8, 9, and 10 of 1962. During the spring semester of the 1961-1962 school year, the aural tests were administered to three additional class sections of Music 138 and Music 148 on May 10, 1962; the nonaural tests were administered on May 2, 1962; and the individual sight singing examinations were administered on May 7, 8, and 9 of 1962.

The sight singing examinations were administered individually at times selected by the students in the sample population. The individual tests were administered in a private music studio.

The classroom and studio environment for conducting the criterion testing was highly satisfactory in all cases. No interruptions or outside disturbances of an auditory or visual nature intruded into the test environment during the entire testing program. The classrooms and studio used for the proficiency testing were large, comfortable, well lighted, and well ventilated. No deficiencies in the physical setting of the test environments were observed.

No deficiencies in the emotional climate were observed. Student response to the proficiency testing program was excellent. Class morale appeared to be high. Student involvement, attention, and participation in taking the tests appeared to be total and sincere. An atmosphere of relaxed formality prevailed throughout the course of the administration of all tests. In the opinion of members of the music theory faculty of North Texas State University,

the test results represent the best efforts of the participating students.

At the beginning of the proficiency testing program the students were told that they would be given a series of achievement tests designed to measure their skills in music theory. They were told that their test scores would not be used for the purposes of grade assignment or placement in class sections of subsequent music theory courses. The students were told the tests were a part of a research program being conducted at the School of Music. They were told that an effort was being made to determine the relationships between musical skills as predicted by the admission and orientation testing programs and actual accomplishment in music theory courses as measured by objective achievement examinations based on music theory course content. No further explanations regarding the nature or purpose of the research were presented to the students.

Difficulties Encountered in the Testing Program

As a result of the splendid cooperation extended to this research program, the data for the study were collected in an efficient and orderly manner. The only difficulty encountered in gathering the data was the result of the absences of students from music theory classes on the days the criterion tests were administered and absences in Music Orientation on the days predictor tests were administered. Private and

small group test sessions were arranged for the few students who missed tests. Little difficulty was experienced in securing the needed test scores. The make-up tests were administered within two weeks of each test's initial testing date. The make-up tests were administered in music theory classrooms during evening hours.

Procedures Employed for the Analysis of Test Data

The general treatment of the data obtained in the study was indicated previously. The mathematical reduction and analysis of the data was accomplished in a straightforward manner as follows:

1. Scores were obtained on all measures used in the study.

2. Scatter diagrams (7) were constructed using all possible pairs of tests. The linear relationship between variables was visually confirmed in each diagram. The correlation coefficients were computed from the grouped data employed in the scatter diagrams. The correlation coefficients were computed again from ungrouped data (9); a Monroe Statistical Calculator Model 8N was employed for this purpose. The correlation coefficients were confirmed. The correlation coefficients obtained from the ungrouped data are those reported and employed in this study. The means, standard deviations, and the sums of the squared scores employed in the study were obtained by machine

calculation using the ungrouped data. The specific forms of the scores used in the computation of the correlation coefficients were reported in previous sections of this chapter.

3. A program following the Wherry-Doolittle test selection method described by Garrett (5) was written by Statler for an IBM 1620 Computer. After the accuracy of the operation of the computer program was verified, the necessary data was supplied to the computer, and the maximum obtainable multiple correlation coefficient between the selected predictor variables and total proficiency scores was obtained. The predictor variables employed were as follows: Otis Quick-Scoring Mental Ability Tests, Gordon Index of Musical Insight, total Kwalwasser-Dykema Music Tests, Drake "Rhythm," Drake "Musical Memory," total Wing Standardised Tests of Musical Intelligence, and total Freshman Placement Theory Examination. Because of the general unavailability of the Freshman Placement Theory Examination for testing purposes at institutions other than North Texas State University, a second multiple correlation was calculated for the same group of tests with the Freshman Placement Theory Examination deleted from the battery.

4. The minimum value of an acceptable r as defined previously was computed (1, pp. 462-465). The stated hypotheses were tested by comparing the obtained correlation coefficients to this value. The r to z transformation was utilized, and the formula for testing a non-zero hypothesis

about a population correlation coefficient was used. In this particular application, Critical Ratio = -1.28 was required by definition as explained previously. The formula was solved for the z value falling at CR = -1.28, and the obtained z value was converted to r. As previously indicated, a one-tailed test of significance at the 10 per cent level was employed (8, pp. 62-68).

5. The reliability of each proficiency test was computed. The method for ascertaining the reliability of each proficiency test was given in previous sections of this chapter.

6. The regression equations were calculated for all single acceptable tests; the classical formula was employed (8, p. 130).

7. The regression equations were calculated for the two multiple batteries identified previously. These calculations were performed on an IBM 1620 Computer programmed to perform the functions described by Garrett (5, pp. 437-439).

8. The standard error of estimate for each prediction equation was computed (5).

9. The coefficient of forecast efficiency, E, was computed to aid in the interpretation of the obtained correlations (5).

10. Ogives were constructed to provide a basis for interpreting the proficiency scores (7).

CHAPTER BIBLIOGRAPHY

1. Blommers, Paul and E. F. Lindquist, Elementary Statistical Methods, Boston, Houghton Mifflin Company, 1960.

2. Buros, Oscar Krisen, editor, The Fifth Mental Measurements Yearbook, Highland Park, New Jersey, The Gryphon Press, 1959.

3. _____, editor, The Fourth Mental Measurements Yearbook, Highland Park, New Jersey, The Gryphon Press, 1953.

4. _____, editor, The Third Mental Measurements Yearbook, New Brunswick, Rutgers University Press, 1949.

5. Garrett, Henry E., Statistics in Psychology and Education, New York, Longmans, Green and Company, 1959.

6. Hindemith, Paul, Elementary Training for Musicians, New York, Associated Music Publishers, Inc., 1946.

7. Lindquist, E. F., A First Course in Statistics, Cambridge, Massachusetts, Houghton Mifflin Company, 1942.

8. McNemar, Quin, Psychological Statistics, New York, John Wiley and Sons, Inc., 1959.

9. Monroe Calculating Machine Methods General Statistics, Orange, New Jersey, Monroe Calculating Machine Company, Inc., 1960.

10. North Texas State College, Catalog 1961-1962, Bulletin No. 323, Denton, Texas, North Texas State College, 1961.

11. Ottman, Robert William, Elementary Harmony, Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1961.

12. _____, Music for Sight Singing, Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1956.

13. _____, "A Statistical Investigation of the Influence of Selected Factors on the Skill of Sight Singing," unpublished doctoral dissertation, School of Music, North Texas State College, Denton, Texas, 1955.

14. "Recommendations in Theory, Music History, and Literature," Bulletin of the National Association of Schools of Music, XLV (January, 1958), 1-7.

15. "Theory," unpublished syllabus, School of Music, North Texas State University, Denton, Texas, 1961.

CHAPTER IV

THE PRESENTATION AND INTERPRETATION OF DATA

The Presentation of the Data

The application of the procedures described in Chapter III to the materials employed in the study provided the data necessary for the solution of the problem stated in Chapter I. The processed data obtained in the study are presented and interpreted in this chapter. Raw data are not reported in this study.

The Intercorrelations among the Predictor Tests

Table V presents the intercorrelations among the predictor tests. One of the purposes of this investigation was to ascertain the degree of relationship between scores on each predictor test and scores on each of the other predictor tests selected for study. These correlations provide information which may be used in two ways as follows:

1. The intercorrelations among the predictor variables must be obtained in order to compute multiple correlation coefficients. Two multiple batteries which provide satisfactory prediction of proficiency scores in collegiate music theory are provided in this study, but many other satisfactory combinations of predictor tests selected from the group studied in this investigation may be chosen and used.

TABLE V

THE INTERCORRELATIONS AMONG THE PREDICTOR TESTS

Tests *	2 **	3	4	5	6	7	8	9	10
1	.24248	.07231	.44183	.26654	.26047	.46234	.29346	.47149	.53044
2		-.01946	.15241	.09005	.05257	.16610	.03994	.06802	.15312
3			.54005	.92772	.46385	.29742	.36696	.33484	.39912
4				.81483	.56813	.67256	.35325	.70804	.70802
5					.58922	.54324	.36922	.54356	.57113
6						.45378	.41804	.41873	.44312
7							.24719	.70426	.68968
8								.23986	.25301
9									.91589
10									

*List of Tests (N = 91)

1. "Musical Memory" tests of the Drake Musical Aptitude Tests
2. "Rhythm" tests of the Drake Musical Aptitude Tests
3. "Fundamentals" test of the Freshman Placement Theory Examination
4. Mean of subtests B + C of the Freshman Placement Theory Examination
5. Total Freshman Placement Theory Examination
6. Gordon Index of Musical Insight
7. Four selected tests of the Kwalwasser-Dykema Music Tests
8. Otis Quick-Scoring Mental Ability Tests
9. The first three subtests of the Wing Standardised Tests of Musical Intelligence
10. Total Wing Standardised Tests of Musical Intelligence

**For computational purposes the table should be read to five places. For interpretive purposes the table should be read only to one or two places. For interpretive purposes five place correlation coefficients imply false accuracy.

The correlations in Table V may be of special interest to individuals who wish to employ particular combinations of certain prognostic measures investigated in this study. For these individuals, the usefulness of this study may be broadened by the possibilities for computing additional multiple correlation coefficients and regression equations for particular groups of tests selected from the total battery investigated.

2. A knowledge of the interrelationships among the predictor variables may be used in assessing the relative practical usefulness of certain tests as substitutes for other tests where the validity of each of the tests is satisfactory. Two tests highly related to each other, for example, need not be used together, since either single test may provide the information desired. Economy in time, effort, and money may be achieved by the avoidance of unnecessary duplication in testing. Where several tests are highly related to each other, one test may be selected in preference to others which may be longer, more difficult to administer and score, or more expensive. In some cases, an available test may be substituted for an unavailable one. Other considerations such as reliability, adequacy of sampling in test questions, or objectivity in measurement may dictate the selection of one test in preference to another one.

The interrelationships among the tests investigated are reported in Table V and are interpreted as follows:

1. The correlations between the "Musical Memory" tests of the Drake Musical Aptitude Tests and the other predictor tests investigated range from negligible (+0.07) to marked (+0.53), but they are not high enough to justify any test substitution for this measure.

2. The correlations between the "Rhythm" tests of the Drake Musical Aptitude Tests and the other predictor tests investigated range from negative negligible (-0.02) to positive slight (+0.24). The relationships are too low to justify any test substitution for this measure.

3. The correlations between the "Fundamentals" test of the Freshman Placement Theory Examination and the other predictor tests investigated range from negative negligible (-0.02) to very high (+0.93). The relationship between this test and the total Freshman Placement Theory Examination is high enough to justify consideration of the use of this shorter test as a substitute for the longer test in predicting certain proficiency scores. The substitution should be considered only for predicting those proficiency scores which may be predicted satisfactorily from "Fundamentals" scores. These proficiency scores are identified in subsequent sections of this chapter.

4. The correlations between the mean of subtests B + C of the Freshman Placement Theory Examination and the other

predictor tests investigated range from negligible (+0.15) to high (+0.81), but they are not high enough to justify any test substitution for this measure.

5. The correlations between the total Freshman Placement Theory Examination and the other predictor tests investigated range from negligible (+0.09) to very high (+0.93). The relationship between this test and the "Fundamentals" test is very high, but substitution in this case is not possible. The "Fundamentals" test is a subtest of the total Freshman Placement Theory Examination.

6. The correlations between the Gordon Index of Musical Insight and the other predictor tests investigated range from negligible (+0.05) to marked (+0.59), but they are not high enough to justify any test substitution for this measure.

7. The correlations between the four selected tests of the Kwalwasser-Dykema Music Tests and the other predictor tests investigated range from negligible (+0.17) to marked (+0.70), but they are not high enough to justify any test substitution for this measure.

8. The correlations between the Otis Quick-Scoring Mental Ability Tests and the other predictor tests range from negligible (+0.04) to marked (+0.42), but they are not high enough to justify any test substitution for this measure.

9. The correlations between the first three subtests of the Wing Standardised Tests of Musical Intelligence and the other predictor tests investigated range from negligible (+0.07) to very high (+0.92). The relationship between this test and the total Wing Standardised Tests of Musical Intelligence is high enough to justify consideration of the use of this shorter test as a substitute for the longer test in predicting certain proficiency scores. The substitution should be considered only for predicting those proficiency scores which may be predicted satisfactorily from scores on the first three subtests of the Wing Standardised Tests of Musical Intelligence. These proficiency scores are identified in subsequent sections of this chapter.

10. The correlations between the Wing Standardised Tests of Musical Intelligence and the other predictor tests investigated range from negligible (+0.15) to very high (+0.92). The relationship between this test and the first three subtests of this test is very high, but substitution in this case is not possible. The first three subtests are parts of the total Wing battery.

The Intercorrelations among the Proficiency Tests

Table VI presents the intercorrelations among the proficiency tests. These correlations have no direct application to the problem of this study. They may be of special interest to investigators who wish to employ these

TABLE VI

THE INTERCORRELATIONS AMONG THE PROFICIENCY TESTS

Tests*	B**	C	D	E	F	G	H	J	K
A	.51468	.48759	.40614	.38057	.49784	.53674	.79040	.56396	.71804
B		.67545	.82972	.37704	.52301	.40316	.87012	.51852	.81351
C			.68559	.43163	.55770	.40548	.86045	.55470	.79913
D				.34330	.51276	.38999	.76404	.49546	.78421
E					.64243	.44191	.47174	.82717	.68037
F						.57408	.62620	.88054	.79910
G							.53250	.74767	.70736
H								.64897	.92465
J									.87483
K									

*List of Tests (N = 91)

A. Rhythmic Dictation
B. Melodic Dictation
C. Harmonic Dictation
D. Sight Singing
E. Part-Writing
F. Keyboard Recognition and Harmony
G. Music Fundamentals
H. Aural Composite Test
J. Nonaural Composite Test
K. Total Proficiency Test

**For computational purposes the table should be read to five places. For interpretive purposes the table should be read only to one or two places. For interpretive purposes five place correlation coefficients imply false accuracy.

proficiency measures in further studies. This information is included to provide greater flexibility in the usefulness of this study in particular situations of interest to other researchers.

It may be observed in Table VI that the scores on the subtests, scores on the composite tests, and scores on the total test battery are all moderately to strongly related to each other. The interrelationships among the various proficiency scores may be interpreted as follows:

1. All of the subtest intercorrelations range from slight (+0.34) to very high (+0.83). All of these intercorrelations except one range from slight (+0.34) to marked (+0.69). Only the correlation between Melodic Dictation and Sight Singing (+0.83) is greater than +0.69. Only four intercorrelations are less than +0.40. Sixteen of the twenty-one subtest intercorrelations are substantial or marked with a range from +0.40 to +0.69.

2. The correlations between the subtests and the two composite tests range from marked (+0.47) to very high (+0.88).

3. The correlation between the two composite tests is marked (+0.65).

4. The correlations between the Total Proficiency Test and the subtests, including the two composite tests, range from marked (+0.68) to very high (+0.92).

The Correlations between the Predictor Tests and the Proficiency Tests

Table VII presents the correlations obtained between scores on the predictor tests investigated and scores on the music theory proficiency tests. For all predictor tests used singly, the focus of this study was on the information summarized in this table. It should be noted that the correlation values reported in Table V, Table VI, and Table VII are carried to five places. In order to avoid large rounding errors in the calculation of the multiple correlation coefficients, the correlation values used in this study were carried the full five places. For mathematical purposes in the lengthy computations involved, the correlation values were not rounded to fewer places. For nonmathematical or interpretative purposes, however, the correlation values reported in the tables should be rounded and read only to two places. The nature of the original data, relatively crude test scores, does not warrant the precision of interpretation implied by correlation values reported to more than two places. Sophisticated test users should be aware of the precision, or lack of it, of test scores. This same awareness also should be applied to correlation values based on test scores. At best, correlation values and test scores are obtained approximations of more precise values. This interpretative attitude was not applied to other areas of this study. Lack of

TABLE VII

THE CORRELATIONS BETWEEN THE PREDICTOR TESTS AND THE PROFICIENCY TESTS

Tests*	A **	B	C	D	E	F	G	H	J	K
1	.31939	.41124	.36755	.49100	.20685	.27094	.01570	.43583	.19507	.39090
2	-.05708	-.00877	.15253	-.01119	-.10206	.00150	-.12832	.05354	-.09154	-.02877
3	.63388	.41049	.39189	.33355	.43115	.50322	.60659	.56782	.61429	.62225
4	.54145	.78937	.62967	.75357	.43601	.59843	.40644	.77823	.57292	.78158
5	.67853	.63303	.54898	.56327	.48897	.61163	.59961	.73695	.67714	.77589
6	.61680	.63503	.42108	.57501	.37872	.53006	.50924	.66237	.56485	.68866
7	.39342	.69834	.53082	.72550	.22669	.41944	.37980	.64461	.40881	.64152
8	.50035	.40512	.26968	.27928	.26069	.47211	.29616	.46462	.40933	.46710
9	.42965	.71108	.56120	.72418	.09294	.40613	.23922	.67600	.29394	.59521
10	.46784	.72400	.60213	.73232	.16505	.44651	.30946	.71245	.36675	.64856

*List of Tests (N = 91)

1. "Musical Memory," Drake Musical Aptitude Tests
2. "Rhythm," Drake Musical Aptitude Tests
3. "Fundamentals," Freshman Placement Theory Examination
4. B + C, Freshman Placement Theory Examination
5. Total Freshman Placement Theory Examination
6. Gordon Index of Musical Insight
7. Four selected tests, Kwalwasser-Dykema Music Tests
8. Otis Quick-Scoring Mental Ability Tests
9. Selected tests, Wing Standardised Tests of Musical Intelligence
10. Total Wing Standardised Tests of Musical Intelligence

A. Rhythmic Dictation
B. Melodic Dictation
C. Harmonic Dictation
D. Sight Singing
E. Part-Writing
F. Keyboard Recognition and Harmony
G. Music Fundamentals
H. Aural Composite Test
J. Nonaural Composite Test
K. Total Proficiency Test

**For computational purposes the table should be read to five places. For interpretive purposes the table should be read only to one or two places. For interpretive purposes five place correlation coefficients imply false accuracy.

precision in the testing, the scoring, or the mathematical reduction of test data was not tolerated in the study.

Table VII may be used to identify predictor tests which may be used to predict single, composite, or total proficiency scores. To select prognostic tests directly from the table, a test user may determine the minimum correlation value acceptable for a given type of situation, and then he may scan the table for values reaching or exceeding that value. For example, to predict Keyboard Recognition and Harmony scores at the level of accuracy attained by $\underline{r}$ = +0.60, scores on two tests, the mean of tests B + C of the Freshman Placement Theory Examination (rounded) and the total Freshman Placement Theory Examination, may be used. Any desired minimum level of acceptable correlation may be selected in keeping with the specific purpose of a prognosis.

Of the individual tests selected for study in this investigation, the best predictors of single, composite, and total proficiency scores are as follows:

1. Rhythmic Dictation scores are best predicted by the total Freshman Placement Theory Examination scores.

2. Melodic Dictation scores are best predicted by the mean of subtests B + C of the Freshman Placement Theory Examination scores.

3. Harmonic Dictation scores are best predicted by the mean of subtests B + C of the Freshman Placement Theory Examination scores.

4. Sight Singing scores are best predicted by the mean of subtests B + C of the Freshman Placement Theory Examination scores.

5. Part-Writing scores are best predicted by total Freshman Placement Theory Examination scores. The highest level of accuracy possible using the tests employed in this study is not satisfactory for individual prognosis.

6. Keyboard Recognition and Harmony scores are best predicted by total Freshman Placement Theory Examination scores.

7. Music Fundamentals scores are best predicted by the "Fundamentals" subtest of the Freshman Placement Theory Examination scores.

8. Aural Composite Test scores are best predicted by the mean of subtests B + C of the Freshman Placement Theory Examination scores.

9. Nonaural Composite Test scores are best predicted by total Freshman Placement Theory Examination scores.

10. Total Proficiency Test scores are best predicted by the mean of subtests B + C of the Freshman Placement Theory Examination scores.

The Means and Standard Deviations of the Tests Employed in the Study

The mean and standard deviation of each test employed in the study are reported in Table VIII. In addition to the interpretive value of the statistics, the information

TABLE VIII

THE MEANS AND STANDARD DEVIATIONS OF THE TESTS EMPLOYED IN THE STUDY (N = 91)

Name of Test	Mean	Standard Deviation
"Musical Memory," Drake Musical Aptitude Tests	70.4066	28.0490
"Rhythm," Drake Musical Aptitude Tests	34.8571	24.9668
"Fundamentals," Freshman Placement Theory Examination	68.1648	20.3257
B + C, Freshman Placement Theory Examination	74.3297	13.3226
Total Freshman Placement Theory Examination	71.0220	14.8789
Gordon Index of Musical Insight	50.9451	29.0003
Four selected tests, Kwalwasser-Dykema Music Tests	81.9780	5.5393
Otis Quick-Scoring Mental Ability Tests	113.3516	9.8057
Selected tests, Wing Standardised Tests of Musical Intelligence	61.4835	7.2815
Total Wing Standardised Tests of Musical Intelligence	94.7582	10.5598
Rhythmic Dictation	50.0000	10.0000
Melodic Dictation	50.0000	10.0000
Harmonic Dictation	50.0000	10.0000
Sight Singing	50.0000	10.0000
Part-Writing	50.0000	10.0000
Keyboard Recognition and Harmony	50.0000	10.0000
Music Fundamentals	50.0000	10.0000
Aural Composite Test	149.9341	24.7090
Nonaural Composite Test	150.0220	24.7776
Total Proficiency Test	349.7582	52.1851

provided in Table VIII may be used to compute raw score multiple regression equations for the prediction of any single proficiency score, composite proficiency score, or total proficiency score from any selected combination of predictor tests. Considerable flexibility in the usefulness of the data obtained for the solution of the problem in this study may be realized by the proper treatment of the information provided in Table V, Table VI, Table VII, and Table VIII.

The Multiple Correlations Obtained between Two Selected Batteries of Predictor Tests and Total Proficiency Scores

The Wherry-Doolittle regression analysis using all predictor test scores as the predictor variables and the total proficiency score as the criterion variable selected six predictor tests which provided $R = +0.8798$, the maximum multiple correlation obtainable from the tests investigated. The tests selected were as follows:

1. "Rhythm," Drake Musical Aptitude Tests
2. Total Freshman Placement Theory Examination
3. Gordon Index of Musical Insight
4. Four selected tests, Kwalwasser-Dykema Music Tests
5. Otis Quick-Scoring Mental Ability Tests
6. Total Wing Standardised Tests of Musical Intelligence

When the Freshman Placement Theory Examination was deleted from the group of predictor variables and a second

Wherry-Doolittle regression analysis was made, five predictor tests were selected which provided R = +0.8340, the maximum multiple correlation obtainable from the remaining predictor tests. The tests selected for the second battery were as follows:

1. "Rhythm," Drake Musical Aptitude Tests
2. Gordon Index of Musical Insight
3. Four selected tests, Kwalwasser-Dykema Music Tests
4. Otis Quick-Scoring Mental Ability Tests
5. Total Wing Standardised Tests of Musical Intelligence

The Reliabilities of the Proficiency Tests

The split-half reliability of each test in the proficiency battery as estimated by the Spearman-Brown prophecy formula is reported in Table IX. Since all of the obtained reliabilities were well above +0.90, the reliabilities of the individual proficiency tests were considered adequate. It should be noted from Table IX that the reliabilities of three of the tests are above +0.95. The reliabilities of the remaining four tests are above +0.91. For the entire criterion battery the individual reliabilities, when rounded to the usual two decimal places, range from +0.92 to +0.98. The procedures employed in ascertaining the reliabilities of the proficiency tests were described in Chapter III.

TABLE IX

THE RELIABILITIES OF THE PROFICIENCY TESTS (N = 91)

Name of Test	Split-Half Reliability
Rhythmic Dictation	$\underline{r}$ = .91908
Melodic Dictation	$\underline{r}$ = .92632
Harmonic Dictation	$\underline{r}$ = .93304
Sight Singing	$\underline{r}$ = .97699
Part-Writing	$\underline{r}$ = .95338
Keyboard Recognition and Harmony	$\underline{r}$ = .94577
Music Fundamentals	$\underline{r}$ = .96897

Since the scores on the individual proficiency tests were found to be highly reliable, the composite proficiency scores and the total proficiency scores were estimated to by highly reliable.

The Interpretation of the Data

The Testing of the Hypotheses

To test the stated hypotheses, Fischer's $\underline{r}$ to $\underline{z}$ transformation was utilized, and the formula for testing a nonzero hypothesis about a population correlation coefficient was used. Where the obtained correlation coefficients, $\underline{r}$ or $\underline{R}$, were equal to or were greater than the selected *a priori* value of +0.60, no tests of significance of

difference were applied. Only obtained correlation values less than +0.60 could lead to the rejection of hypotheses in this study. Obviously, no r or $R \geqslant +0.60$ actually obtained from a sample population could be interpreted logically in any way which could lead to the rejection of a hypothesis that the true value of r or R for the population was not less than +0.60. Where the obtained correlation coefficients were less than +0.60, a one-tailed test of significance was employed; in this study only obtained correlations differing in one direction from the a priori value were of concern.

The magnitude of the difference between an obtained correlation value and an a priori value required to find the two values significantly different from each other is dependent upon the level of significance selected in hypothesis testing. The difference between an a priori value and an obtained value significantly different from the a priori value decreases as the level of significance increases. Also, Type I and Type II errors in hypothesis testing are directly related to the choice of a level of significance. The 10 per cent level of significance was selected in this study in order to reject hypotheses and consequently tests with a reasonable minimum of difference between the obtained correlations and the a priori value and to reduce the risk of making the Type II error. The consequences of rejecting a true hypothesis (Type I error)

could not cause difficulty to students where the findings of this study are applied. The consequences of accepting a false hypothesis (Type II error) could cause considerable difficulty.

The correlations reported in Table VII were those employed in testing the hypotheses. The minimum value of an r for a satisfactory predictor as defined in Chapter I was calculated as described in Chapter III.

As calculated, the minimum value of an acceptable r was +0.505. Between the predictor tests and the proficiency tests the correlations equal to or less than +0.505 are significantly different from (less than) the a priori value of r, +0.60, at the 10 per cent level on a one-tailed test of significance (Critical Ratio = 1.28). This should be interpreted to mean that the obtained correlations equal to or less than +0.505 between predictor tests and proficiency tests indicate unsatisfactory prognostic capability according to the standards defined in Chapter I and described in Chapter III of this study. Correlations greater than +0.505 should be considered satisfactory.

If other less stringent levels of significance are desired, prognostic tests may be selected directly from Table VII without further computation by employing either of the following levels of significance:

1. At the 5 per cent level on a one-tailed test of significance (CR = 1.64) an $r \leq +0.475$ is significantly

different from (less than) +0.60. This should be interpreted to mean that obtained correlations equal to or less than +0.475 between predictor tests and criterion tests indicate unsatisfactory prognostic capability. The minimum acceptable value of $\underline{r}$ remains unchanged at +0.60, but this change in the level of statistical significance permits the obtained correlations to differ from +0.60 by a greater amount than allowed at the 10 per cent level. At the 5 per cent level correlations ranging downward from +0.60 do not become statistically different from that value until they reach +0.475. At this level of significance all correlations greater than +0.475 between predictor and proficiency tests should be considered acceptable and satisfactory for prognostic purposes since they do not fall below the minimum a priori value.

2. At the 1 per cent level on a one-tailed test of significance (CR = 2.33), an $\underline{r} \leq +0.420$ is significantly different from (less than) +0.60. This should be interpreted to mean that obtained correlations equal to or less than +0.420 between predictor tests and proficiency tests indicate unsatisfactory prognostic capability. In this case also, the minimum acceptable value of $\underline{r}$ is +0.60, but the change in the level of statistical significance permits the obtained correlations to differ from +0.60 by a greater amount than allowed at the 5 per cent or 10 per cent levels. At the 1 per cent level, correlations ranging downward

from +0.60 do not become statistically different from that value until they reach +0.420. At this level of significance all correlations greater than +0.420 between predictor and proficiency tests should be considered acceptable and satisfactory for prognostic purposes since they do not fall below the minimum a priori value.

At the 10 per cent level of significance the following interpretations of the data summarized in Table VII should be made:

1. The correlations between the "Musical Memory" tests of the Drake Musical Aptitude Tests and the proficiency tests fail to reach the minimum acceptable value of r for any proficiency test.

2. The correlations between the "Rhythm" tests of the Drake Musical Aptitude Tests and the proficiency tests fail to reach the minimum acceptable value of r for any proficiency test.

3. The correlations between the "Fundamentals" test of the Freshman Placement Theory Examination and the proficiency tests exceed the minimum acceptable value of r for the proficiency tests of Rhythmic Dictation, Music Fundamentals, the Aural Composite Test, the Nonaural Composite Test, and the Total Proficiency Test.

4. The correlations between the mean of tests B + C of the Freshman Placement Theory Examination and the proficiency tests exceed the minimum acceptable value of r

for the proficiency tests of Rhythmic Dictation, Melodic Dictation, Harmonic Dictation, Sight Singing, Keyboard Recognition and Harmony, the Aural Composite Test, the Nonaural Composite Test, and the Total Proficiency Test.

5. The correlations between the total Freshman Placement Theory Examination and the proficiency tests exceed the minimum acceptable value of r for the proficiency tests of Rhythmic Dictation, Melodic Dictation, Harmonic Dictation, Sight Singing, Keyboard Recognition and Harmony, Music Fundamentals, the Aural Composite Test, the Nonaural Composite Test, and the Total Proficiency Test.

6. The correlations between the Gordon Index of Musical Insight and the proficiency tests exceed the minimum acceptable value of r for the proficiency tests of Rhythmic Dictation, Melodic Dictation, Sight Singing, Keyboard Recognition and Harmony, Music Fundamentals, the Aural Composite Test, the Nonaural Composite Test, and the Total Proficiency Test.

7. The correlations between the four selected tests of the Kwalwasser-Dykema Music Tests and the proficiency tests exceed the minimum acceptable value of r for the proficiency tests of Melodic Dictation, Harmonic Dictation, Sight Singing, the Aural Composite Test, and the Total Proficiency Test.

8. The correlations between the Otis Quick-Scoring Mental Ability Tests and the proficiency tests fail to

reach the minimum acceptable value of *r* for any proficiency test.

9. The correlations between the first three tests of the Wing Standardised Tests of Musical Intelligence and the proficiency tests exceed the minimum acceptable value of *r* for the proficiency tests of Melodic Dictation, Harmonic Dictation, Sight Singing, the Aural Composite Test, and the Total Proficiency Test.

10. The correlations between the total Wing Standardised Tests of Musical Intelligence and the proficiency tests exceed the minimum acceptable value of *r* for the proficiency tests of Melodic Dictation, Harmonic Dictation, Sight Singing, the Aural Composite Test, and the Total Proficiency Test.

When the 5 per cent level of significance is selected, several prognostic possibilities are added to the above list. They include the following:

1. The correlations between the "Musical Memory" tests of the Drake Musical Aptitude Tests and the proficiency tests exceed the minimum acceptable value of *r* for the proficiency test of Sight Singing.

2. The correlations between the "Fundamentals" test of the Freshman Placement Theory Examination and the proficiency tests exceed the minimum acceptable value of *r* for the proficiency test of Keyboard Recognition and Harmony.

3. The correlations between the total Freshman Placement Theory Examination and the proficiency tests exceed the minimum acceptable value of r for the proficiency test of Part-Writing.

4. The correlations between the Otis Quick-Scoring Mental Ability Tests and the proficiency tests exceed the minimum acceptable value of r for the proficiency test of Rhythmic Dictation.

When the 1 per cent level of significance is selected, several prognostic possibilities are added to the two above lists. They include the following:

1. The correlations between the "Musical Memory" tests of the Drake Musical Aptitude Tests and the proficiency tests exceed the minimum acceptable value of r for the proficiency test of the Aural Composite Test.

2. The correlations between the "Fundamentals" test of the Freshman Placement Theory Examination and the proficiency tests exceed the minimum acceptable value of r for the proficiency test of Part-Writing.

3. The correlations between the mean of tests B + C of the Freshman Placement Theory Examination and the proficiency tests exceed the minimum acceptable value of r for the proficiency test of Part-Writing.

4. The correlations between the Gordon Index of Musical Insight and the proficiency tests exceed the minimum

acceptable value of *r* for the proficiency test of Harmonic Dictation.

5. The correlations between the Otis Quick-Scoring Mental Ability Tests and the proficiency tests exceed the minimum acceptable value of *r* for the proficiency tests of Keyboard Recognition and Harmony, the Aural Composite Test, and the Total Proficiency Test.

6. The correlations between the first three tests of the Wing Standardised Tests of Musical Intelligence and the proficiency tests exceed the minimum acceptable value of *r* for the proficiency test of Rhythmic Dictation.

7. The correlations between the total Wing Standardised Tests of Musical Intelligence and the proficiency tests exceed the minimum acceptable value of *r* for the proficiency tests of Rhythmic Dictation and Keyboard Recognition and Harmony.

For the first of the two multiple predictor batteries, the Wherry-Doolittle test selection method selected six of the tests in the total predictor battery and provided $R = +0.8797$ as the maximum value of the relationship between predictor test scores and total proficiency scores. In the second predictor battery, the battery with the Freshman Placement Theory Examination omitted, five tests were selected and provided $R = +0.8340$ as the maximum value of the relationship between predictor test scores and total proficiency scores. The value of *R* in the case of both

multiple batteries far exceeds the a priori value. This should be interpreted to mean that both batteries are satisfactory predictors of the criterion.

For the first battery the predictor tests were selected in the following order:

1. Total Freshman Placement Theory Examination
2. Gordon Index of Musical Insight
3. Four selected tests of the Kwalwasser-Dykema Music Tests
4. "Rhythm" tests of the Drake Musical Aptitude Tests
5. Otis Quick-Scoring Mental Ability Tests
6. Total Wing Standardised Tests of Musical Intelligence

The contribution of the last five tests to the squared shrunken multiple correlation are as follows: +0.0821 Gordon Index of Musical Insight; +0.0440 four selected tests of the Kwalwasser-Dykema Music Tests; +0.0170 "Rhythm" tests of the Drake Musical Aptitude Tests; +0.0148 Otis Quick-Scoring Mental Ability Tests; and +0.0141 total Wing Standardised Tests of Musical Intelligence.

The first multiple battery accounts for 77 per cent of the variance of the total proficiency score. The six tests, in the numerical order listed above, contribute 30.5 per cent, 16.6 per cent, 11.9 per cent, 0.4 per cent, 6.3 per cent, and 11.3 per cent, respectively, to the variance of the proficiency scores on the Total Proficiency Test.

For the second battery the predictor tests were selected in the following order:

1. Gordon Index of Musical Insight
2. Total Wing Standardised Tests of Musical Intelligence
3. Four selected tests of the Kwalwasser-Dykema Music Tests
4. Otis Quick-Scoring Mental Ability Tests
5. "Rhythm" tests of the Drake Musical Aptitude Tests

The contribution of the last four tests to the squared shrunken multiple correlation are as follows: +0.1467 total Wing Standardised Tests of Musical Intelligence; +0.0291 four selected tests of the Kwalwasser-Dykema Music Tests; +0.0261 Otis Quick-Scoring Mental Ability Tests; and +0.0193 "Rhythm" tests of the Drake Musical Aptitude Tests.

The second multiple battery accounts for 69.6 per cent of the variance of the total proficiency score. The five tests, in the numerical order listed above, contribute 26.3 per cent, 18.2 per cent, 16.3 per cent, 8.4 per cent, and 0.4 per cent, respectively, to the variance of the proficiency scores on the Total Proficiency Test.

The Prognostic Application of the Data

The tests identified as satisfactory predictors may be used to predict proficiency scores. Regression equations expressed in the test score forms used in this study are provided for this purpose. The prediction of a proficiency

score from a satisfactory predictor score may be accomplished easily by substituting the score on the selected predictor test for X in the proper equation and solving the equation for the Y value. The predictor test score substituted for X in the proper equation must be multiplied by the value of the regression coefficient, and the regression constant given in each equation must then be summed algebraically with that product to obtain the predicted proficiency score. The regression coefficients (given in numerical value in the equations) give the weights of the scores in the independent variables (proficiency test scores). This coefficient must not be confused with the beta weight of a score which is expressed in terms of a standard deviation value. The form of each test score used in this study was given in Chapter III. Each regression equation is to be solved for the Y value; Y = the estimated proficiency score from a given X, a predictor test score.

The regression equation for predicting proficiency scores on the Rhythmic Dictation test from the obtained scores on the "Fundamentals" test of the Freshman Placement Theory Examination.--In the following equation X = the earned score on the "Fundamentals" test of the Freshman Placement Theory Examination, and Y = the estimated or predicted proficiency score on the Rhythmic Dictation test.

$$Y = 0.31186X + 28.74213$$

The regression equation for predicting proficiency scores on the Music Fundamentals test from the obtained scores on the "Fundamentals" test of the Freshman Placement Theory Examination.--In the following equation X = the earned score on the "Fundamentals" test of the Freshman Placement Theory Examination, and Y = the estimated or predicted proficiency score on the Music Fundamentals test.

$$Y = 0.29843X + 29.65758$$

The regression equation for predicting proficiency scores on the Aural Composite Test from the obtained scores on the "Fundamentals" test of the Freshman Placement Theory Examination.--In the following equation X = the earned score on the "Fundamentals" test of the Freshman Placement Theory Examination, and Y = the estimated or predicted proficiency score on the Aural Composite Test.

$$Y = 0.69027X + 102.88199$$

The regression equation for predicting proficiency scores on the Nonaural Composite Test from the obtained scores on the "Fundamentals" test of the Freshman Placement Theory Examination.--In the following equation X = the earned score on the "Fundamentals" test of the Freshman Placement Theory Examination, and Y = the estimated or predicted proficiency score on the Nonaural Composite Test.

$$Y = 0.74883X + 98.97815$$

The regression equation for predicting proficiency scores on the Total Proficiency Test from the obtained scores on the "Fundamentals" test of the Freshman Placement Theory Examination.--In the following equation X = the earned score on the "Fundamentals" test of the Freshman Placement Theory Examination, and Y = the estimated or predicted proficiency score on the Total Proficiency Test.

$$Y = 1.59759X + 240.85880$$

The regression equation for predicting proficiency scores on the Rhythmic Dictation test from the obtained scores on the mean of subtests B + C of the Freshman Placement Theory Examination.--In the following equation X = the earned score on the mean of subtests B + C of the Freshman Placement Theory Examination, and Y = the estimated or predicted proficiency score on the Rhythmic Dictation test.

$$Y = 0.40641X + 19.79167$$

The regression equation for predicting proficiency scores on the Melodic Dictation test from the obtained scores on the mean of subtests B + C of the Freshman Placement Theory Examination.--In the following equation X = the earned score on the mean of subtests B + C of the Freshman Placement Theory Examination, and Y = the estimated or predicted proficiency score on the Melodic Dictation test.

$$Y = 0.59250X + 5.95966$$

The regression equation for predicting proficiency scores on the Harmonic Dictation test from the obtained scores on the mean of subtests B + C of the Freshman Placement Theory Examination.--In the following equation X = the earned score on the mean of subtests B + C of the Freshman Placement Theory Examination, and Y = the estimated or predicted proficiency score on the Harmonic Dictation test.

$$Y = 0.47263X + 14.86956$$

The regression equation for predicting proficiency scores on the Sight Singing test from the obtained scores on the mean of subtests B + C of the Freshman Placement Theory Examination.--In the following equation X = the earned score on the mean of subtests B + C of the Freshman Placement Theory Examination, and Y = the estimated or predicted proficiency score on the Sight Singing test.

$$Y = 0.56563X + 7.95690$$

The regression equation for predicting proficiency scores on the Keyboard Recognition and Harmony test from the obtained scores on the mean of subtests B + C of the Freshman Placement Theory Examination.--In the following equation X = the earned score on the mean of subtests B + C of the Freshman Placement Theory Examination, and Y = the estimated or predicted proficiency score on the Keyboard Recognition and Harmony test.

$$Y = 0.44918X + 16.61259$$

The regression equation for predicting proficiency scores on the Aural Composite Test from the obtained scores on the mean of subtests B + C of the Freshman Placement Theory Examination.--In the following equation X = the earned score on the mean of subtests B + C of the Freshman Placement Theory Examination, and Y = the estimated or predicted proficiency score on the Aural Composite Test.

$$Y = 1.44335X + 42.65033$$

The regression equation for predicting proficiency scores on the Nonaural Composite Test from the obtained scores on the mean of subtests B + C of the Freshman Placement Theory Examination.--In the following equation X = the earned score on the mean of subtests B + C of the Freshman Placement Theory Examination, and Y = the estimated or predicted proficiency score on the Nonaural Composite Test.

$$Y = 1.06552X + 70.82222$$

The regression equation for predicting proficiency scores on the Total Proficiency Test from the obtained scores on the mean of subtests B + C of the Freshman Placement Theory Examination.--In the following equation X = the earned score on the mean of subtests B + C of the Freshman Placement Theory Examination, and Y = the estimated or predicted proficiency score on the Total Proficiency Test.

$$Y = 3.06147X + 122.20006$$

The regression equation for predicting proficiency scores on the Rhythmic Dictation test from the obtained scores on the total Freshman Placement Theory Examination.--In the following equation X = the earned score on the total Freshman Placement Theory Examination, and Y = the estimated or predicted proficiency score on the Rhythmic Dictation test.

$$Y = 0.45603X + 17.61184$$

The regression equation for predicting proficiency scores on the Melodic Dictation test from the obtained scores on the total Freshman Placement Theory Examination.--In the following equation X = the earned score on the total Freshman Placement Theory Examination, and Y = the estimated or predicted proficiency score on the Melodic Dictation test.

$$Y = 0.42545X + 19.78370$$

The regression equation for predicting proficiency scores on the Harmonic Dictation test from the obtained scores on the total Freshman Placement Theory Examination.--In the following equation X = the earned score on the total Freshman Placement Theory Examination, and Y = the estimated or predicted proficiency score on the Harmonic Dictation test.

$$Y = 0.36896X + 23.79573$$

The regression equation for predicting proficiency scores on the Sight Singing test from the obtained scores on the total Freshman Placement Theory Examination.--In the following equation X = the earned score on the total Freshman Placement Theory Examination, and Y = the estimated or predicted proficiency score on the Sight Singing test.

$$Y = 0.37856X + 23.11392$$

The regression equation for predicting proficiency scores on the Keyboard Recognition and Harmony test from the obtained scores on the total Freshman Placement Theory Examination.--In the following equation X = the earned score on the total Freshman Placement Theory Examination, and Y = the estimated or predicted proficiency score on the Keyboard Recognition and Harmony test.

$$Y = 0.41107X + 20.80499$$

The regression equation for predicting proficiency scores on the Music Fundamentals test from the obtained scores on the total Freshman Placement Theory Examination.--In the following equation X = the earned score on the Freshman Placement Theory Examination, and Y = the estimated or predicted proficiency score on the Music Fundamentals test.

$$Y = 0.40299X + 21.37885$$

The regression equation for predicting proficiency scores on the Aural Composite Test from the obtained scores on the total Freshman Placement Theory Examination.--In the following equation X = the earned score on the total Freshman Placement Theory Examination, and Y = the estimated or predicted proficiency score on the Aural Composite Test.

$$Y = 1.22383X + 63.01525$$

The regression equation for predicting proficiency scores on the Nonaural Composite Test from the obtained scores on the total Freshman Placement Theory Examination.--In the following equation X = the earned score on the total Freshman Placement Theory Examination, and Y = the estimated or predicted proficiency score on the Nonaural Composite Test.

$$Y = 1.12763X + 69.91347$$

The regression equation for predicting proficiency scores on the Total Proficiency Test from the obtained scores on the total Freshman Placement Theory Examination.--In the following equation X = the earned score on the total Freshman Placement Theory Examination, and Y = the estimated or predicted proficiency score on the Total Proficiency Test.

$$Y = 2.72129X + 156.48675$$

The regression equation for predicting proficiency scores on the Rhythmic Dictation test from the obtained scores on the Gordon Index of Musical Insight.--In the following equation X = the earned score on the Gordon Index of Musical Insight, and Y = the estimated or predicted proficiency score on the Rhythmic Dictation test.

$$Y = 0.21268X + 39.16500$$

The regression equation for predicting proficiency scores on the Melodic Dictation test from the obtained scores on the Gordon Index of Musical Insight.--In the following equation X = the earned score on the Gordon Index of Musical Insight, and Y = the estimated or predicted proficiency score on the Melodic Dictation test.

$$Y = 0.21897X + 38.84456$$

The regression equation for predicting proficiency scores on the Sight Singing test from the obtained scores on the Gordon Index of Musical Insight.--In the following equation X = the earned score on the Gordon Index of Musical Insight, and Y = the estimated or predicted proficiency score on the Sight Singing test.

$$Y = 0.19827X + 39.89912$$

The regression equation for predicting proficiency scores on the Keyboard Recognition and Harmony test from the obtained scores on the Gordon Index of Musical Insight.--In the following equation X = the earned score on the Gordon Index of Musical Insight, and Y = the estimated or predicted proficiency score on the Keyboard Recognition and Harmony test.

$$Y = 0.18277X + 40.68877$$

The regression equation for predicting proficiency scores on the Music Fundamentals test from the obtained scores on the Gordon Index of Musical Insight.--In the following equation X = the earned score on the Gordon Index of Musical Insight, and Y = the estimated or predicted proficiency score on the Music Fundamentals test.

$$Y = 0.17559X + 41.05455$$

The regression equation for predicting proficiency scores on the Aural Composite Test from the obtained scores on the Gordon Index of Musical Insight.--In the following equation X = the earned score on the Gordon Index of Musical Insight, and Y = the estimated or predicted proficiency score on the Aural Composite Test.

$$Y = 0.56435X + 121.18324$$

The regression equation for predicting proficiency scores on the Nonaural Composite Test from the obtained scores on the Gordon Index of Musical Insight.--In the following equation X = the earned score on the Gordon Index of Musical Insight, and Y = the estimated or predicted proficiency score on the Nonaural Composite Test.

$$Y = 0.48260X + 125.43590$$

The regression equation for predicting proficiency scores on the Total Proficiency Test from the obtained scores on the Gordon Index of Musical Insight.--In the following equation X = the earned score on the Gordon Index of Musical Insight, and Y = the estimated or predicted proficiency score on the Total Proficiency Test.

$$Y = 1.23922X + 286.62602$$

The regression equation for predicting proficiency scores on the Melodic Dictation test from the obtained scores on the four selected tests of the Kwalwasser-Dykema Music Tests.--In the following equation X = the earned score on the four selected tests of the Kwalwasser-Dykema Music Tests, and Y = the estimated or predicted proficiency score on the Melodic Dictation test.

$$Y = 1.26070X - 53.34966$$

The regression equation for predicting proficiency scores on the Harmonic Dictation test from the obtained scores on the four selected tests of the Kwalwasser-Dykema Music Tests.--In the following equation X = the earned score on the four selected tests of the Kwalwasser-Dykema Music Tests, and Y = the estimated or predicted proficiency score on the Harmonic Dictation test.

$$Y = 0.95827X - 28.55705$$

The regression equation for predicting proficiency scores on the Sight Singing test from the obtained scores on the four selected tests of the Kwalwasser-Dykema Music Tests.--In the following equation X = the earned score on the four selected tests of the Kwalwasser-Dykema Music Tests, and Y = the estimated or predicted proficiency score on the Sight Singing test.

$$Y = 1.30975X - 57.37068$$

The regression equation for predicting proficiency scores on the Aural Composite Test from the obtained scores on the four selected tests of the Kwalwasser-Dykema Music Tests.--In the following equation X = the earned score on the four selected tests of the Kwalwasser-Dykema Music Tests, and Y = the estimated or predicted proficiency score on the Aural Composite Test.

$$Y = 2.87539X - 85.78462$$

The regression equation for predicting proficiency scores on the Total Proficiency Test from the obtained scores on the four selected tests of the Kwalwasser-Dykema Music Tests.--In the following equation X = the earned score on the four selected tests of the Kwalwasser-Dykema Music Tests, and Y = the estimated or predicted proficiency score on the Total Proficiency Test.

$$Y = 6.04368X - 145.69059$$

The regression equation for predicting proficiency scores on the Melodic Dictation test from the obtained scores on the first three subtests of the Wing Standardised Tests of Musical Intelligence.--In the following equation X = the earned score on the first three subtests of the Wing Standardised Tests of Musical Intelligence, and Y = the estimated or predicted proficiency score on the Melodic Dictation test.

$$Y = 0.97655X - 10.04171$$

The regression equation for predicting proficiency scores on the Harmonic Dictation test from the obtained scores on the first three subtests of the Wing Standardised Tests of Musical Intelligence.--In the following equation X = the earned score on the first three subtests of the Wing Standardised Tests of Musical Intelligence, and Y = the estimated or predicted proficiency score on the Harmonic Dictation test.

$$Y = 0.77072X + 2.61344$$

The regression equation for predicting proficiency scores on the Sight Singing test from the obtained scores on the first three subtests of the Wing Standardised Tests of Musical Intelligence.--In the following equation X = the earned score on the first three subtests of the Wing Standardised Tests of Musical Intelligence, and Y = the estimated or predicted proficiency score on the Sight Singing test.

$$Y = 0.99454X - 11.14780$$

The regression equation for predicting proficiency scores on the Aural Composite Test from the obtained scores on the first three subtests of the Wing Standardised Tests of Musical Intelligence.--In the following equation X = the earned score on the first three subtests of the Wing Standardised Tests of Musical Intelligence, and Y = the estimated or predicted proficiency score on the Aural Composite Test.

$$Y = 2.29393X + 8.89526$$

The regression equation for predicting proficiency scores on the Total Proficiency Test from the obtained scores on the first three subtests of the Wing Standardised Tests of Musical Intelligence.--In the following equation X = the earned score on the first three subtests of the Wing Standardised Tests of Musical Intelligence, and Y = the estimated or predicted proficiency score on the Total Proficiency Test.

$$Y = 4.26575X + 87.48496$$

The regression equation for predicting proficiency scores on the Melodic Dictation test from the obtained scores on the total Wing Standardised Tests of Musical Intelligence.--In the following equation X = the earned score on the total Wing Standardised Tests of Musical Intelligence, and Y = the estimated or predicted proficiency score on the Melodic Dictation test.

$$Y = 0.68561X - 14.96716$$

The regression equation for predicting proficiency scores on the Harmonic Dictation test from the obtained scores on the total Wing Standardised Tests of Musical Intelligence.--In the following equation X = the earned score on the total Wing Standardised Tests of Musical Intelligence, and Y = the estimated or predicted proficiency score on the Harmonic Dictation test.

$$Y = 0.57020X - 4.03112$$

The regression equation for predicting proficiency scores on the Sight Singing test from the obtained scores on the total Wing Standardised Tests of Musical Intelligence.--In the following equation X = the earned score on the total Wing Standardised Tests of Musical Intelligence, and Y = the estimated or predicted proficiency score on the Sight Singing test.

$$Y = 0.69349X - 15.71386$$

The regression equation for predicting proficiency scores on the Aural Composite Test from the obtained scores on the total Wing Standardised Tests of Musical Intelligence.--In the following equation X = the earned score on the total Wing Standardised Tests of Musical Intelligence, and Y = the estimated or predicted proficiency score on the Aural Composite Test.

$$Y = 1.66707X - 8.03445$$

The regression equation for predicting proficiency scores on the Total Proficiency Test from the obtained scores on the total Wing Standardised Tests of Musical Intelligence.--In the following equation X = the earned score on the total Wing Standardised Tests of Musical Intelligence, and Y = the estimated or predicted proficiency score on the Total Proficiency Test.

$$Y = 3.20509X + 46.04965$$

The multiple regression equation for predicting proficiency scores on the Total Proficiency Test from the obtained scores on the battery of six predictor tests selected by the Wherry-Doolittle method.--In the following equation X_1 = the earned score on the total Freshman Placement Theory Examination, X_2 = the earned score on the Gordon Index of Musical Insight, X_3 = the earned score on the four selected tests of the Kwalwasser-Dykema Music Tests, X_4 = the earned score on the "Rhythm" tests of the Drake Musical

Aptitude Tests, X_5 = the earned score on the Otis Quick-Scoring Mental Ability Tests, X_6 = the earned score on the total Wing Standardised Tests of Musical Intelligence, and Y = the estimated or predicted proficiency score on the Total Proficiency Test.

$$Y = 1.3788X_1 + 0.4439X_2 + 1.7546X_3 - 0.2927X_4 + 0.7154X_5 + 0.8584X_6 - 66.8508$$

The equation is solved for Y by multiplying the scores earned on the indicated tests by the respective regression coefficients (the numerals preceding each X) and algebraically summing the products and the regression constant (the last numeral in the equation).

The beta coefficients from which the regression coefficients (score or b weights) were derived are as follows: +0.3931 total Freshman Placement Theory Examination; +0.2467 Gordon Index of Musical Insight; +0.1862 four selected tests of the Kwalwasser-Dykema Music Tests; -0.1400 "Rhythm" tests of the Drake Musical Aptitude Tests; +0.1344 Otis Quick-Scoring Mental Ability Tests; and +0.1737 total Wing Standardised Tests of Musical Intelligence.

The multiple regression equation for predicting proficiency scores on the Total Proficiency Test from the obtained scores on the battery of five predictor tests selected by the Wherry-Doolittle method.--In the following equation X_1 = the earned score on the Gordon Index of

Musical Insight, X_2 = the earned score on the total Wing Standardised Tests of Musical Intelligence, X_3 = the earned score on the four selected tests of the Kwalwasser-Dykema Music Tests, X_4 = the earned score on the Otis Quick-Scoring Mental Ability Tests, X_5 = the earned score on the "Rhythm" tests of the Drake Musical Aptitude Tests, and Y = the estimated or predicted proficiency score on the Total Proficiency Test.

$$Y = 0.6864X_1 + 1.3864X_2 + 2.3930X_3 + 0.9553X_4 - 0.2950X_5 - 110.7577$$

The equation is solved for Y by multiplying the scores earned on the indicated tests by the respective regression coefficients (the numerals preceding each X) and algebraically summing the products and the regression constant (the last numeral in the equation).

The beta coefficients from which the regression coefficients (score or b weights) were derived are as follows: +0.3815 Gordon Index of Musical Insight; +0.2805 total Wing Standardised Tests of Musical Intelligence; +0.2540 four selected tests of the Kwalwasser-Dykema Music Tests; +0.1795 Otis Quick-Scoring Mental Ability Tests; and -0.1411 "Rhythm" tests of the Drake Musical Aptitude Tests.

The Accuracy of Prediction

The accuracy of prediction from the regression equations reported in the preceding section of this study

may be ascertained by means of the standard error of estimate. The standard error of estimate for each regression equation provided is given in Table X.

The standard error of estimate provided for the prediction of proficiency scores from satisfactory predictor test scores should be interpreted as the standard deviation of the predicted scores (Y scores) for each regression equation. The values reported in the table are expressed in units of the Y or proficiency score scales. The standard error of estimate added to and subtracted from a Y score predicted from a given X score provides the upper and lower limits of a score range that would include 68.26 cases out of one hundred predictions of that Y value from the given X. The accuracy and usefulness of a predicted Y score, an estimated proficiency score, should be interpreted in terms of the magnitude of the standard error of estimate in relation to the Y score scale.

Not all values in Table X may be compared to each other. The values, in some cases, are in terms of different score scales; however, certain comparisons are possible. For each individual set of proficiency scores there is only one score scale. Since the score scale of the Aural Composite Test, for example, is always the same regardless of the predictor test selected to estimate Aural Composite Test scores, all of the values for this test may be compared;

TABLE X

THE STANDARD ERROR OF ESTIMATE FOR THE PREDICTION OF PROFICIENCY SCORES IN COLLEGIATE MUSIC THEORY FROM SATISFACTORY PREDICTOR TEST SCORES

Tests*	A	B	C	D	E	F	G	H	J	K
1	7.766	. . .	. . .	. . .	. . .	. . .	7.924	20.3009	19.6338	40.9444
2	8.417	6.131	7.766	6.614	. . .	8.000	. . .	15.4629	20.3573	32.6574
3	7.332	7.766	8.352	8.285	. . .	7.924	8.000	16.6193	18.1669	32.6574
4	7.846	7.684	. . .	8.146	. . .	8.480	8.602	18.5639	20.5282	37.7716
5	. . .	7.141	8.480	6.834	. . .	. . .	. . .	18.9864	. . .	40.0990
6	. . .	7.042	8.285	6.940	. . .	. . .	. . .	18.1166	. . .	41.7481
7	. . .	6.940	8.000	6.834	. . .	. . .	. . .	17.4001	. . .	39.6555
8	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	25.7325
9	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	29.1088

*List of Tests (N = 91)

1. "Fundamentals," Freshman Placement Theory Examination
2. B + C, Freshman Placement Theory Examination
3. Total Freshman Placement Theory Examination
4. Gordon Index of Musical Insight
5. Four selected tests, Kwalwasser-Dykema Music Tests
6. Selected tests, Wing Standardised Tests of Musical Intelligence
7. Total Wing Standardised Tests of Musical Intelligence
8. Multiple Battery of Six Tests
9. Multiple Battery of Five Tests

A. Rhythmic Dictation
B. Melodic Dictation
C. Harmonic Dictation
D. Sight Singing
E. Part-Writing
F. Keyboard Recognition and Harmony
G. Music Fundamentals
H. Aural Composite Test
J. Nonaural Composite Test
K. Total Proficiency Test

the predictor test which provides the smallest standard error of estimate may be selected to provide the most accurate estimation of scores for that proficiency test. Since all of the scores on the individual proficiency tests were reported as T-scores, all of the values in Table X may be compared directly to each other except those for the two composite proficiency tests and the total proficiency test.

Another method of interpreting the usefulness of the regression equations in terms of the accuracy of prediction employs E, the coefficient of forecasting efficiency. Table XI presents the values of E expressed as percentages.

The value of E is a measure of the predictive efficiency of an obtained r. It represents the extent of the improvement of prediction based on a given value of r over a prediction based on only a knowledge of the Y or predicted score distribution. Where r = 0, the best forecast of Y is the mean of the Y distribution, and the standard error of estimate is the standard deviation of the Y distribution. As the value of r increases, the accuracy of prediction improves. The amount of the improvement based on r = 0 for the tests predicted in this study is expressed as a percentage gain in Table XI. E provides a quick estimate of the usefulness of the predictor tests. All of the E values may be compared directly. A study of Table XI reveals

TABLE XI

THE PREDICTIVE EFFICIENCY OF SATISFACTORY PREDICTOR TEST SCORES FOR ESTIMATING PROFICIENCY SCORES IN COLLEGIATE MUSIC THEORY

Tests*	A	B	C	D	E	F	G	H	J	K
1	22.34%	. . .	. . .	. . .	. . .	. . .	20.76%	17.84%	20.76%	21.54%
2	15.83%	38.69%	22.34%	33.86%	. . .	20.00%	. . .	37.42%	17.84%	37.42%
3	26.68%	22.34%	16.48%	17.15%	. . .	20.76%	20.00%	32.74%	26.68%	37.42%
4	21.54%	23.16%	. . .	18.54%	. . .	15.20%	13.98%	24.87%	17.15%	27.62%
5	. . .	28.59%	15.20%	31.66%	. . .	. . .	. . .	23.16%	. . .	23.16%
6	. . .	29.58%	17.15%	30.60%	. . .	. . .	. . .	26.68%	. . .	20.00%
7	. . .	30.60%	20.00%	31.66%	. . .	. . .	. . .	29.58%	. . .	24.01%
8	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	50.69%
9	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	44.22%

*List of Tests (N = 91)

1. "Fundamentals," Freshman Placement Theory Examination
2. B + C, Freshman Placement Theory Examination
3. Total Freshman Placement Theory Examination
4. Gordon Index of Musical Insight
5. Four selected tests, Kwalwasser-Dykema Music Tests
6. Selected tests, Wing Standardised Tests of Musical Intelligence
7. Total Wing Standardised Tests of Musical Intelligence
8. Multiple Battery of Six Tests
9. Multiple Battery of Five Tests

A. Rhythmic Dictation
B. Melodic Dictation
C. Harmonic Dictation
D. Sight Singing
E. Part-Writing
F. Keyboard Recognition and Harmony
G. Music Fundamentals
H. Aural Composite Test
J. Nonaural Composite Test
K. Total Proficiency Test

that values of r must be very high to provide the accuracy desired for the prediction of individual scores.

The Conversion of Proficiency Scores to Percentile Ranks

The interpretation of proficiency test scores is facilitated by the conversion of these scores to percentile ranks. The composite and total proficiency scores are abstract values which possess no particular mathematical properties useful in interpreting the scores. The proficiency scores on the individual proficiency tests are normalized T-scores which do possess mathematical properties useful in interpreting the scores.

Because of the widespread use and the easy interpretation of percentile ranks, this scale was selected for use in this study. The use of percentile rank scores provides a common score scale for the direct comparison of performances on the single, composite, or total proficiency tests for either individuals or groups.

The interpretation of proficiency scores in terms of course marks in collegiate music theory was not attempted in the present study. The factors which affected course grades were not isolated in this study; therefore, the contribution of proficiency in handling the subject matter content of collegiate music theory courses to the course marks received by theory students could not be determined. Although this type of information could be useful, a simple interpretation

of proficiency scores in terms of course grades in collegiate music theory was not realistic or practical for the present study. The proficiency tests were measures of specific performance, not omnibus measures of general success in completing collegiate music theory courses.

The frequent lack of agreement between prognostic measures such as those employed in this study and actual course marks is well known. According to Kwalwasser (1), under normal conditions achievement and talent are comparable and bear approximately a one-to-one positive relationship to each other, but under certain conditions an inverse, negative relationship may exist. A disinterested but talented individual may achieve very little; or a person with poor or mediocre ability--with the aid of superior instruction, strong work habits, and the will to learn--may achieve at a fairly good level. The drive or will to learn mentioned by Kwalwasser was also mentioned as an important factor in achievement by Schoen (2, p. 151). Since this factor of drive was not measured in this study, grades were not employed as interpretative devices.

Figure 1 may be used for converting the normalized T-scores on the proficiency tests of Rhythmic Dictation, Melodic Dictation, Harmonic Dictation, Sight Singing, Keyboard Recognition and Harmony, Part-Writing, and Music Fundamentals to percentile ranks. A predicted score on

these proficiency tests may be converted to a percentile rank by locating on the ogive the point directly above the predicted T-score and reading the percentile rank value that coincides with that intersection.

Figure 2 may be used for converting Aural Composite Test scores to percentile ranks. A predicted Aural Composite Test score may be converted to a percentile rank by locating on the ogive the point directly above the predicted score and reading the percentile rank value that coincides with that intersection.

Figure 3 may be used for converting Nonaural Composite Test scores to percentile ranks. A predicted Nonaural Composite Test score may be converted to a percentile rank by locating on the ogive the point directly above the predicted score and reading the percentile rank value that coincides with that intersection.

Figure 4 may be used for converting Total Proficiency Test scores to percentile ranks. A predicted Total Proficiency Test score may be converted to a percentile rank by locating on the ogive the point directly above the predicted score and reading the percentile rank value that coincides with that intersection.

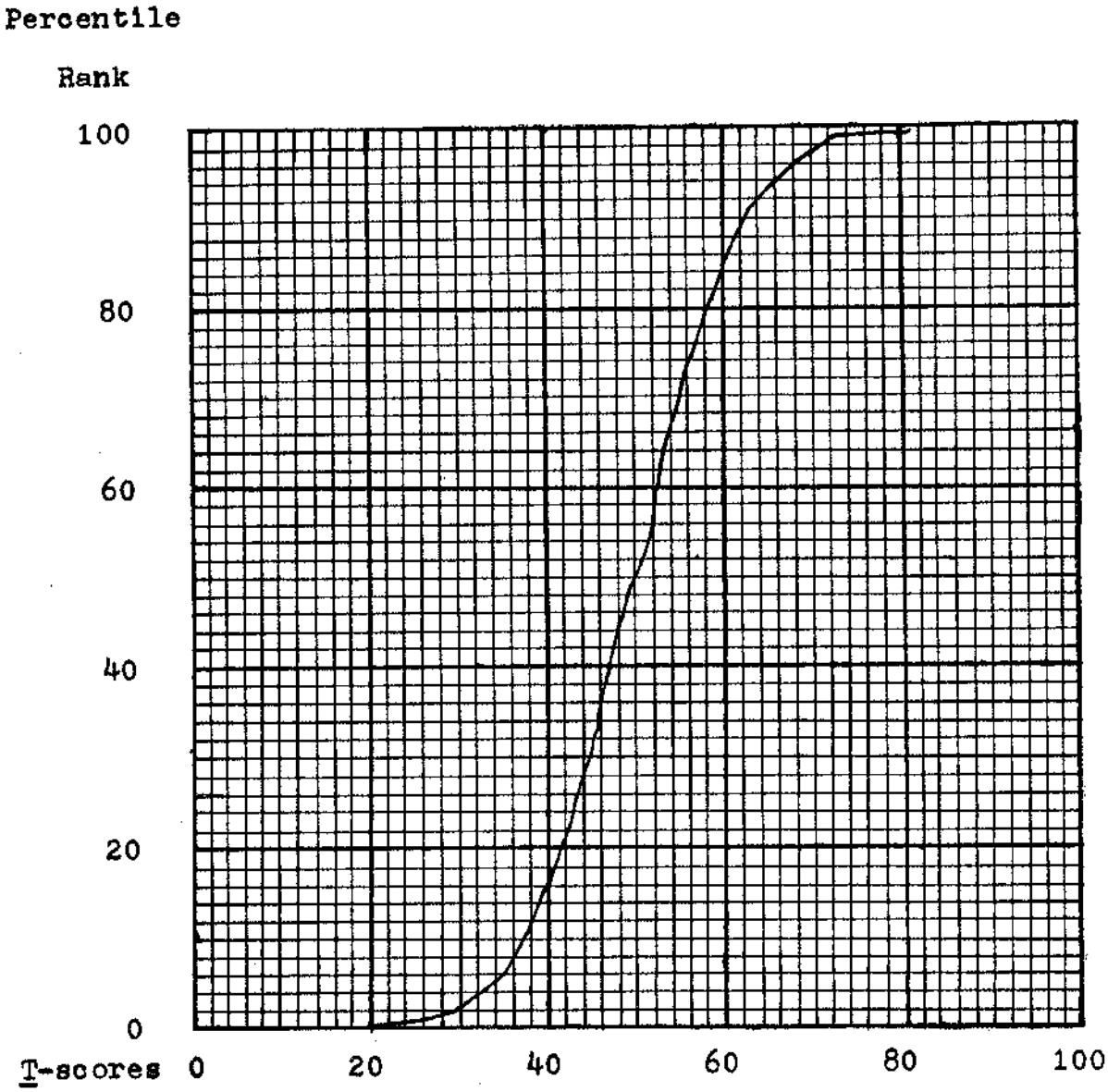


Fig. 1--Ogive for converting normalized T-scores on the tests of Rhythmic Dictation, Melodic Dictation, Harmonic Dictation, Sight Singing, Keyboard Recognition and Harmony, Part-Writing, and Music Fundamentals to percentile ranks.

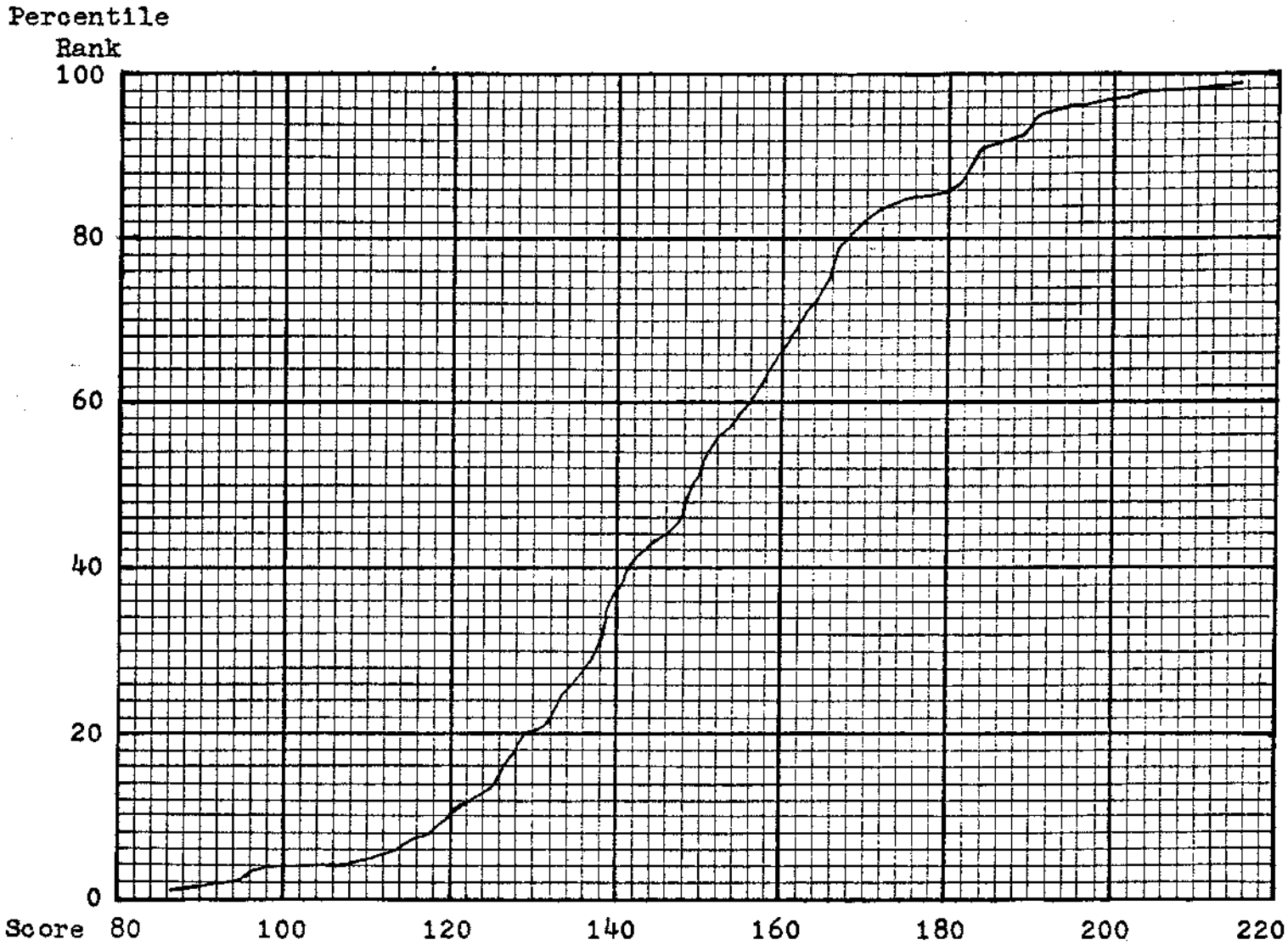


Fig. 2--Ogive for converting the Aural Composite Test scores to percentile ranks

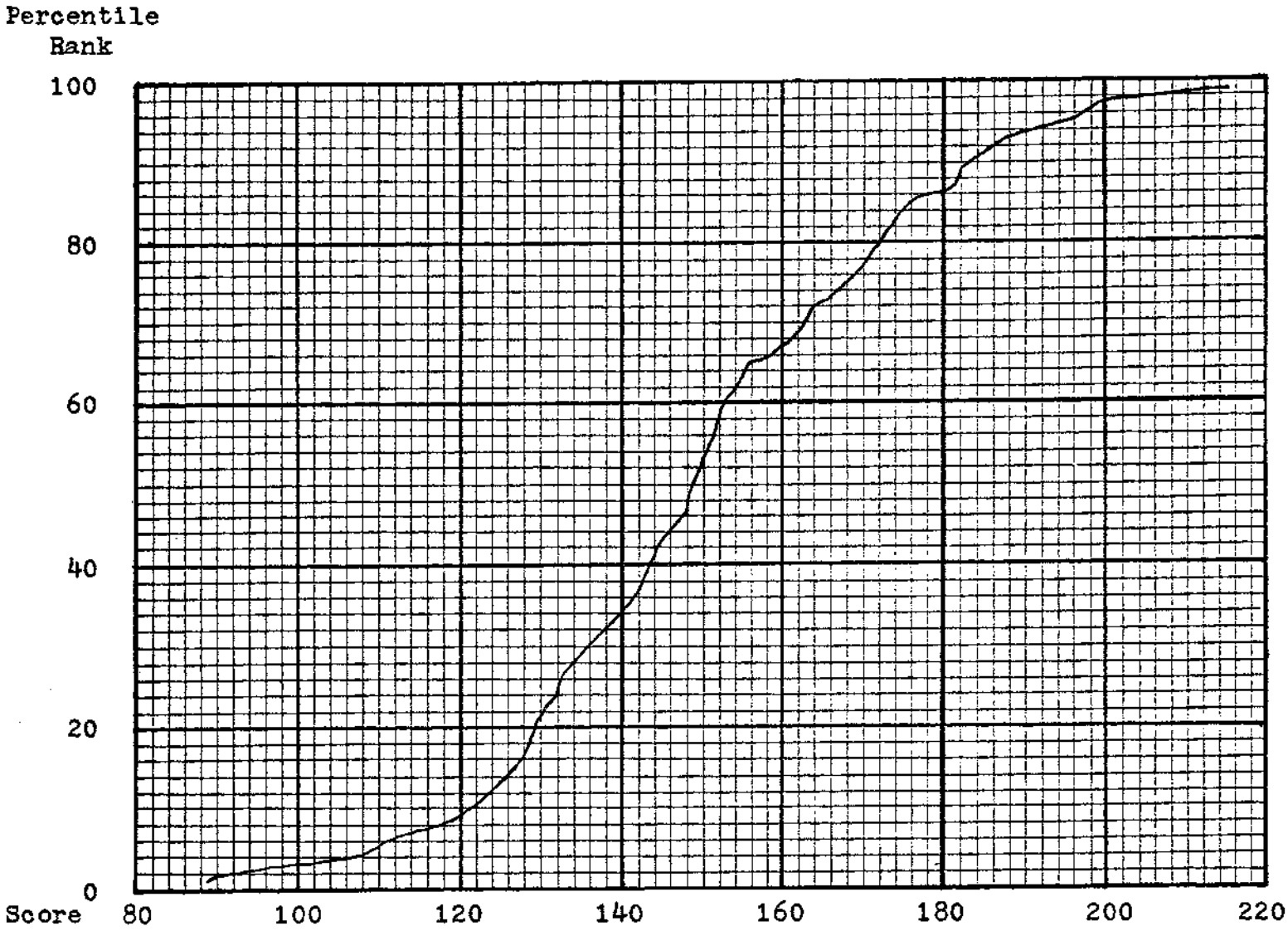


Fig. 3--Ogive for converting the Nonaural Composite Test scores to percentile ranks

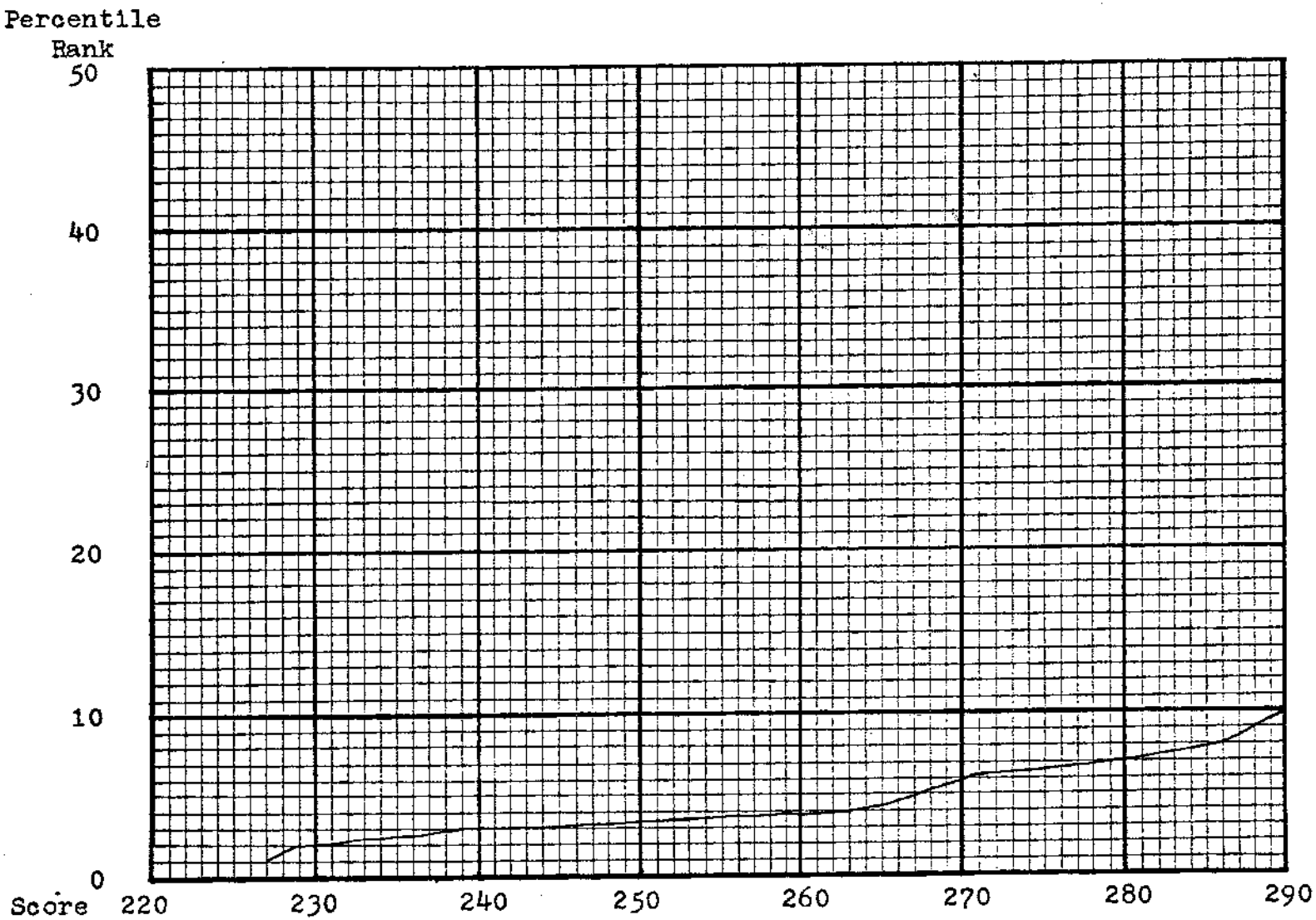


Fig. 4--Ogive for converting Total Proficiency Test scores to percentile ranks

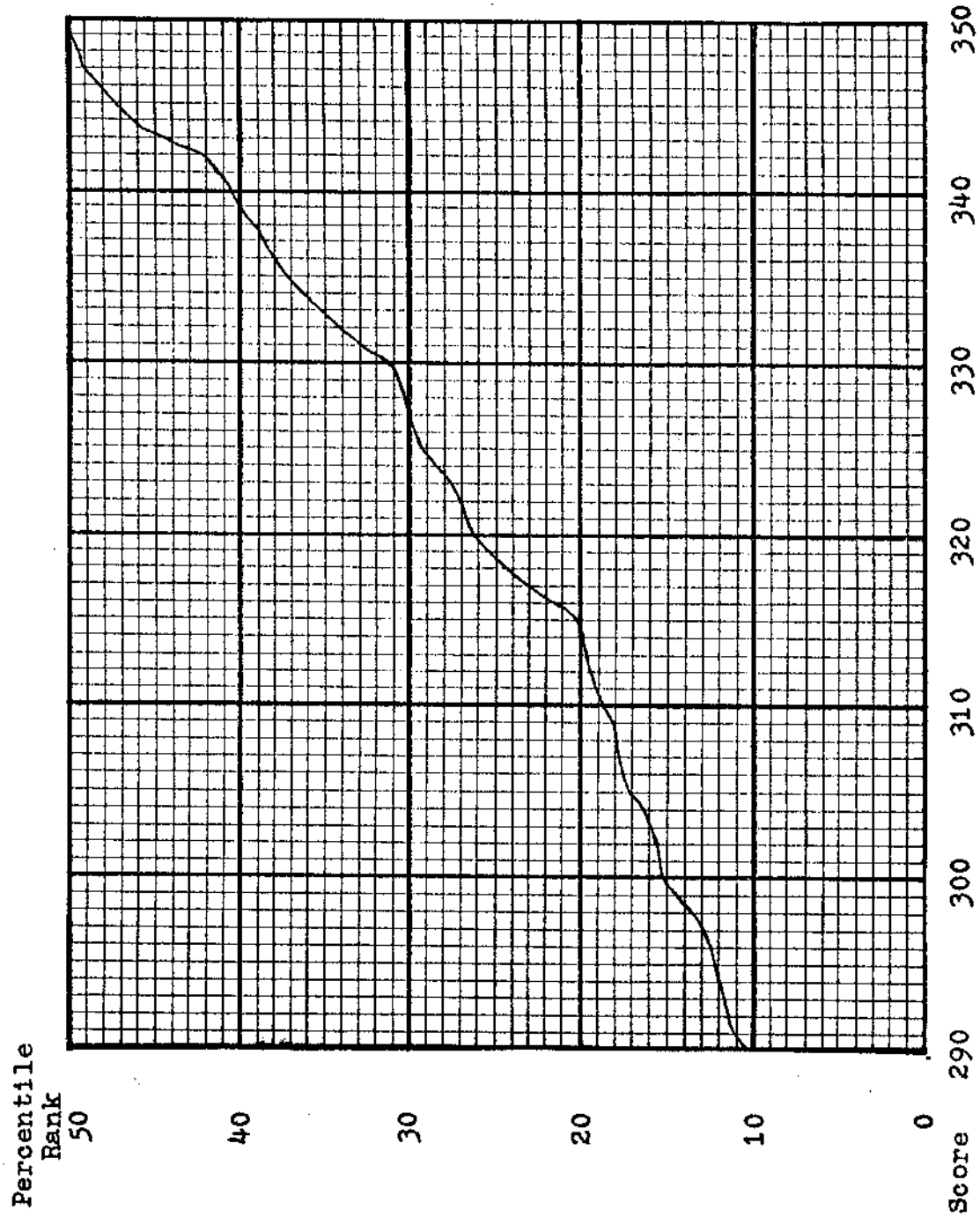


Fig. 4--Continued

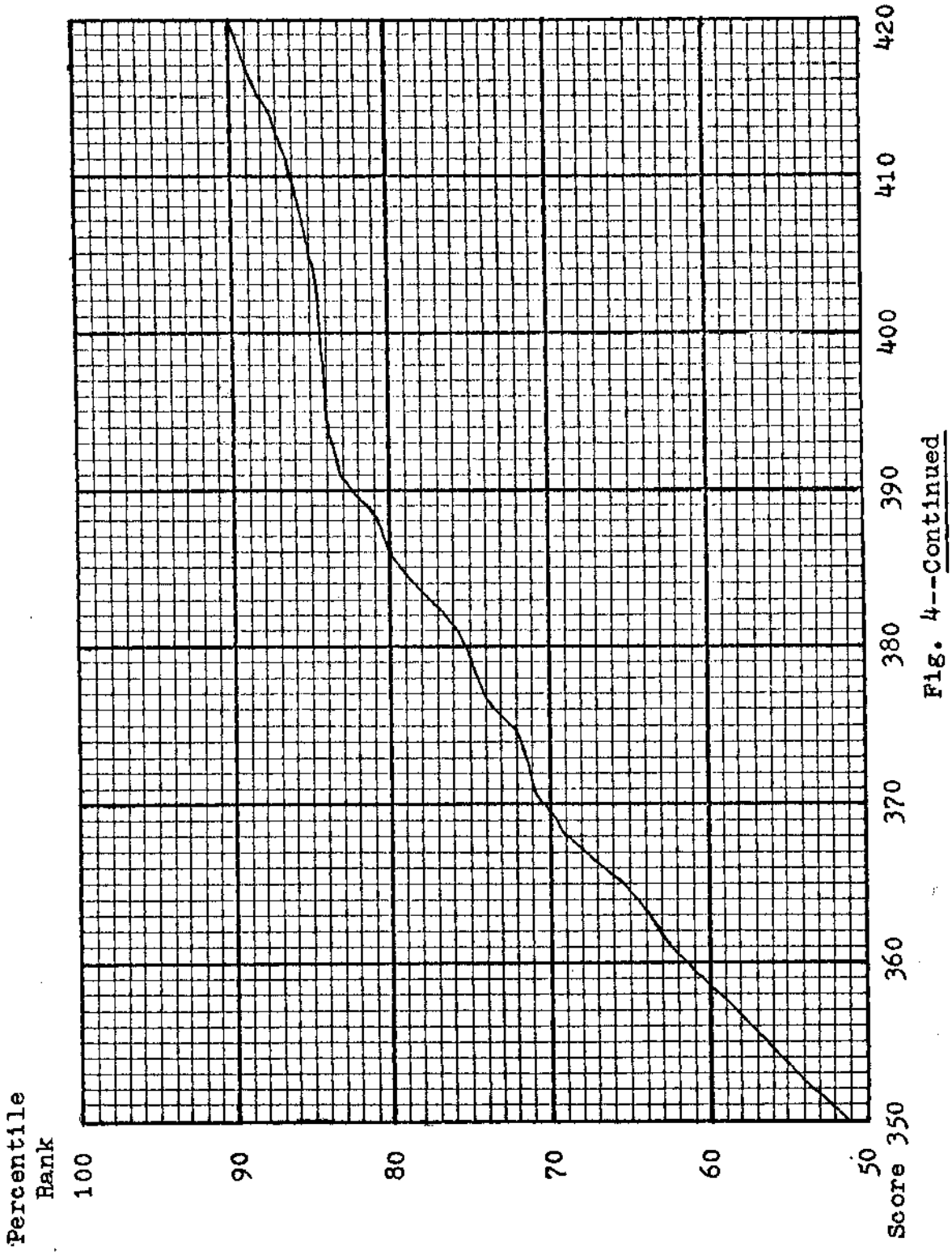


Fig. 4--Continued

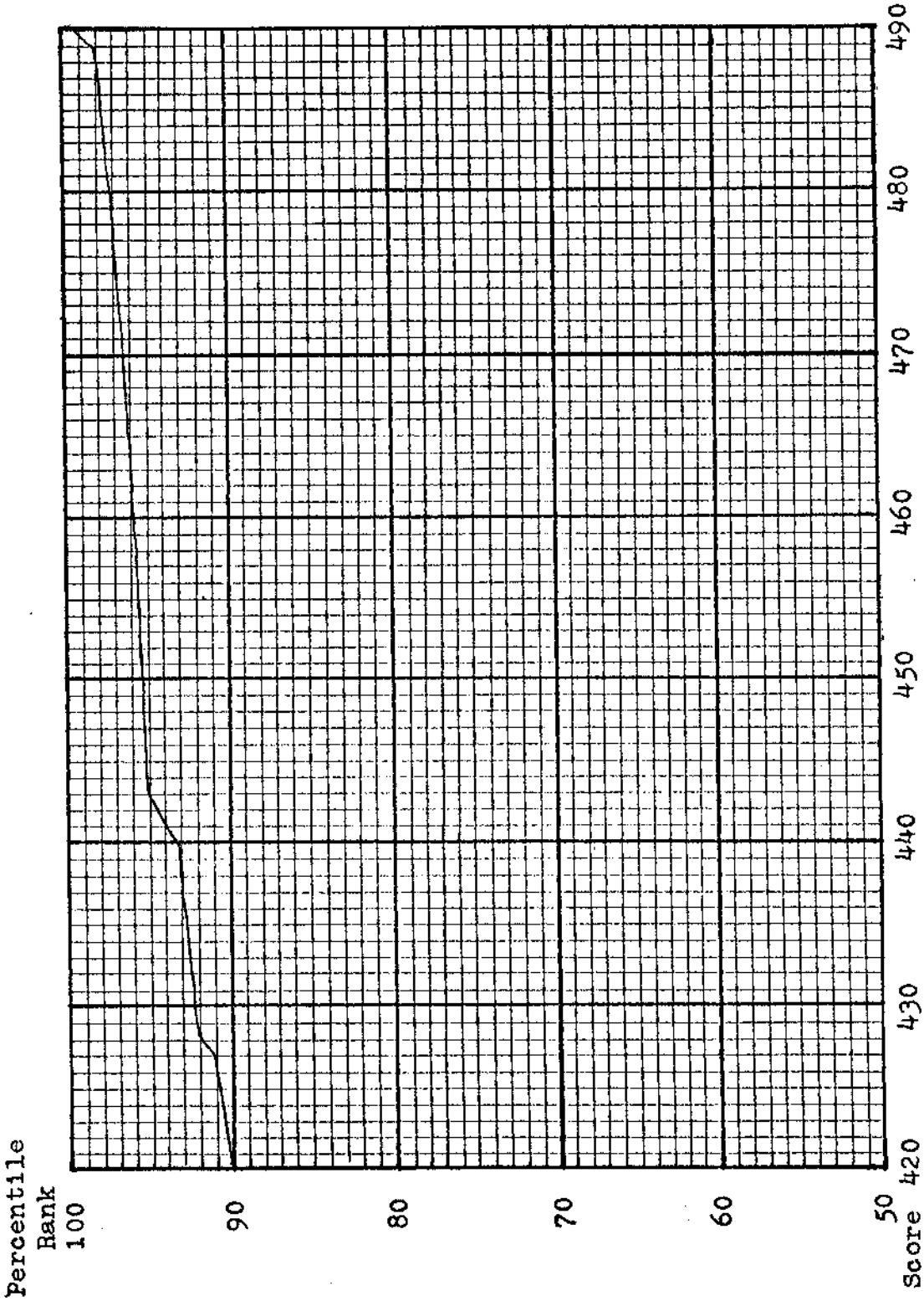


Fig. 4--Continued

The accuracy of prediction from a regression equation may be expressed as the range between certain upper and lower percentile ranks by the use of the standard error of estimate. The upper and lower percentile ranks which may be converted from the predicted score $\pm$ the standard error of estimate identify the limits on the percentile rank scale within which 68.26 cases out of one hundred predictions of that particular score actually will fall. A prediction and the accuracy of that prediction may be stated with great simplicity by the use of the conversion ogives.

CHAPTER BIBLIOGRAPHY

1. Kwalwasser, Jacob, Exploring the Musical Mind, New York, Coleman-Ross Company, 1955.

2. Schoen, Max, The Psychology of Music, New York, The Ronald Press Company, 1940.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The Problem and the Design of the Study

The problem in this study may be stated as an analysis of the prognostic capability of scores on selected tests for the prediction of proficiency in music theory at the collegiate freshman level. The purpose of the study was to compare certain tests as predictors of collegiate music theory proficiency scores. The subordinate purposes of the investigation were to ascertain the degrees of relationships between the scores on the selected criterion and scores on certain tests selected for investigation, to ascertain the degrees of interrelationships among scores on the predictor tests, and to ascertain which weighted combination of scores on selected predictor tests provides the optimum prediction of the criterion.

The study was undertaken to determine empirically for the selected criterion the prognostic validity of certain tests used both singly and collectively. Single tests or weighted combinations of selected tests identified as satisfactory predictors of proficiency in collegiate music theory may be used at the college level for the purposes of guiding,

counseling, placing, selecting, or grouping students on the basis of anticipated levels of performance in collegiate music theory courses.

The data for the study were secured through a testing program involving ninety-one freshmen music majors enrolled in music theory courses in the School of Music at North Texas State University during the 1961-1962 academic year. The predictor tests selected for investigation were administered to the individuals in the population studied at the time the students began their first semester of college work. Proficiency examinations based on music theory course content were administered to those same individuals as they concluded their first pair of semester-length courses in collegiate music theory. The value of the Pearson product-moment correlation coefficient was computed for all pairs of test variables, and the Wherry-Doolittle test selection method was employed in the multiple correlation analysis.

The basic hypothesis of the study was that scores on the selected predictor tests, when the tests are used both singly and collectively, are satisfactory predictors of collegiate music theory proficiency scores. An *a priori* correlation value of +0.60 was set as the minimum level for satisfactory individual prediction of proficiency scores. The obtained correlations in the study were compared to the *a priori* value for hypothesis testing.

The study was limited to the problem stated previously. The predictive capabilities of the selected tests were determined only for music theory proficiency scores, and no attempt was made to generalize those relationships to include other aspects of academic or musical achievements.

Because of screening and grouping procedures employed at North Texas State University, the data for the study were gathered over a period of two semesters from students whose college music programs varied. In keeping with this limitation, conclusions based on the findings of this investigation were not projected to populations or situations dissimilar to those described in the study.

Results

The results based on the findings of the investigation and within the scope and limitations of the study are reported below.

Hypothesis 1.--Scores on the Drake "Musical Memory" test are satisfactory predictors of collegiate music theory proficiency scores.

This was found to be not true. The hypothesis was rejected. Negligible to marked positive relationships were found to exist between scores on this test and scores on the seven subtests, scores on the aural and nonaural subtest combinations, and total scores of the proficiency battery, but the relationships were not high enough for use in making

individual predictions. The relationship $\underline{r}$ = +0.39 was obtained between scores on this test and total proficiency scores.

Hypothesis 2.--Scores on the Drake "Rhythm" test are satisfactory predictors of collegiate music theory proficiency scores.

This was found to be not true. The hypothesis was rejected. Negligible positive and negative relationships were found to exist between scores on this test and scores on the seven subtests, scores on the aural and nonaural subtest combinations, and total scores of the proficiency battery. No relationships between this test and proficiency tests were high enough for use in making individual predictions. This was the only predictor test negatively related to any of the proficiency tests. The relationship $\underline{r}$ = -0.03 was obtained between scores on this test and total proficiency scores. This $\underline{r}$ is not significantly different from zero.

This test was selected by the Wherry-Doolittle process for inclusion in the two batteries which provide satisfactory prediction of the criterion. The contribution of this test was negligible in both multiple batteries.

Hypothesis 3.--Scores on the Freshman Placement Theory Examination are satisfactory predictors of collegiate music theory proficiency scores.

This was found to be true. The hypothesis was accepted. Marked to very high positive relationships were found to exist between total scores on this test and scores on the seven subtests, scores on the aural and nonaural subtest combinations, and total scores of the proficiency battery. The relationships between total scores on this test and scores on the proficiency tests were high enough, except for the subtest of Part-Writing, for use in making individual predictions. The relationship r = +0.78 was obtained between total scores on this test and total proficiency scores.

Mean scores on subtests B + C of the Freshman Placement Theory Examination provided the highest correlation with the total proficiency scores. Marked to very high positive relationships were found to exist between mean scores of subtests B + C and scores on the seven subtests, scores on the aural and nonaural subtest combinations, and total scores of the proficiency battery. The relationships between mean scores of subtests B + C on this test and scores on the proficiency tests were high enough, except for the subtests of Music Fundamentals and Part-Writing, for use in making individual predictions. The relationship r = +0.78 was obtained between mean scores on subtests B + C and total proficiency scores.

Slight to marked positive relationships were found to exist between scores on subtest A of the Freshman Placement

Theory Examination and scores on the seven subtests, scores on the aural and nonaural subtest combinations, and total scores of the proficiency battery. The relationships between scores on subtest A and scores on the proficiency tests were high enough except for the subtests of Sight Singing, Keyboard Recognition and Harmony, Part-Writing, Melodic Dictation, and Harmonic Dictation, for use in making individual predictions. The relationship r = +0.62 was obtained between scores on subtest A and total proficiency scores.

Hypothesis 4.--Scores on the Gordon Index of Musical Insight are satisfactory predictors of collegiate music theory proficiency scores.

This was found to be true. The hypothesis was accepted. Slight to marked positive relationships were found to exist between scores on this test and scores on the seven subtests, scores on the aural and nonaural subtest combinations, and total scores of the proficiency battery. The relationships between scores on this test and scores on the proficiency tests were high enough, except for the subtests of Part-Writing and Harmonic Dictation, for use in making individual predictions. The relationship r = +0.69 was obtained between scores on this test and total proficiency scores.

Hypothesis 5.--Scores on the Kwalwasser-Dykema Music Tests of "Pitch Imagery," "Rhythm Discrimination," "Rhythm

Imagery," and "Tonal Memory" when summed to form a single total score for each individual are satisfactory predictors of collegiate music theory proficiency scores.

This was found to be true. The hypothesis was accepted. Slight to very high positive relationships were found to exist between summed total scores on these tests and scores on the seven subtests, scores on the aural and nonaural subtest combinations, and total scores of the proficiency battery. The relationships between summed total scores on these tests and scores on the proficiency tests were high enough, except for the subtests of Keyboard Recognition and Harmony, Music Fundamentals, Part-Writing, and Rhythmic Dictation and the nonaural subtest combination, for use in making individual predictions. The relationship $\underline{r} = +0.64$ was obtained between summed total scores on this battery and total proficiency scores.

Hypothesis 6.--Scores on the Otis Quick-Scoring Mental Ability Tests are satisfactory predictors of collegiate music theory proficiency scores.

This was found to be not true. The hypothesis was rejected. Slight to marked positive relationships were found to exist between scores on this test and scores on the seven subtests, scores on the aural and nonaural subtest combinations, and total scores of the proficiency battery. The relationships between scores on this test and scores on

the proficiency tests were not high enough for use in making individual predictions. The relationship r = +0.47 was obtained between scores on this test and total proficiency scores.

This test was selected by the Wherry-Doolittle process for inclusion in the two batteries which provide satisfactory prediction of the criterion. The contribution of this test was negligible in both multiple batteries.

Hypothesis 7.--Scores on the Wing Standardised Tests of Musical Intelligence are satisfactory predictors of collegiate music theory proficiency scores.

This was found to be true. The hypothesis was accepted. Negligible to very high positive relationships were found to exist between total scores on this test and scores on the seven subtests, scores on the aural and nonaural subtest combinations, and total scores of the proficiency battery. The relationships between total scores on this test and scores on the proficiency tests were high enough, except for the subtests of Keyboard Recognition and Harmony, Music Fundamentals, Part-Writing, and Rhythmic Dictation and the nonaural subtest combination, for use in making individual predictions. The relationship r = +0.65 was obtained between total scores on this test and total proficiency scores.

Negligible to very high positive relationships were found to exist between scores on the combined first three subtests of the Wing Standardised Tests of Musical Intelligence and scores on the seven subtests, scores on the aural and nonaural subtest combinations, and total scores of the proficiency battery. The relationships between scores on the combined first three subtests of this battery and scores on the proficiency tests were high enough, except for the subtests of Keyboard Recognition and Harmony, Music Fundamentals, Part-Writing, and Rhythmic Dictation and the nonaural subtest combination, for use in making individual predictions. The relationship $r = +0.60$ was obtained between scores on the combined first three subtests of this battery and total proficiency scores.

Hypothesis 8.--Scores on the various predictor tests when selected and combined to yield the maximum obtainable accuracy of prediction are satisfactory predictors of collegiate music theory proficiency scores.

This was found to be true. The hypothesis was accepted. The Wherry-Doolittle process using all predictor tests and employing the total proficiency score as the criterion selected six of the proficiency tests in order to provide the optimum prediction of the criterion. The only test not selected for use in the multiple battery was the Drake "Musical Memory" test. The relationship $R = +0.88$ was

obtained between scores on this selected group of predictor tests and total proficiency scores.

The unavailable Freshman Placement Theory Examination was deleted from the predictor battery, and another Wherry-Doolittle regression analysis was made using the remaining predictor tests. This was done since the Freshman Placement Theory Examination is not available for use except at North Texas State University. In this case, the hypothesis was found also to be true. The hypothesis was accepted for a second predictor battery. The Wherry-Doolittle process using the predictor tests and employing the total proficiency score as the criterion selected five of the proficiency tests in order to provide the optimum prediction of the criterion when the Freshman Placement Theory Examination was deleted from the predictor battery. The test not selected for use in the multiple battery was the Drake "Musical Memory" test. The relationship $R = +0.83$ was obtained between scores on this second selected group of predictor tests and total proficiency scores.

Conclusions

Based on the findings of this investigation, the following conclusions within the scope and limitations of the study were drawn:

1. Where there is a need for reasonably accurate individual estimations of proficiency scores in collegiate music

theory, a battery of tests consisting of the Freshman Placement Theory Examination, the Gordon Index of Musical Insight, the combined four subtests of "Pitch Imagery," "Rhythm Discrimination," "Rhythm Imagery," and "Tonal Memory" of the Kwalwasser-Dykema Music Tests, both "Rhythm" tests of the Drake Musical Aptitude Tests, the Otis Quick-Scoring Mental Ability Tests, and the Wing Standardised Tests of Musical Intelligence will provide the optimum accuracy of prediction obtainable from the group of tests studied in this investigation.

2. Where there is a need for reasonably accurate individual estimations of proficiency scores in collegiate music theory and where the Freshman Placement Theory Examination is not available for use, a battery of tests consisting of the other examinations named above will provide the optimum accuracy of prediction obtainable from the available tests studied in this investigation.

3. Where (1) the need or desire for the accuracy levels provided by the multiple test batteries in estimating individual predictions of proficiency scores in collegiate music theory does not exist, (2) testing time is limited, (3) funds or facilities for extensive testing are not available, (4) professional, clerical, and machine help are not adequate for scoring tests, for analyzing and interpreting data, and for computing the estimated proficiency scores from the regression equations, or (5) other conditions

exist which make the use of the multiple batteries impractical, certain individual tests which were identified as satisfactory predictors of the criterion may be used. They are as follows:

A. The Freshman Placement Theory Examination total test, the mean of subtests B + C, or subtest A alone are satisfactory predictors.

B. The Gordon Index of Musical Insight is a satisfactory predictor.

C. The combined four subtests of "Pitch Imagery," "Rhythm Discrimination," "Rhythm Imagery," and "Tonal Memory" of the Kwalwasser-Dykema Music Tests are satisfactory predictors.

D. The Wing Standardised Tests of Musical Intelligence total test or the combined first three subtests only are satisfactory predictors.

Recommendations

Based on the results of the study, the following tests are recommended, within the scope and limitations of this study, for use in guiding, counseling, selecting, classifying, or grouping college music students on the basis of proficiency scores in freshman music theory:

1. The Freshman Placement Theory Examination total test, the mean of subtests B + C, or subtest A alone are satisfactory predictors.

2. The Gordon Index of Musical Insight is a satisfactory predictor.

3. The combined four subtests of "Pitch Imagery," "Rhythm Discrimination," "Rhythm Imagery," and "Tonal Memory" of the Kwalwasser-Dykema Music Tests are satisfactory predictors.

4. The Wing Standardised Tests of Musical Intelligence total test or the combined first three subtests only are satisfactory predictors.

5. A multiple test battery employing (1) the total Freshman Placement Theory Examination, (2) the Gordon Index of Musical Insight, (3) the combined four subtests of "Pitch Imagery," "Rhythm Discrimination," "Rhythm Imagery," and "Tonal Memory" of the Kwalwasser-Dykema Music Tests, (4) the total Wing Standardised Tests of Musical Intelligence, (5) the Otis Quick-Scoring Mental Ability Tests, and (6) the two tests of "Rhythm" of the Drake Musical Apptitude Tests is a satisfactory predictor and, for the tests studied, provides the optimum prediction of the oriterion.

6. A multiple test battery employing (1) the Gordon Index of Musical Insight, (2) the combined four subtests of "Pitch Imagery," "Rhythm Discrimination," "Rhythm Imagery," and "Tonal Memory" of the Kwalwasser-Dykema Music Tests, (3) the total Wing Standardised Tests of Musical Intelligence, (4) the Otis Quick-Scoring Mental Ability Tests, and (5) the two tests of "Rhythm" of the Drake Musical Aptitude

Tests is a satisfactory predictor and provides, for the tests studied, the optimum prediction of the criterion where the Freshman Placement Theory Examination is not available.

Based on insights gained during the investigation of the problem in this study, the following recommendations concerning future studies are made:

1. Predictor tests should be validated against objective measures of proficiency in collegiate music theory secured over and based on a full two-year sequence of music theory courses.

2. The relationship between grades in collegiate music theory courses and objective measures of proficiency should be ascertained. Also, the relationship between predictor test scores and grades in music theory should be determined. A study combining the recommendation stated above with this recommendation could be especially valuable.

3. The relationships between the predictor tests employed in this study and proficiency in collegiate music theory should be determined for populations that are not homogeneously grouped in music theory courses and classes. Uniformity of instruction in collegiate music theory for the sample population should be controlled stringently.

4. In future studies the time interval between prognostic and criterion testing should be held constant for all of the sample population.

5. In addition to the satisfactory prognostic tests identified for single or multiple use in this study, future studies should include for investigation in a multiple test battery (1) a standardized measure of music achievement suitable for use at the college level such as the Aliferis Achievement Test (1, 2, 5) and (2) a measure of academic motivation or drive such as Schlesser's Personal Values Inventory (4, 6).

It is recognized that studies of the present type need cross validation (3, p. 440). It is, therefore, recommended that future investigations of the problem in this study using the tests employed in this investigation be undertaken.

CHAPTER BIBLIOGRAPHY

1. Aliferis, James, Aliferis Achievement Test Manual (College Entrance Level), Minneapolis, University of Minnesota Press, 1954.

2. Aliferis, James and J. E. Stecklein, "The Development of a College Entrance Test in Music Achievement," Journal of Research in Music Education, I (Fall, 1953), 83-96.

3. Garrett, Henry E., Statistics in Psychology and Education, New York, Longmans, Green and Company, 1959.

4. "Motivation Tests," News, Notes, and Quotes, The Newsletter of Phi Delta Kappa Fraternity, VI (August, 1961), 6, citing the "Newsletter" of Alpha Psi Campus Chapter of Phi Delta Kappa Fraternity, University of Buffalo, Buffalo, New York.

5. Roby, A. Richard, "A Study in the Correlation of Music Theory Grades with the Seashore Measures of Musical Talents and the Aliferis Music Achievement Tests," Journal of Research in Music Education, X (Fall, 1962), 137-142.

6. Schlesser, George E. and John A. Finger, "Preliminary Information on the Interpretation of the Personal Values Inventory," unpublished syllabus, School of Education, Colgate University, Hamilton, New York, October, 1961.

APPENDIX

THE MUSIC THEORY PROFICIENCY TESTS

Transcript of the Recorded General Instructions for the Three Dictation Tests

The examination you are about to take was designed to measure your ability to take rhythmic, melodic, and harmonic dictation. The range of difficulty is rather wide. Some questions may be easy for you; other questions may be quite difficult. The test moves rapidly, and some test items have been made difficult; you may not do as well as you would like on some sections of the test. Do your best work, and do not become discouraged if some test items are too difficult for you to solve in the short time allowed. Try to make a response to all questions. Guess if you are in doubt. A guess may be better than a complete blank. Follow the directions for each test carefully. Use pencil for the test; do not use pen. Work quickly and silently. (Forty-five seconds of time were required for these instructions.)

Transcript of the Recorded Instructions for
the Rhythmic Dictation Test

Sixteen rhythmic dictation exercises will be played. You are asked to complete each exercise by filling in the blank measure or measures on your answer sheet with the rhythm pattern you hear played. Each exercise will be played three times. Some of the items will be played as melodies; some will be played on only one pitch. In both cases you are to write only the rhythmic notation. Each problem has been started correctly for you. Complete each exercise on your paper so that it corresponds to the rhythm pattern you hear played on the organ. The tempo will be established before each exercise is played. It is not necessary for you to perform a conductor's beat or tap a background pattern in this examination. Write the notation as soon as you are able. Please notice that the exercises go across the page from left to right. Also, be sure to take time to look at the meter signatures carefully before you begin to write your answers.

Try the practice exercises. (Practice Exercise 1 was played at this time.) With your solution completing the exercise, Practice Exercise 1 should look like Example A at the top of your answer sheet. Try Practice Exercise 2 now. (Practice Exercise 2 was played at this time.) Your solution to Practice Exercise 2 should look like Example B at the top of your answer sheet. Now try the test.

The Rhythmic Dictation Test as It Was Provided to the Students

THEORY DICTATION TEST

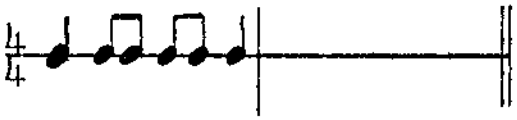
Name_____
(Last) (First)

Part I: Rhythmic Dictation

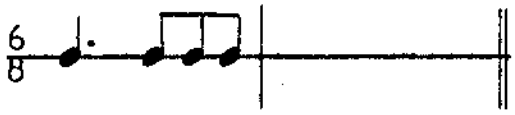
Example A

Example B

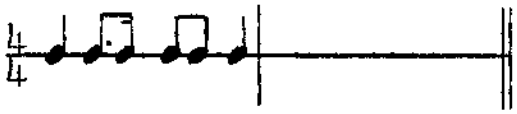
Practice Exercise 1.



Practice Exercise 2.



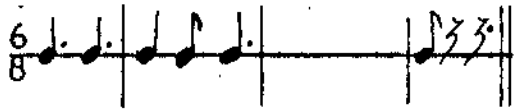
1.



2.

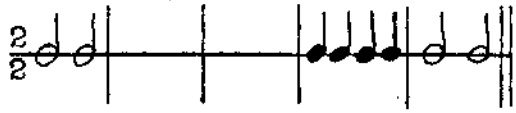
3.

4.



5.

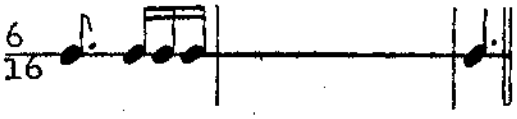
6.



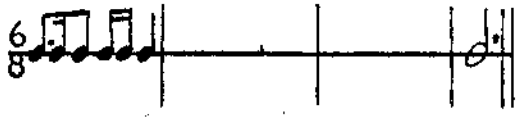
7.

8.

9.



10.

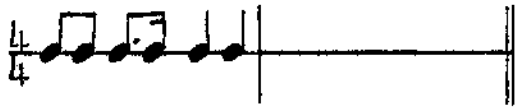


11.

12.

13.

14.



15.

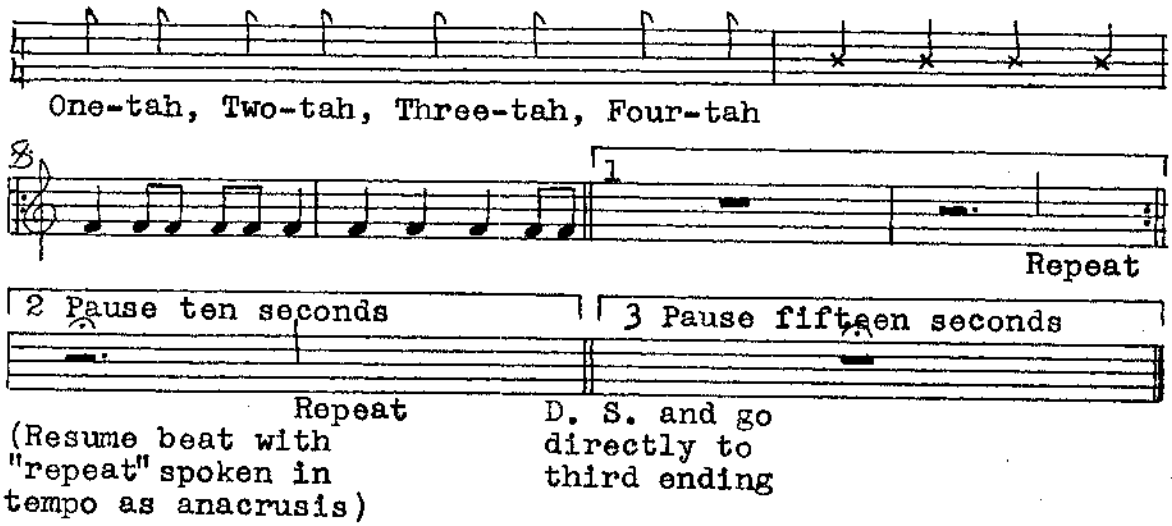
16.

Transcript of the Recorded Rhythmic Dictation

Materials Performed for the Students

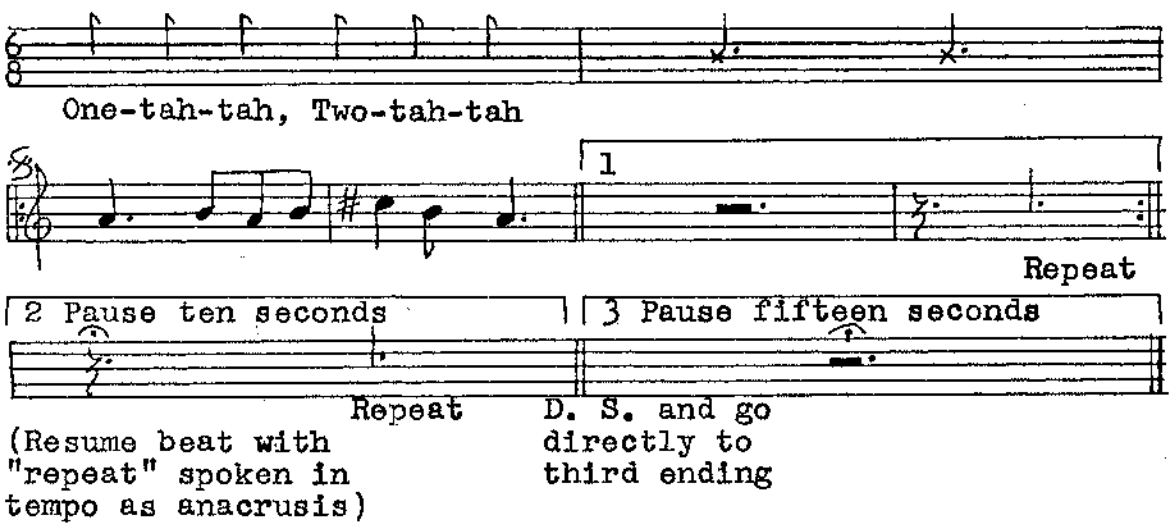
(The two practice exercises and all test items were performed on a reed organ at a mezzo forte dynamic level at eighty-eight beats per minute in a marked but legato style. The information preceding the playing of each exercise was spoken and performed in tempo as indicated by the notation. The clicks indicated by the "x" notation were produced by tapping a wood rod against a large solid block of wood. The sound produced was exact and pleasant in tone quality but with indefinite pitch.)

Practice Exercise Number One



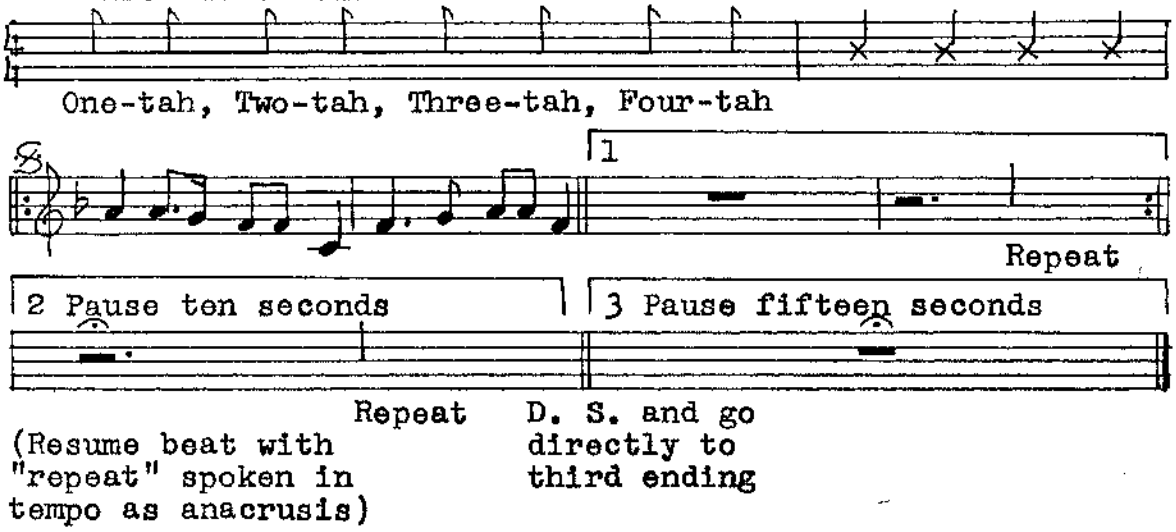
With your solution completing the exercise, Practice Exercise Number One should look like Example A at the top of your answer sheet. Try Practice Exercise Number Two. (Continue without pause.)

Practice Exercise Number Two



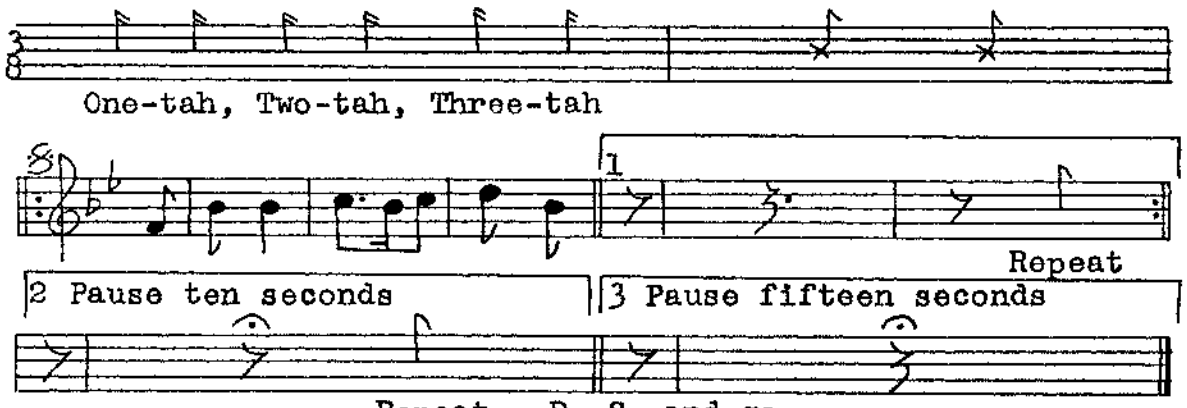
Your solution to Practice Exercise Number Two should look like Example B at the top of your answer sheet. Now try the test. (The test begins here without pause.)

Exercise Number One



(Continue without pause.)

Exercise Number Two

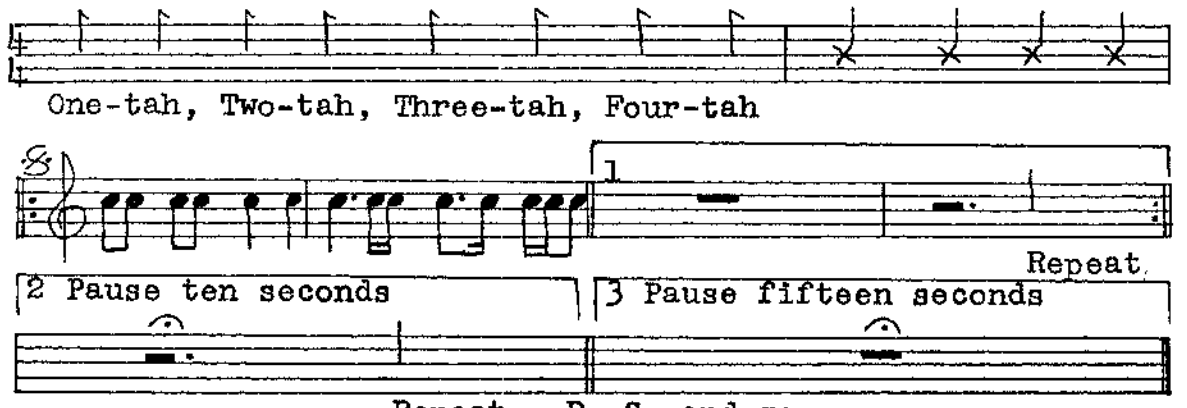


Repeat (Resume beat with "repeat" spoken in tempo as anacrusis)

D. S. and go directly to third ending

(Continue without pause.)

Exercise Number Three

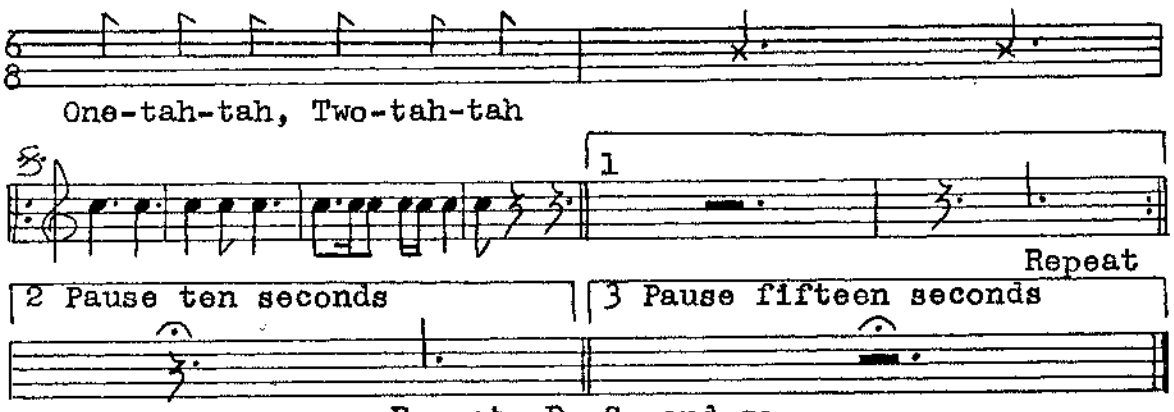


Repeat (Resume beat with "repeat" spoken in tempo as anacrusis)

D. S. and go directly to third ending

(Continue without pause.)

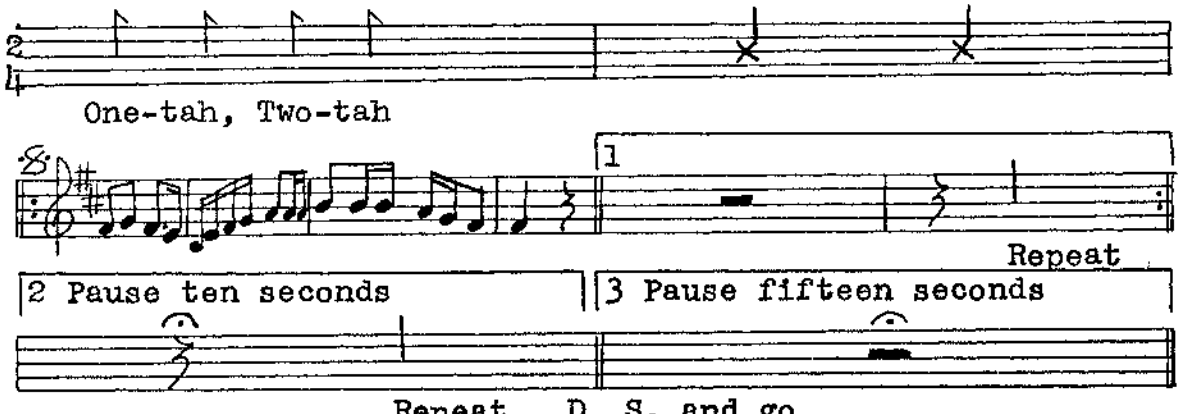
Exercise Number Four



(Resume beat with "repeat" spoken in tempo as anacrusis)

(Continue without pause.)

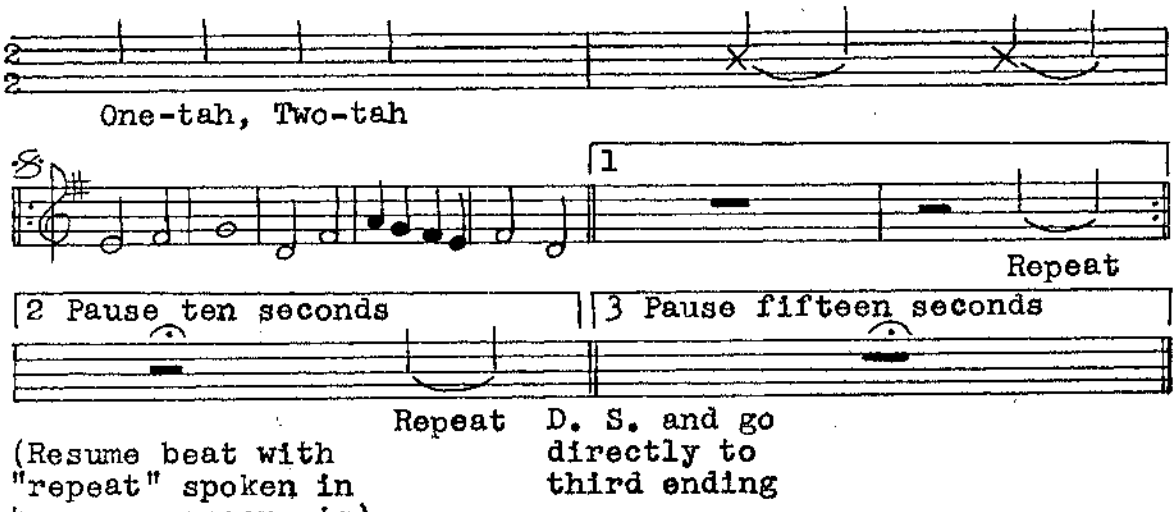
Exercise Number Five



(Resume beat with "repeat" spoken in tempo as anacrusis)

(Continue without pause.)

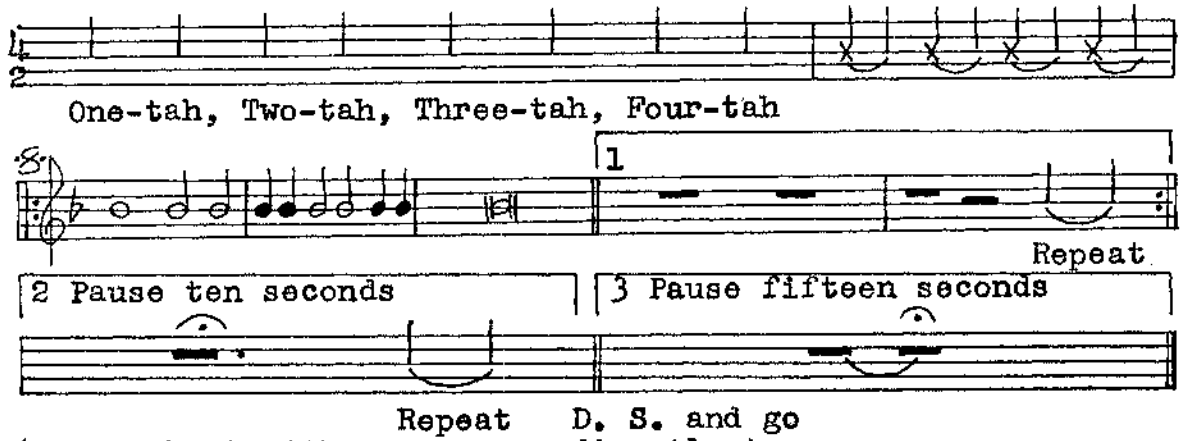
Exercise Number Six



(Resume beat with "repeat" spoken in tempo as anacrusis)

(Continue without pause.)

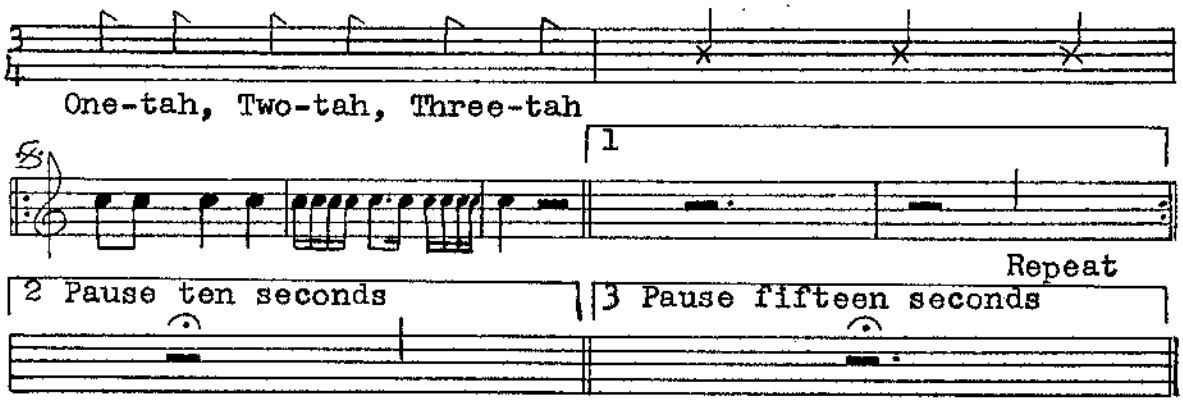
Exercise Number Seven



(Resume beat with "repeat" spoken in tempo as anacrusis)

(Continue without pause.)

Exercise Number Eight



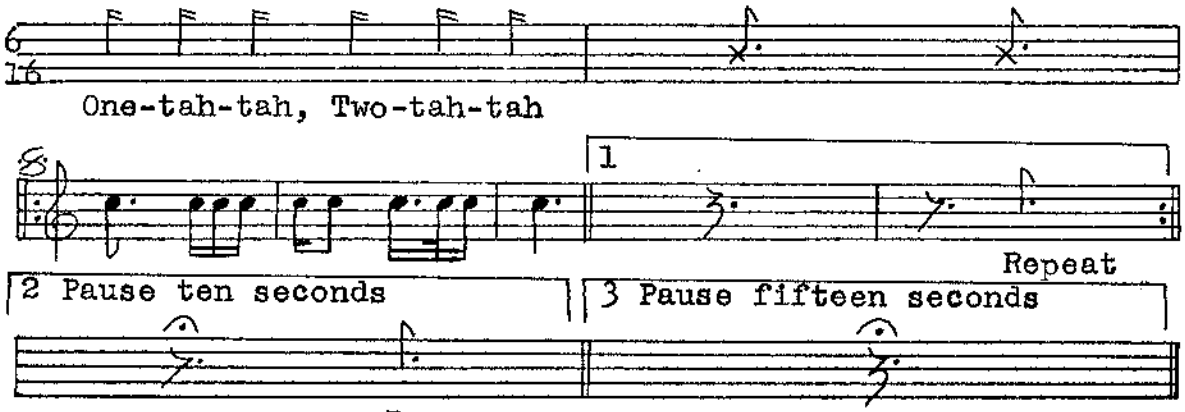
Repeat

(Resume beat with "repeat" spoken in tempo as anacrusis)

D. S. and go directly to third ending

(Continue without pause.)

Exercise Number Nine



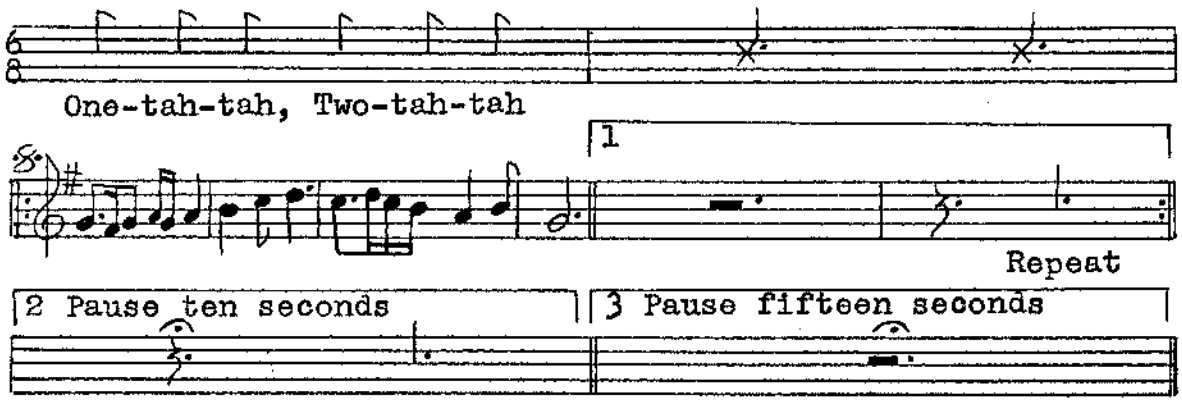
Repeat

(Resume beat with "repeat" spoken in tempo as anacrusis)

D. S. and go directly to third ending

(Continue without pause.)

Exercise Number Ten



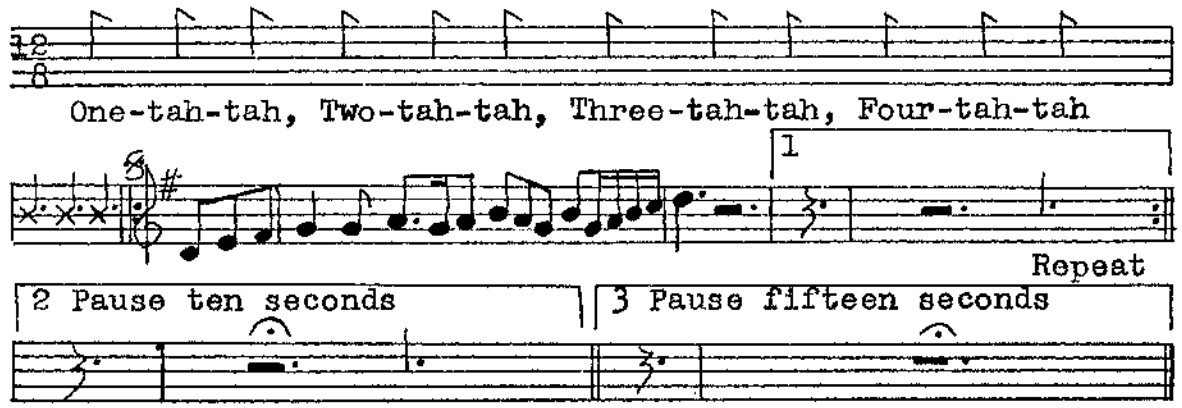
Repeat

(Resume beat with "repeat" spoken in tempo as anacrusis)

D. S. and go directly to third ending

(Continue without pause.)

Exercise Number Eleven



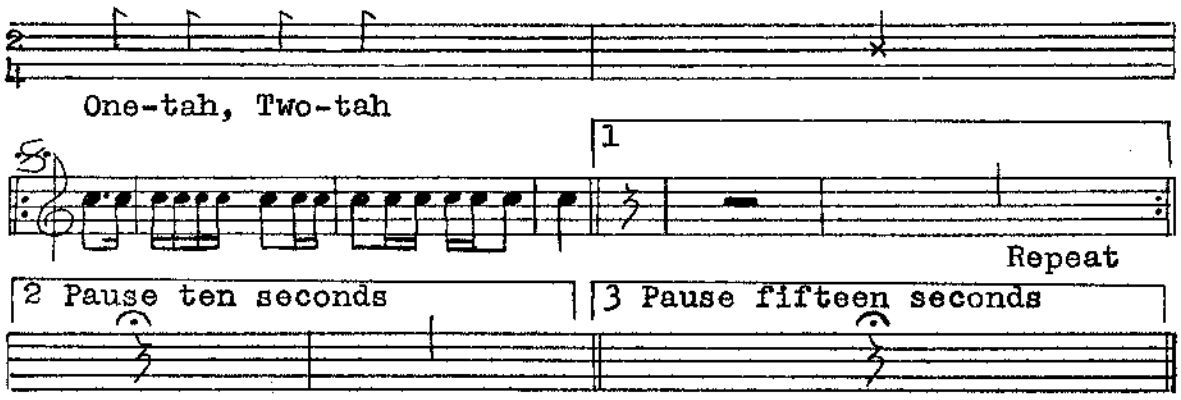
Repeat

(Resume beat with "repeat" spoken in tempo as anacrusis)

D. S. and go directly to third ending

(Continue without pause.)

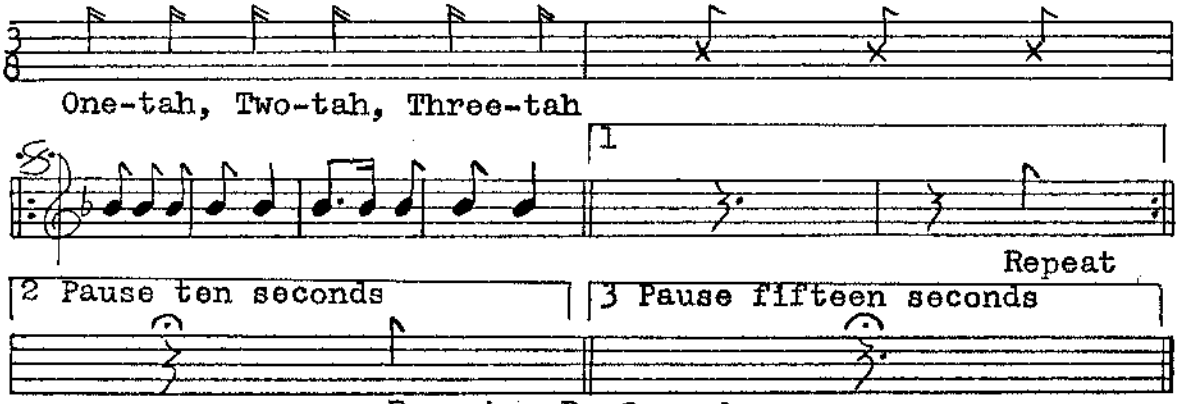
Exercise Number Twelve



(Resume beat with "repeat" spoken in tempo as anacrusis)

(Continue without pause.)

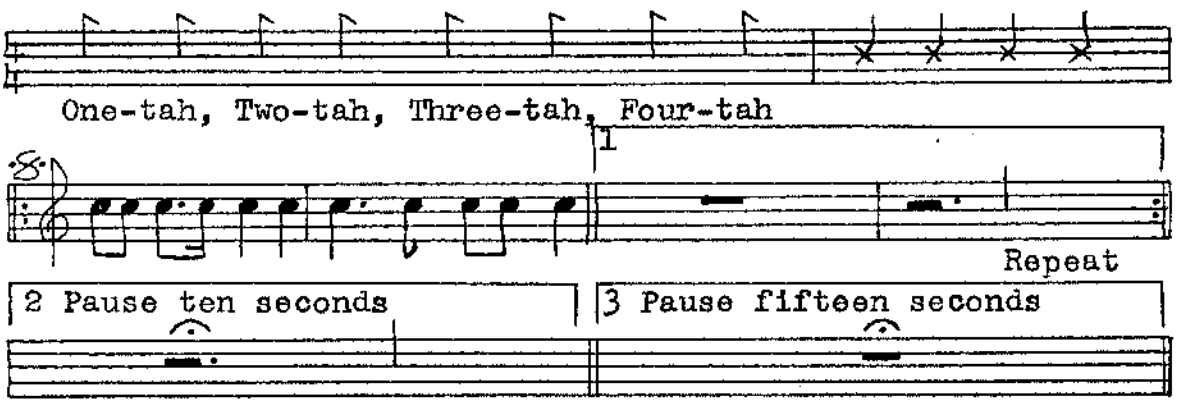
Exercise Number Thirteen



(Resume beat with "repeat" spoken in tempo as anacrusis)

(Continue without pause.)

Exercise Number Fourteen

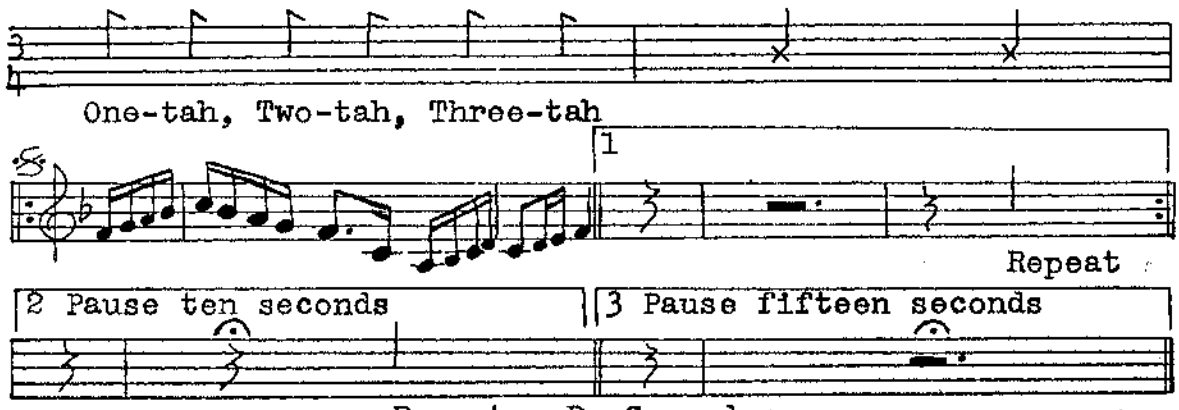


Repeat (Resume beat with "repeat" spoken in tempo as anacrusis)

D. S. and go directly to third ending

(Continue without pause.)

Exercise Number Fifteen

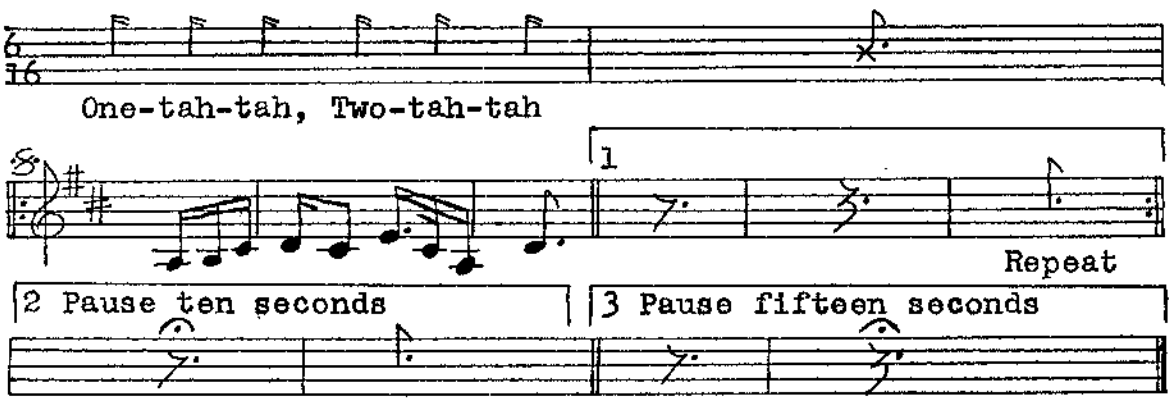


Repeat (Resume beat with "repeat" spoken in tempo as anacrusis)

D. S. and go directly to third ending

(Continue without pause.)

Exercise Number Sixteen



Repeat (Resume beat with "repeat" spoken in tempo as anacrusis)

D. S. and go directly to third ending

This concludes the Rhythm Dictation Test. (The test required nineteen minutes. Continue to the Melodic Dictation Test without pause.)

Transcript of the Recorded Instructions for the Melodic Dictation Test

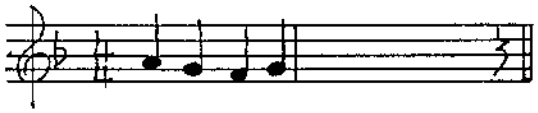
Twelve melodic dictation exercises will be played. You are asked to complete the melodies on your answer sheet by filling in the blank measure or measures with the written pitch notation for the melodies you hear played. All of the melodies will be played in quarter notes only, so there will be no rhythmic problem for you to consider. Simply write each note as a quarter note. Your problem will be one of pitch notation only. The number of notes required to complete each melody is indicated on your answer sheet. Each exercise has been started correctly for you. Each melody will be played twice only. The tonic chord in the key of the melody will be played before each exercise in order to establish the tonality. Please notice that the test items go across the page from left to right; they are not arranged in columns. Exercise 2 is across from Exercise 1, not underneath it. Try the practice exercise. (The practice melody was played at this time.) The correct solution to the practice exercise looks like Example A at the top of your answer sheet. Now try the test. (The test was started without pause.)

The Melodic Dictation Test as It Was Provided to the Students

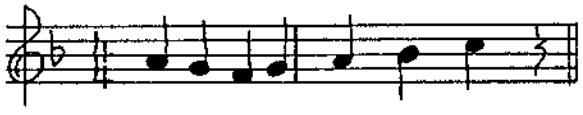
THEORY DICTATION TEST

Part II: Melodic Dictation

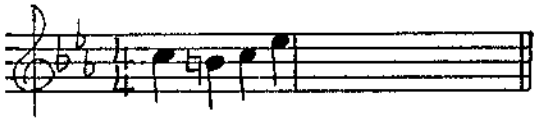
Practice Exercise (3 notes)



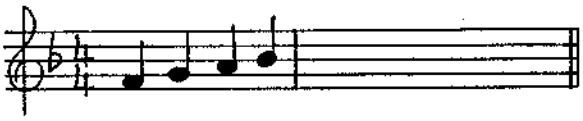
Example A



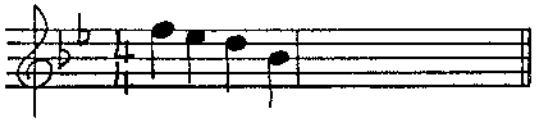
1. (4 notes)



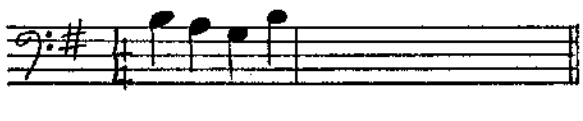
2. (4 notes)



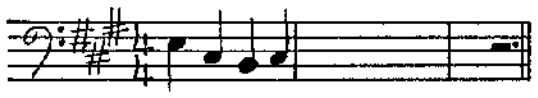
3. (4 notes)



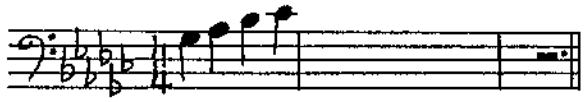
4. (4 notes)



5. (5 notes)

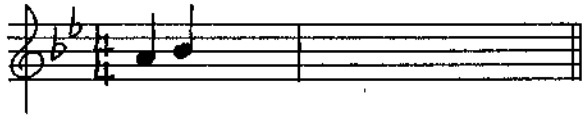


6. (5 notes)



7. (6 notes)

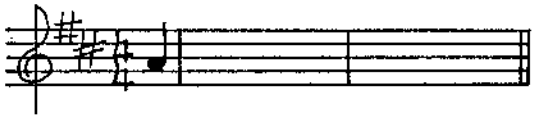
8. (6 notes)



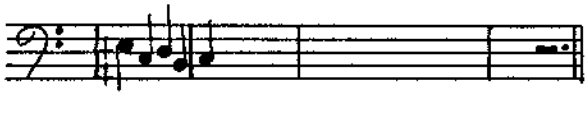
9. (8 notes)

10. (8 notes)

11. (8 notes)



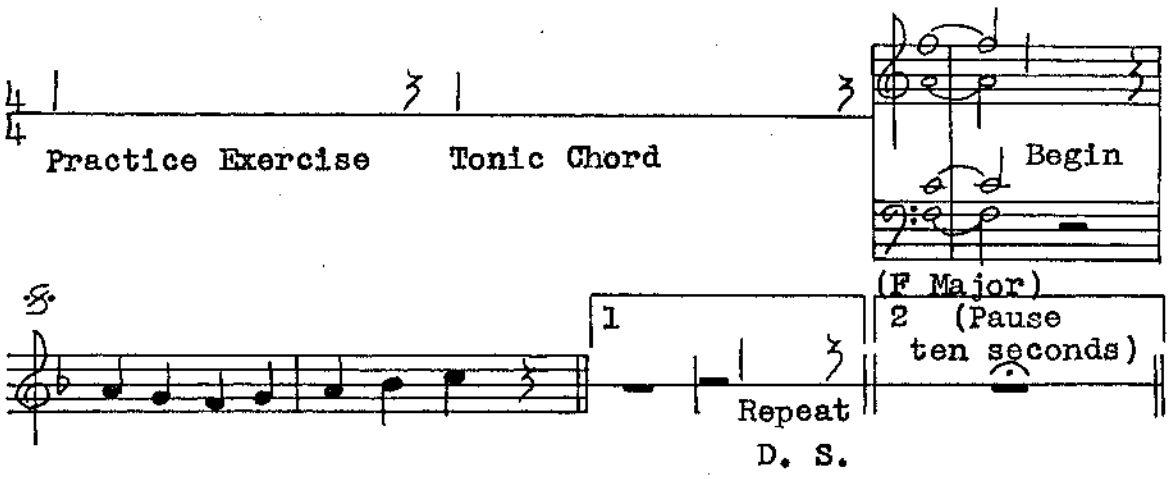
12. (8 notes)



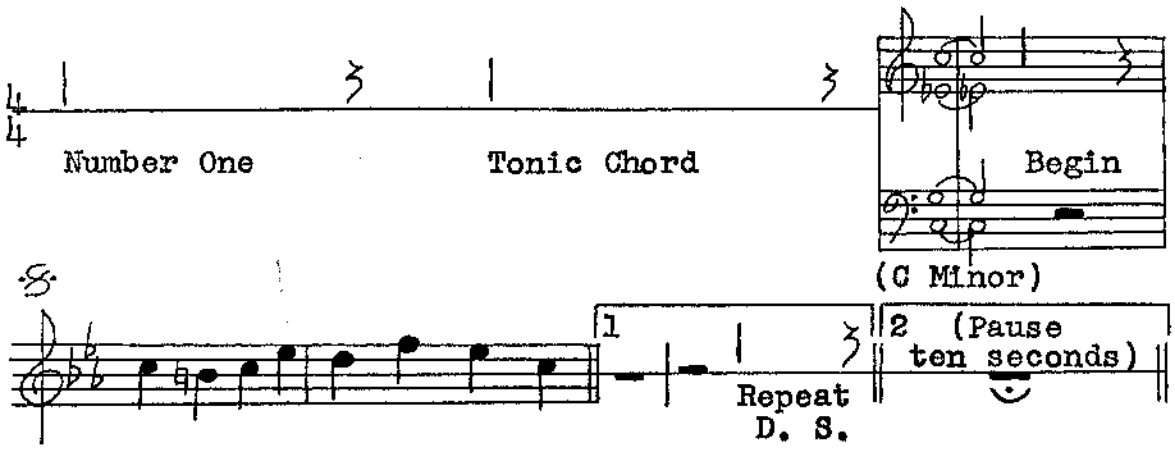
Transcript of the Recorded Melodic Dictation

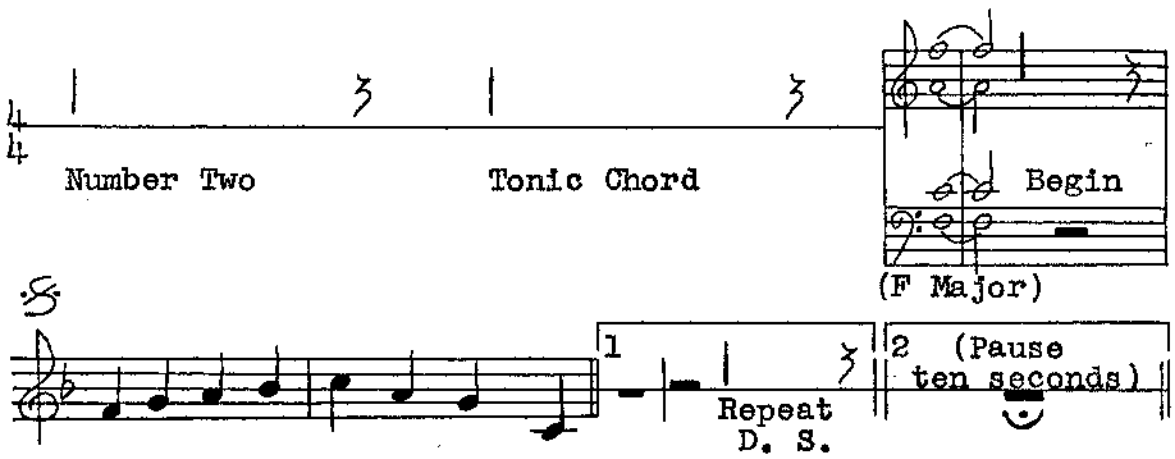
Materials Performed for the Students

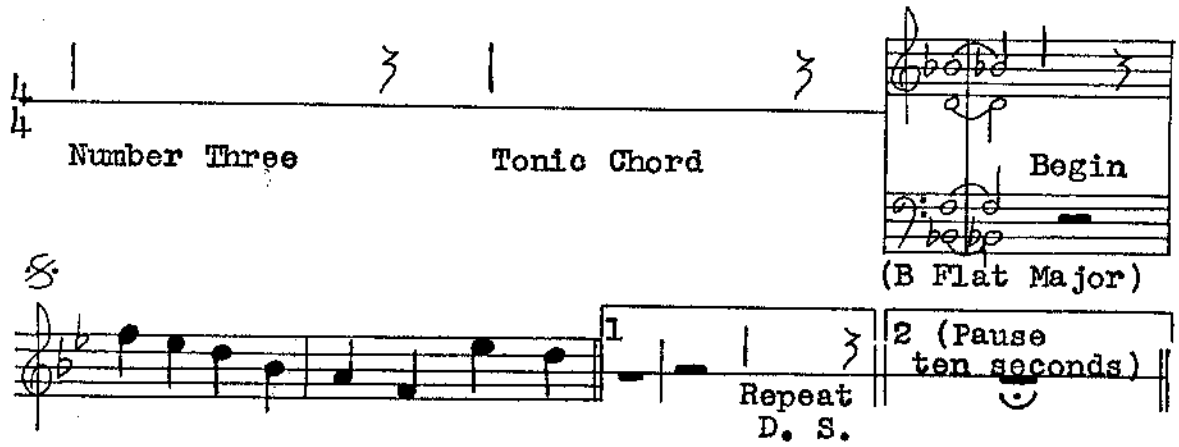
(The practice exercise and all test items were played on the piano at a mezzo forte dynamic level at seventy-two beats per minute in a legato cantabile style. The information preceding the playing of each exercise was spoken and performed in tempo as indicated by the notation.)

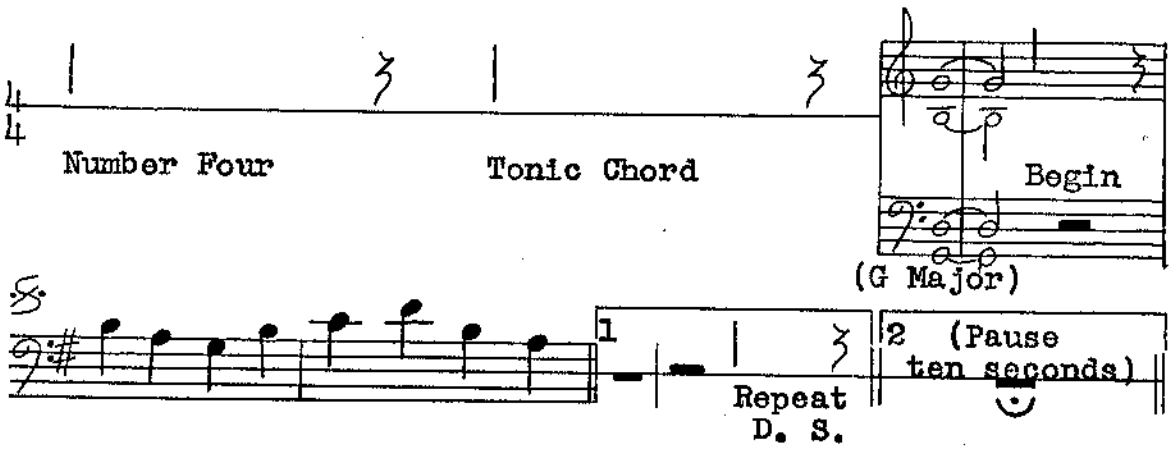


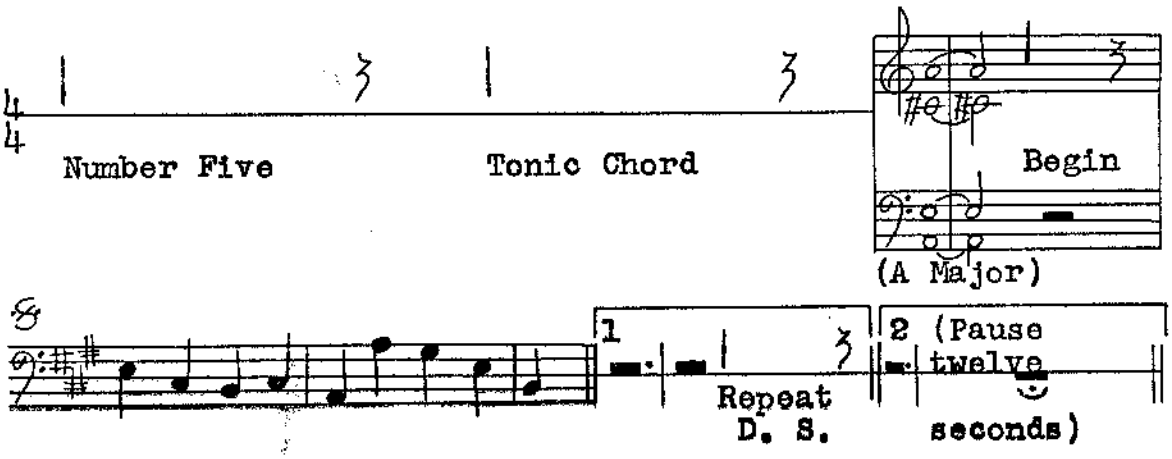
The correct solution of the practice exercise looks like Example A on your answer sheet. Now try the test. (The test was started here without pause.)

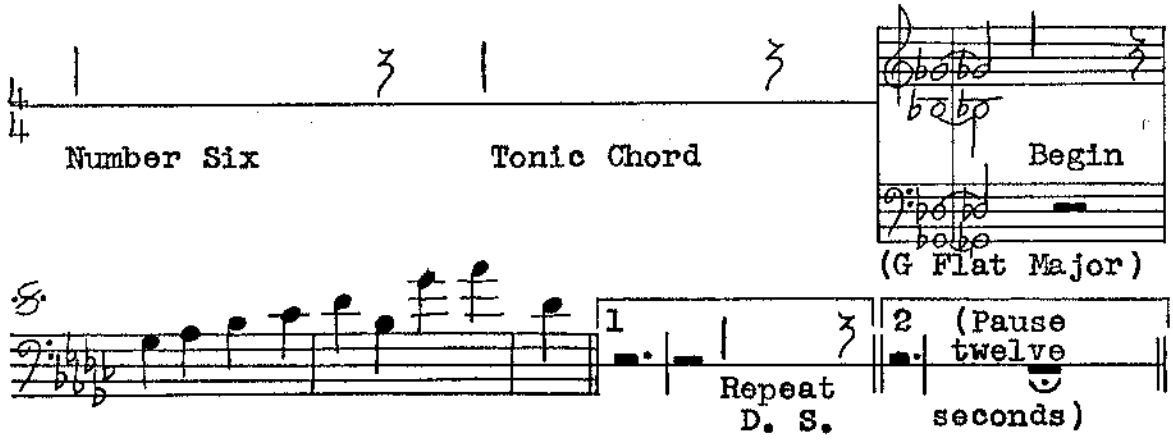

Number One
Tonic Chord
Begin
(C Minor)
1
2 (Pause ten seconds)
Repeat D. S.

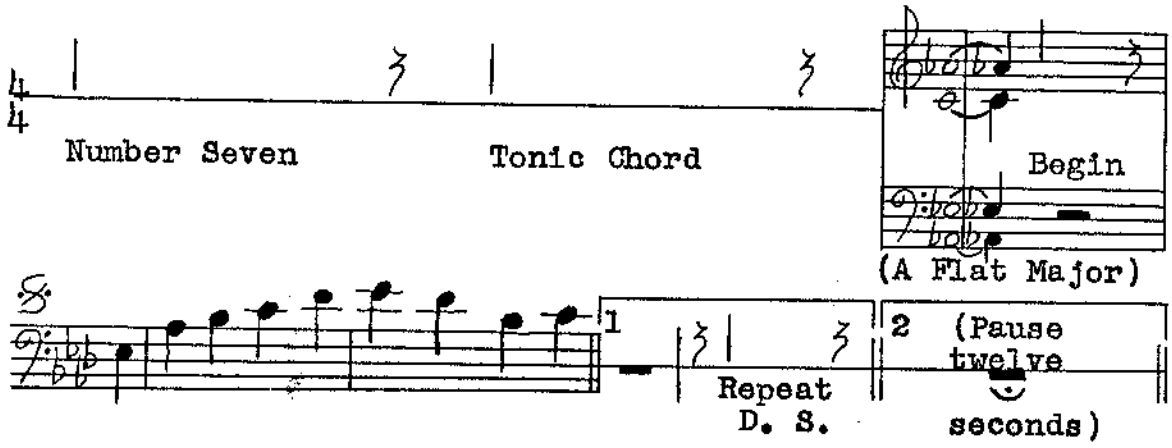

Number Two
Tonic Chord
Begin
(F Major)
1
2 (Pause ten seconds)
Repeat D. S.

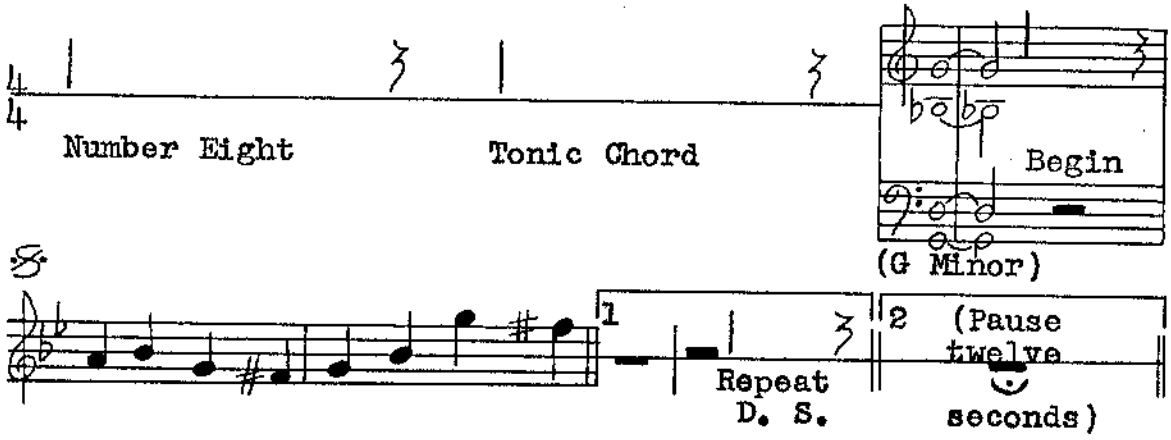

Number Three
Tonic Chord
Begin
(B Flat Major)
1
Repeat
D. S.
2 (Pause
ten seconds)

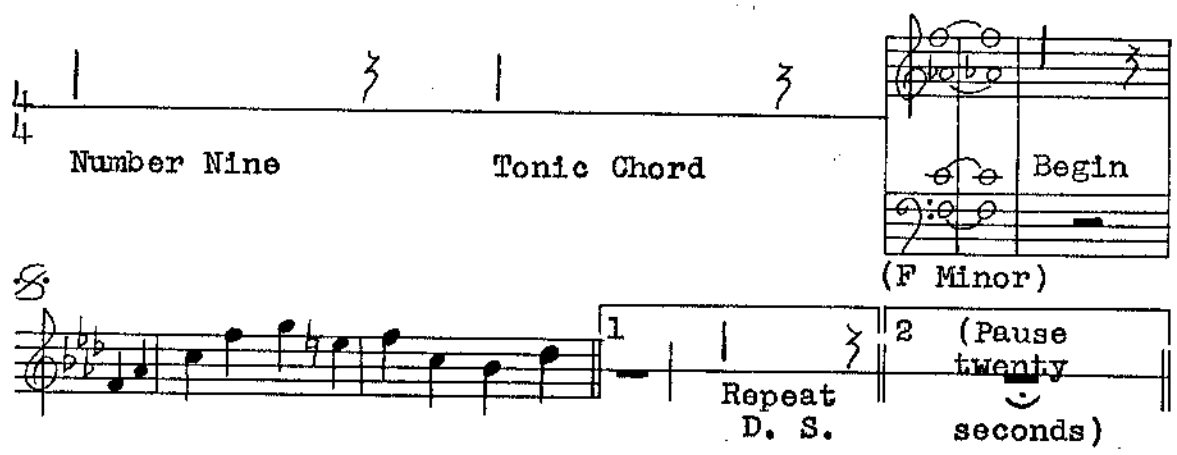

Number Four
Tonic Chord
Begin
(G Major)
1
Repeat
D. S.
2 (Pause
ten seconds)

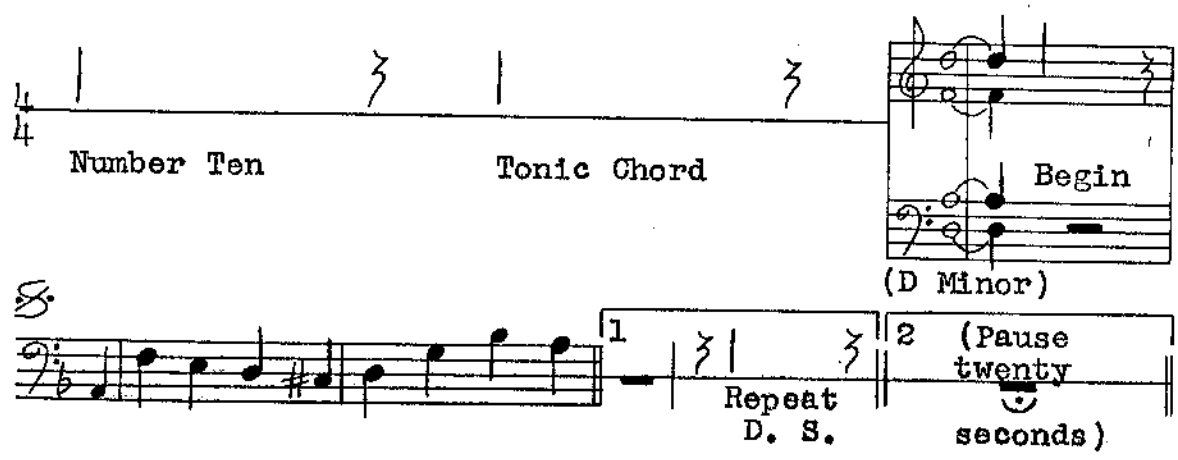

Number Five
Tonic Chord
Begin
(A Major)
1
Repeat
D. S.
2 (Pause
twelve
seconds)

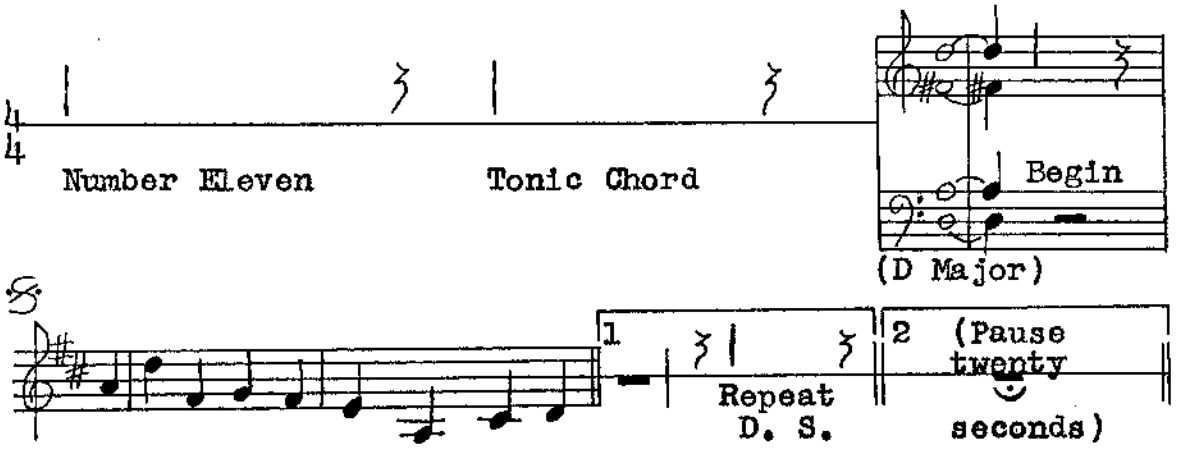

Number Six
Tonic Chord
Begin
(G Flat Major)
1
Repeat
D. S.
2 (Pause
twelve
seconds)

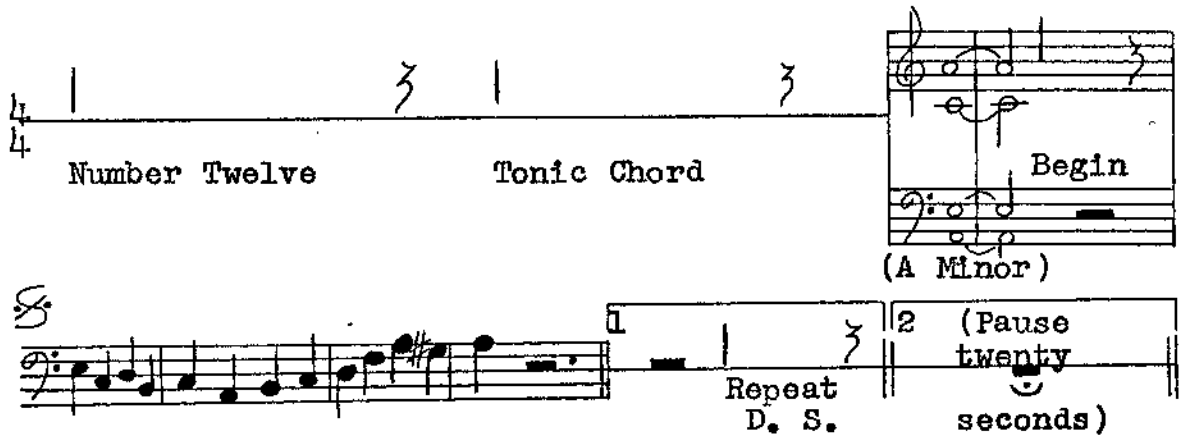

Number Seven
Tonic Chord
Begin
(A Flat Major)
1
Repeat
D. S.
2 (Pause
twelve
seconds)


Number Eight
Tonic Chord
Begin
(G Minor)
1
Repeat
D. S.
2 (Pause
twelve
seconds)


Number Nine
Tonic Chord
Begin
(F Minor)
1
2 (Pause
twenty
Repeat
D. S.
seconds)


Number Ten
Tonic Chord
Begin
(D Minor)
1
2 (Pause
twenty
Repeat
D. S.
seconds)





Stop. This concludes Part II, Melodic Dictation. (The total time required for the test was 11.5 minutes. Part III of the dictation test followed without pause.)

Transcript of the Recorded Instructions

for the Harmonic Dictation Test

Eight harmonic dictation exercises will be played on the piano. Each exercise will be played twice only. You are asked to give the following information about each chord that is played:

1. Give the type of chord.

2. Give the inversion of the chord if the chord is inverted.

Only five types of chords will be played. They are as follows:

1. Major and minor tonic chords

2. Major and minor subdominant chords

3. Major dominant chords

The first and second inversions of the major and minor tonic chords will be used; the first and second inversions of the major and minor subdominant chords will be used; the first inversion of the dominant chord will be used. In minor tonalities be careful to use the correct symbol to indicate minor chords, since in minor keys the tonic and subdominant chords may be either major or minor.

For chords in inversion use the subscript "6" with the chord type number to indicate first inversion chords, and use the subscript "$\frac{6}{4}$" with the chord type number to indicate

second inversion chords. When the root of the chord is the bass note, no subscript needs to be included as part of the chord symbol.

Place one complete chord symbol in each square provided on the answer sheet. The tonic chord for each exercise will be sounded before each exercise is played.

Try the practice exercises. (The practice exercises were played at this time.)

The Harmonic Dictation Test as It Was

Provided to the Students

THEORY DICTATION TEST

Part III: Harmonic Dictation

Practice Exercises

1. 2. 3.

Chord types used: I, i; IV, iv; V

Inversions used: I_6, $I_{\frac{6}{4}}$, i_6, $i_{\frac{6}{4}}$, IV_6, iv_6, V_6

Example A

I	IV	V	I

Example B

i	iv	V	I

Example C

I	IV_6	V_6	I

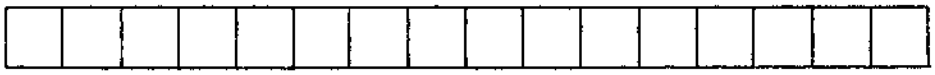
---

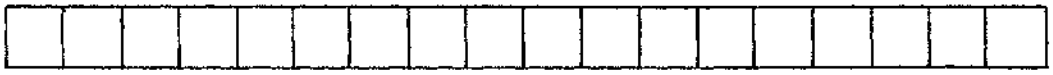
1. 

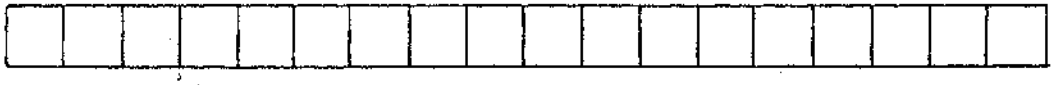
2. 

3. 

4. 

5. 

6. 

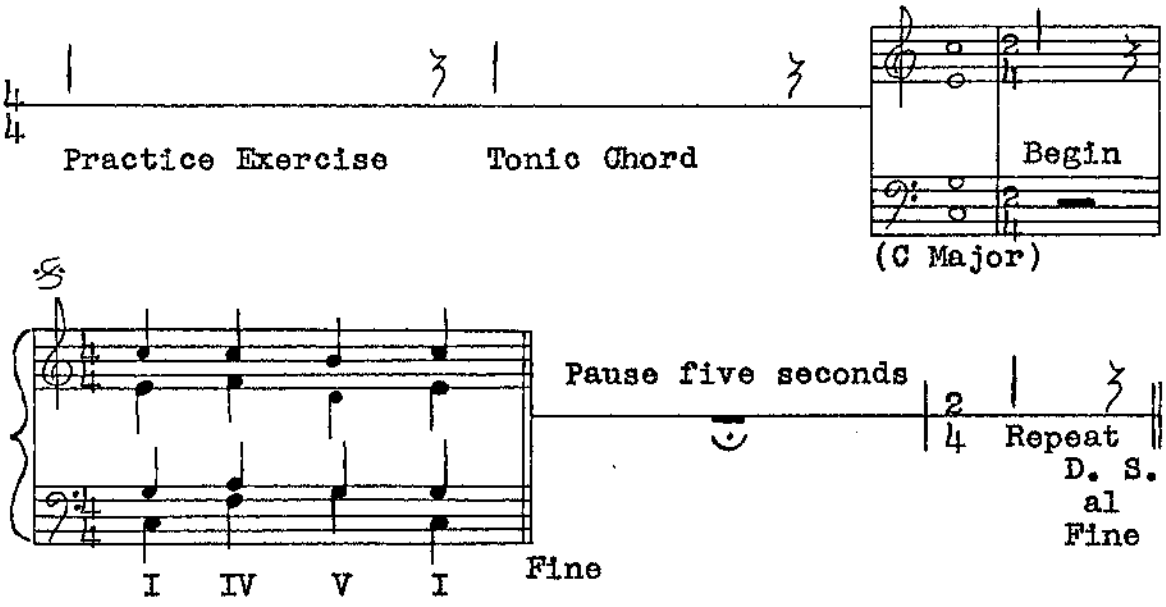
7. 

8. 

Transcript of the Recorded Harmonic Dictation

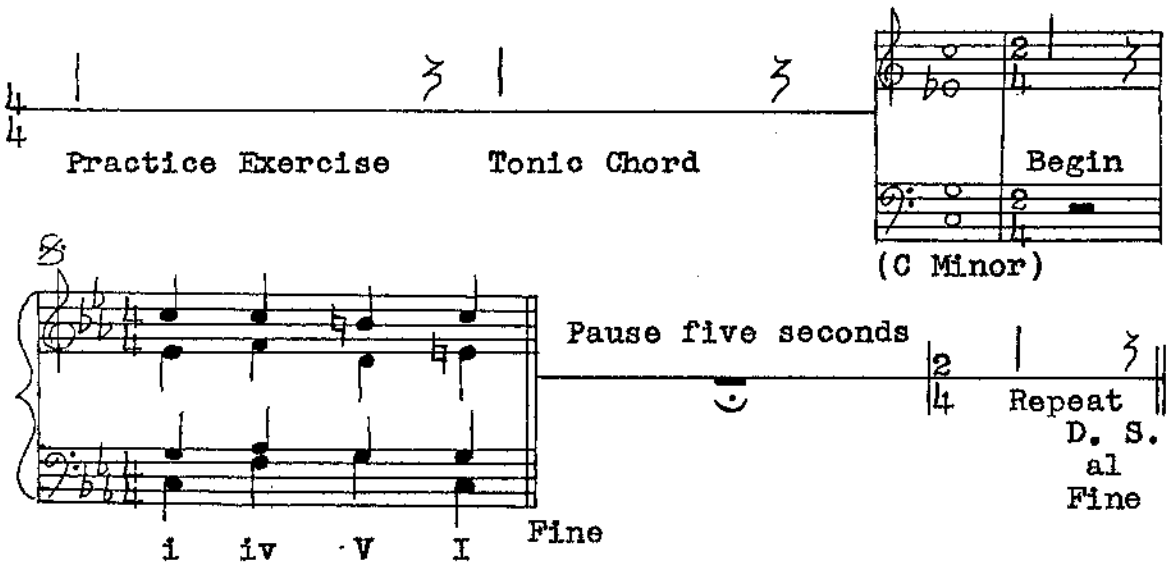
Materials Performed for the Students

(The three practice exercises and all test items were performed on the piano at a mezzo forte dynamic level at fifty-two beats per minute in legato style. The information preceding the playing of each exercise was spoken and performed in tempo as indicated by the notation.)



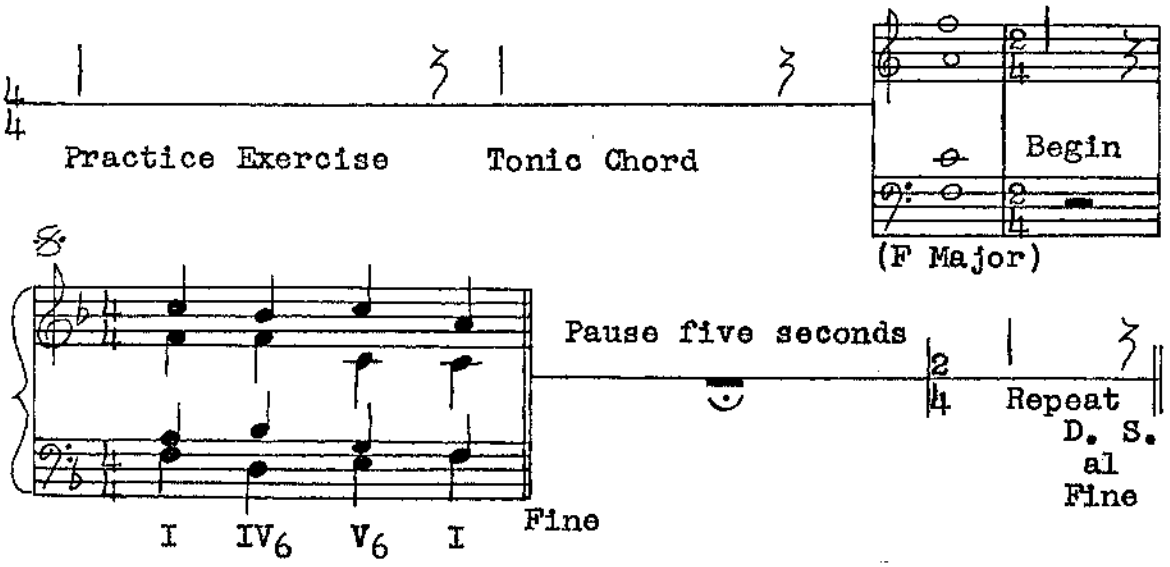
(Pause ten seconds after the repetition.)

The correct solution for the first practice exercise looks like Example A on your answer sheet. Try the second practice exercise. (The second practice exercise was played at this time.)



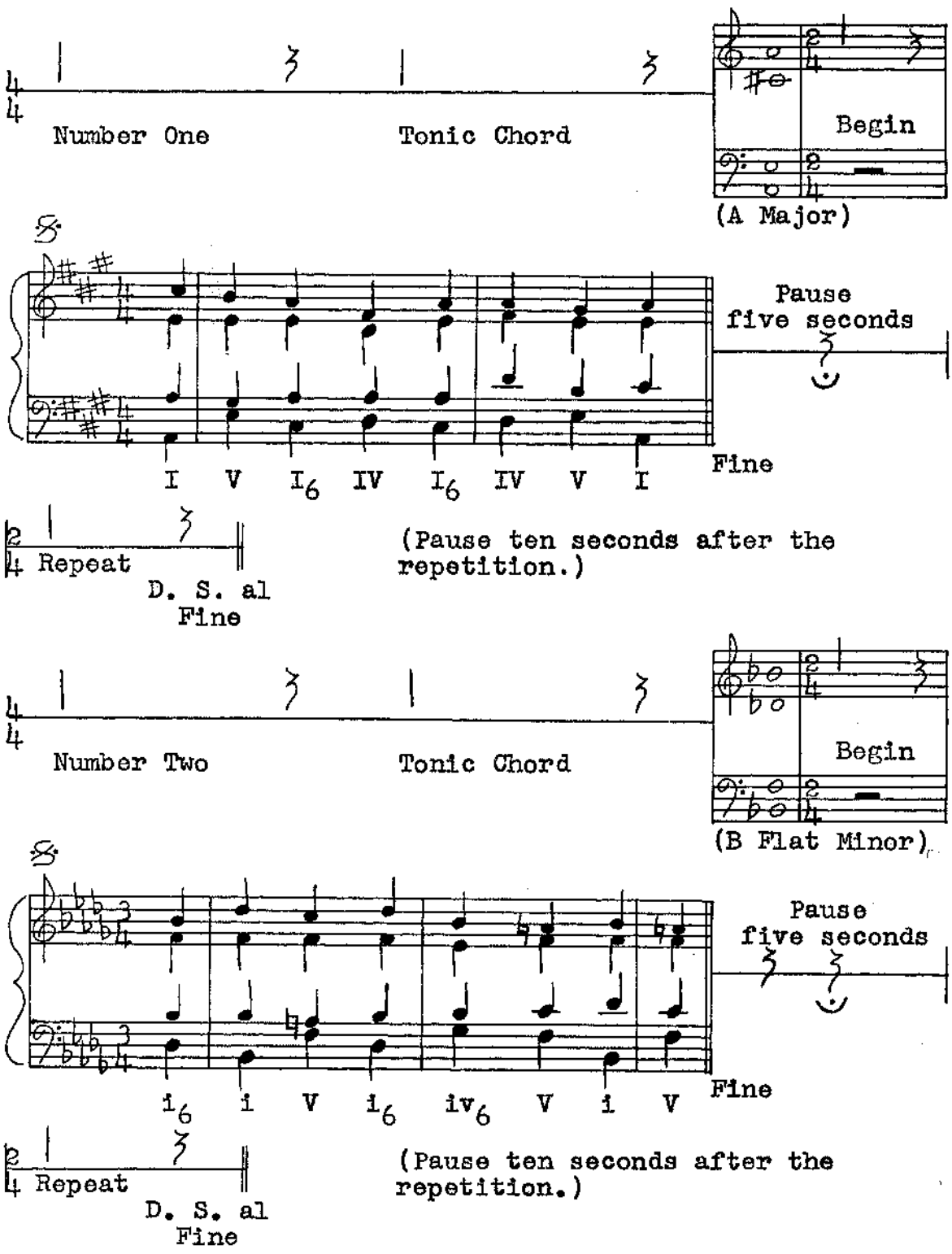
(Pause ten seconds after the repetition.)

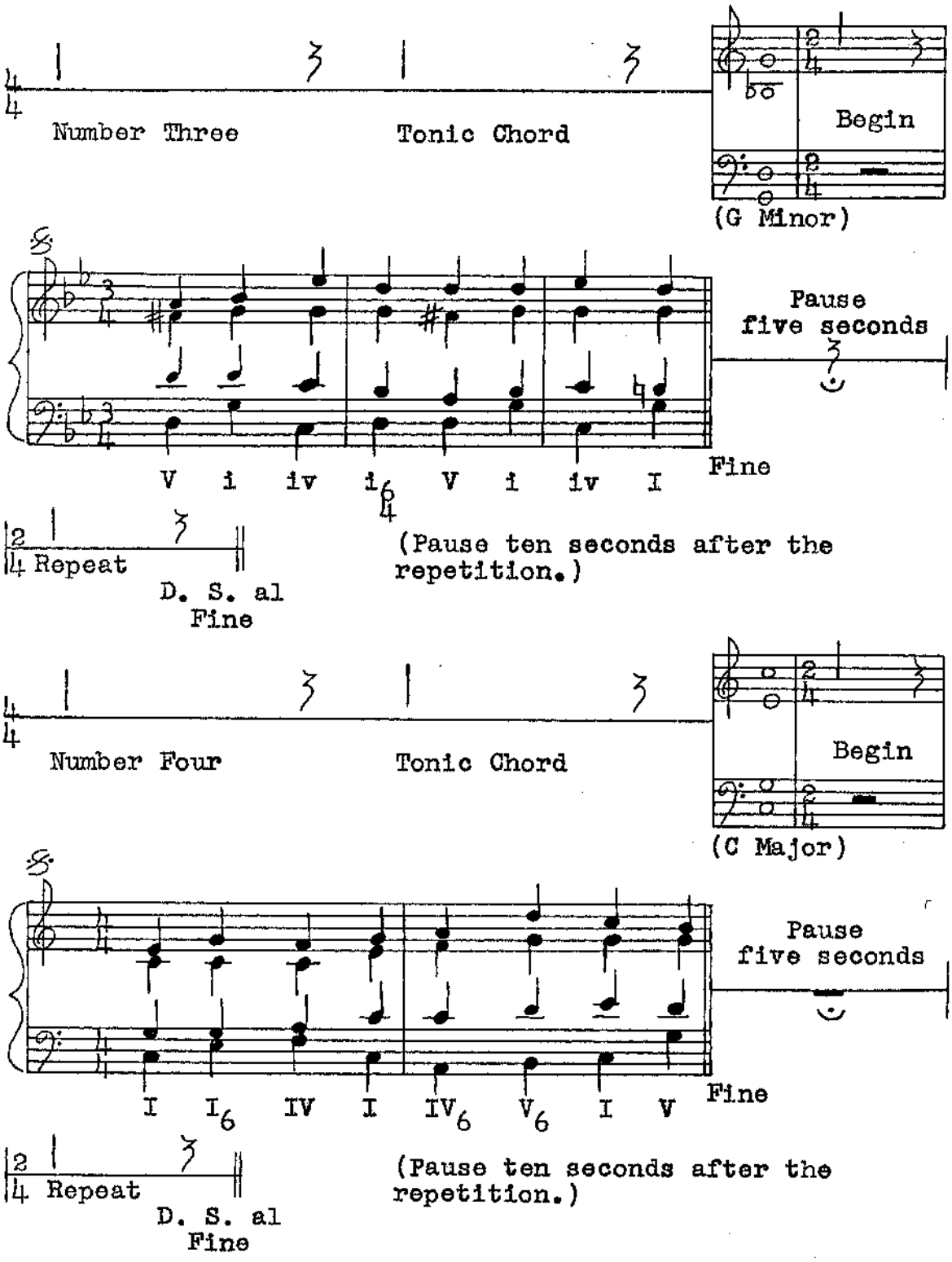
The correct solution for the second practice exercise looks like Example B. Try the third practice exercise. (The third practice exercise was played at this time.)

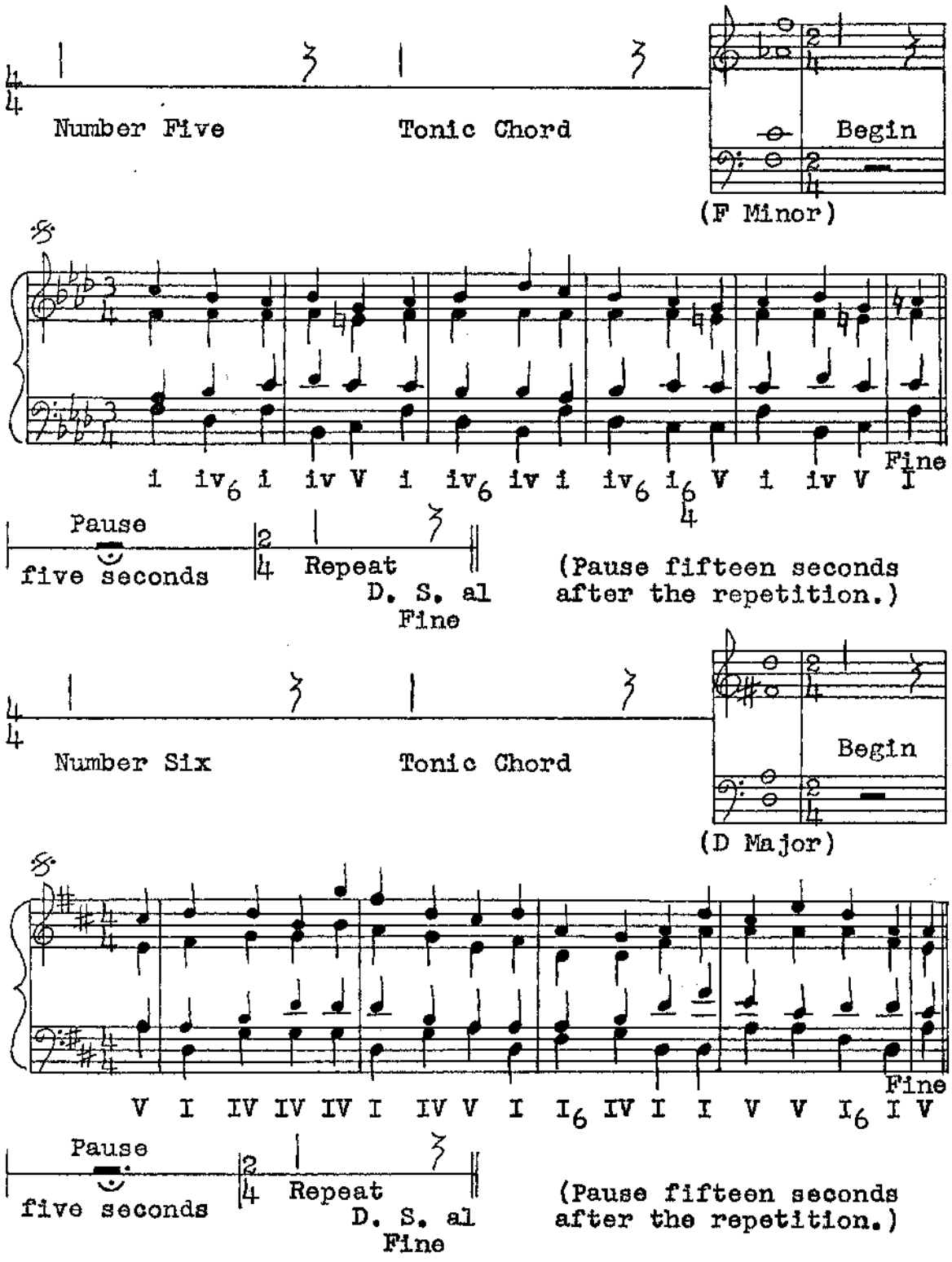


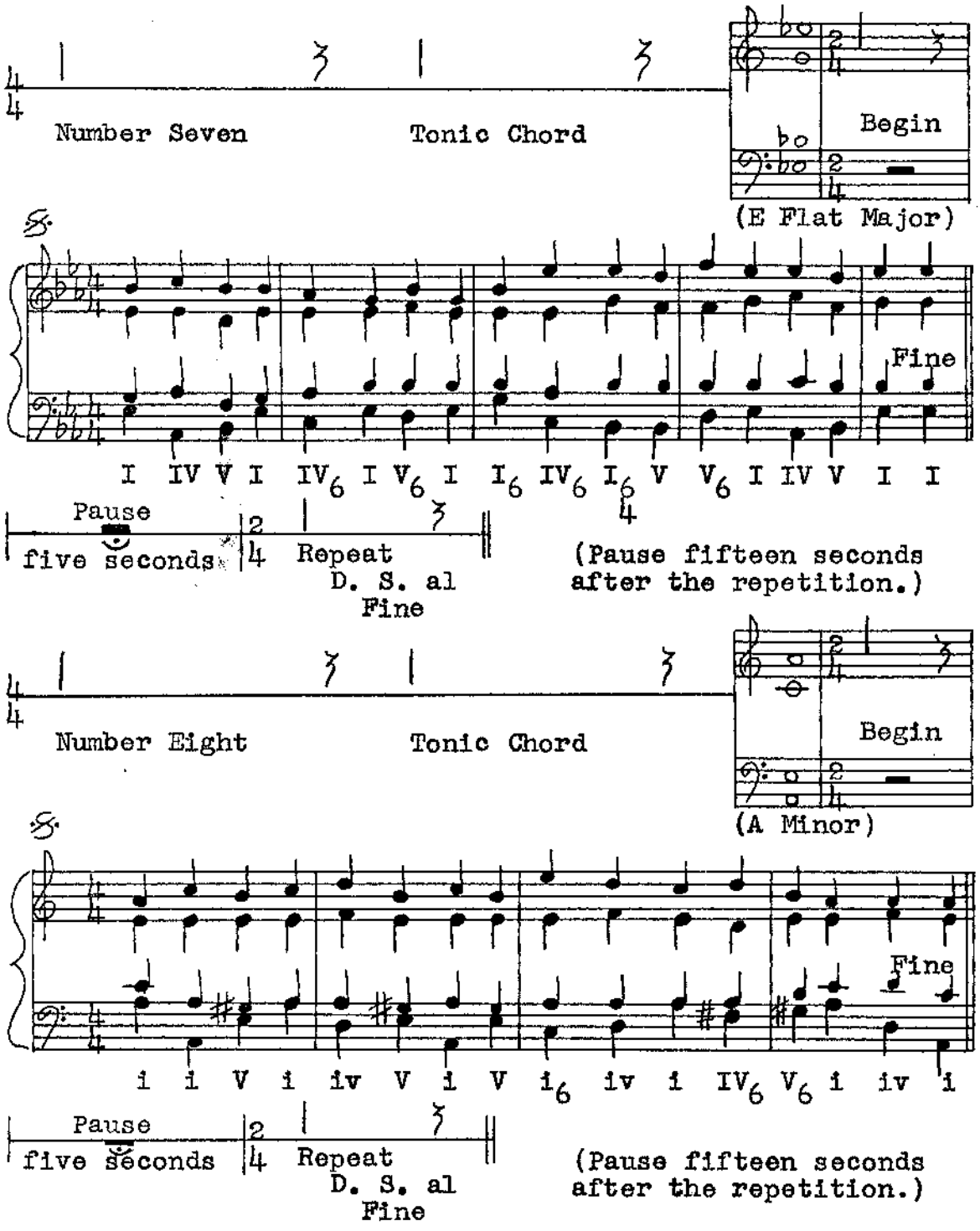
(Pause ten seconds after the repetition.)

The correct solution for the third practice exercise looks like Example C. Now try the test. (The test was played at this time.)


Number One
Tonic Chord
Begin
(A Major)
Pause
five seconds
I V I6 IV I6 IV V I
Fine
Repeat
D. S. al
Fine
(Pause ten seconds after the
repetition.)
Number Two
Tonic Chord
Begin
(B Flat Minor)
Pause
five seconds
i6 i V i6 iv6 V i V
Fine
Repeat
D. S. al
Fine
(Pause ten seconds after the
repetition.)


Number Three
Tonic Chord
Begin
(G Minor)
Pause
five seconds
V i iv i6 V i iv I
Fine
Repeat
D. S. al
Fine
(Pause ten seconds after the
repetition.)
Number Four
Tonic Chord
Begin
(C Major)
Pause
five seconds
I I6 IV I IV6 V6 I V
Fine
Repeat
D. S. al
Fine
(Pause ten seconds after the
repetition.)


Number Five
Tonic Chord
Begin
(F Minor)
i iv6 i iv V i iv6 iv i iv6 i6 V i iv V I
Fine
Pause
five seconds
Repeat
D. S. al Fine
(Pause fifteen seconds after the repetition.)
Number Six
Tonic Chord
Begin
(D Major)
V I IV IV IV I IV V I I6 IV I I V V I6 I V
Fine
Pause
five seconds
Repeat
D. S. al Fine
(Pause fifteen seconds after the repetition.)



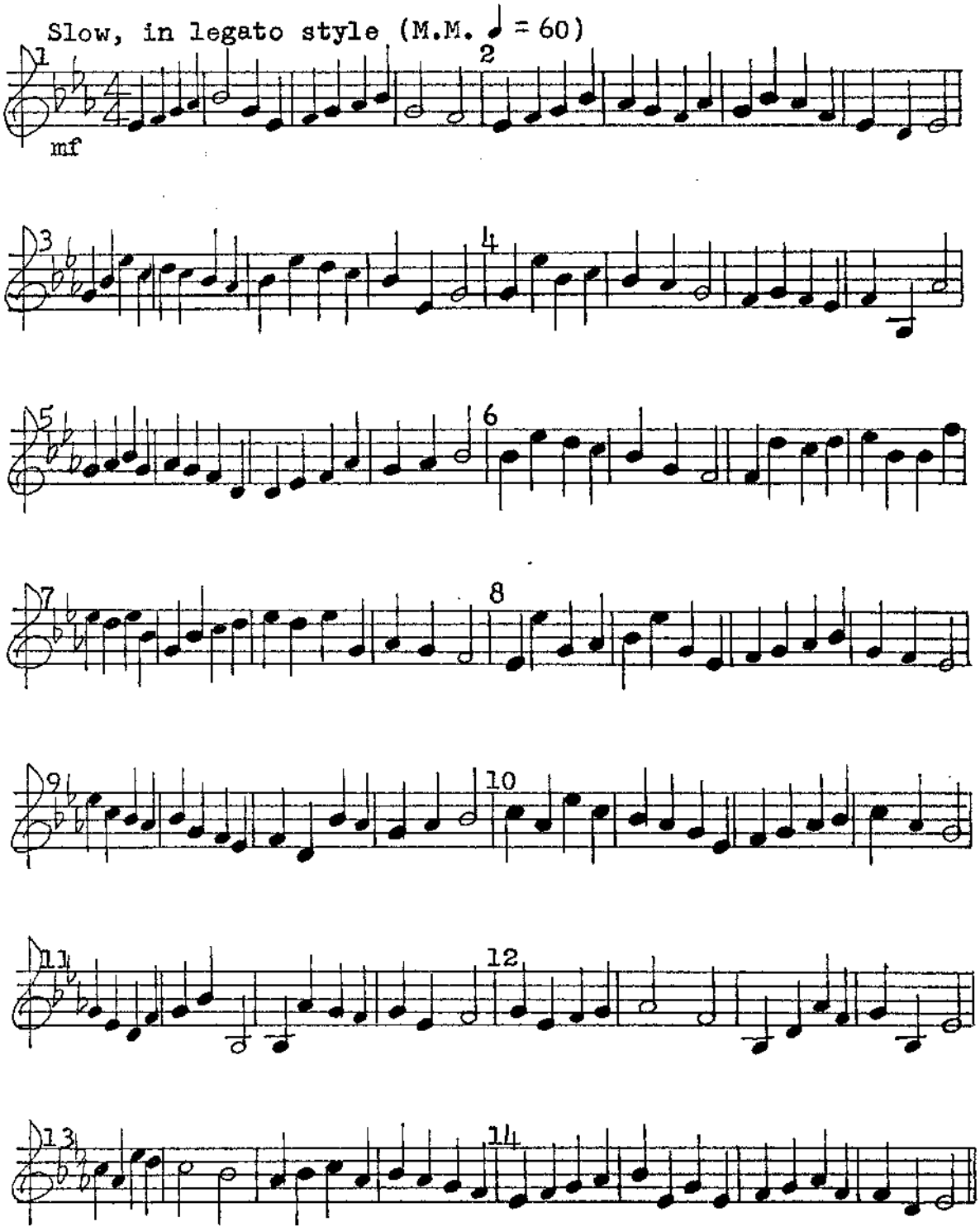
Stop. This concludes the dictation test. (This test required 17.5 minutes. The three dictation tests required forty-eight minutes.)

Transcript of Instructions for the Sight Singing Test

This is the sight singing examination you will be asked to perform. Look over the test silently for a few moments. (Each student was given thirty seconds to examine the copy of the test at this time.) Please sing the melody on "la" in a full voice. Sing slowly and evenly. Here is the tempo. (An electric metronome set at sixty beats per minute was turned on and allowed to operate ten seconds. The test administrator, who was seated at the piano, conducted two measures of four-four meter with the right hand and beat a duple background pattern with the left hand during the time the metronome operated.) You do not need to make a conductor's beat or tap the background. You will be graded only on accuracy in singing correct pitches. If you miss a note, the correct pitch will be given on the piano; sing the missed note correctly, and then continue performing the exercise. The beginning pitch will be given on the piano. (At this time the recording machine was turned on, and the student's name was spoken so that it would be recorded on the tape. The beginning pitch was sounded strongly on the piano, and the tempo was indicated again by a verbal count. When the student responded by singing the correct pitch and seemed to feel the tempo, he was told to begin singing. At the conclusion of the exercise each student was thanked for his cooperation in the research study.)

The Sight Singing Test as It Was Provided to the Students

SIGHT SINGING TEST



The Sight Singing Test Scoring Key

Each sight singing examination was scored aurally. The recording of each individual's performance provided a means for careful evaluation of each examination. During the test, errors in singing the notated pitches were corrected immediately after an incorrect pitch was sung. Slight errors in intonation were not considered wrong pitches, but gross errors were corrected at once at the keyboard. No written record of errors was kept during the actual performance of the examination. The recordings of the performances were scored on individual copies of the sight singing examination at a later time when the recordings were audited. Each student's name was placed at the top of a copy of the sight singing exercise, the tape recording was played, and the errors were indicated on the musical score. A written record of performance errors was transcribed from the tape recording to written notation.

The tape recording provided for very careful appraisal of each interval. Scoring errors resulting from faulty intonation being interpreted initially as incorrect pitches were reduced by auditing questionable portions of some performances several times. Each student's score was the sum of the interval errors on the examination. Each incorrectly sung pitch was counted as one error. A score of zero indicated a perfect performance.

Transcript of Instructions for the Part-Writing Test

This part-writing examination was designed to measure your ability to write alto and tenor voice parts to cadences and chord progressions where the bass and soprano lines and chord symbols are given. In this test you are asked to fill in the alto and tenor voice parts on cadences and a chorale-like progression using the part-writing rules you have studied in your music theory course. Observe proper doublings, voice ranges, chord positions, distance between adjacent voices, and the rules for connecting chords. All chords in the test are in root position. Observe the example carefully. In some cases there may be more than one possible solution. Any solution that follows the rules you have studied in your music theory course will be counted correct. Do not recopy the given bass and soprano notes; simply fill in the required alto and tenor voices. Use pencil for the test. This is a timed examination, so work quickly and accurately. You will be allowed twelve minutes to complete the exercises. You may turn the cover page and begin the test now.

The Part-Writing Test as It Was Provided to the Students

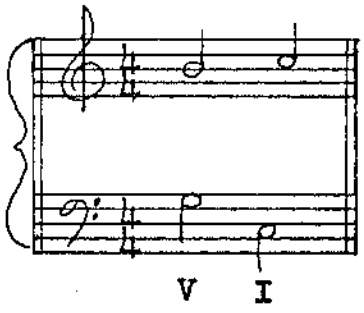
PART-WRITING TEST

Name _____
(First) (Last)

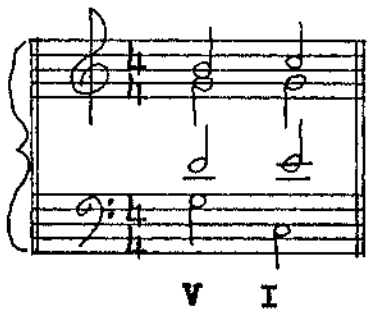
Instructions: Fill in alto and tenor voice parts on cadences and a chorale-like chord progression using the part-writing rules you have studied in your music theory courses. Observe proper doublings, voice ranges, chord positions, distance between adjacent voices, and the rules for connecting chords. All chords in this test are in root position.

Observe the examples carefully. Example A is a sample test item. Example B shows a correct solution as it would appear with the addition of the alto and tenor voice parts to Example A.

Example A



Example B



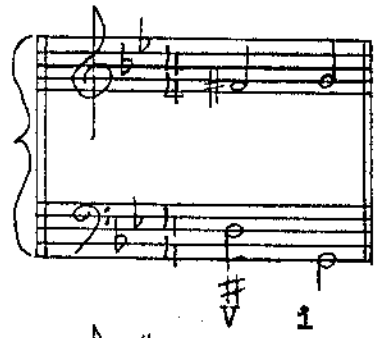
TURN THE PAGE

In some cases there may be more than one possible correct solution. Any solution that follows the rules you have studied in your music theory course will be counted correct.

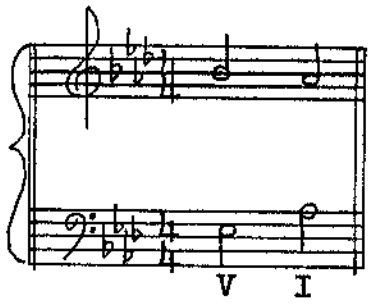
For each exercise the chord symbols are given, and for each chord the bass and soprano notes are given. You will not have to recopy the given bass and soprano notes in the exercises; simply fill in the required alto and tenor voices. Use pencil for the test. This is a timed test, so work quickly and accurately. You will be allowed twelve minutes to complete the exercises.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO BEGIN WORK.

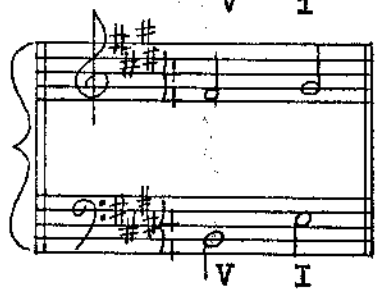
1.



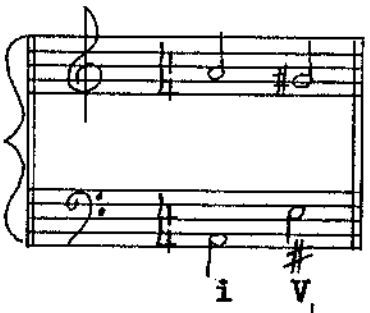
2.



3.



4.



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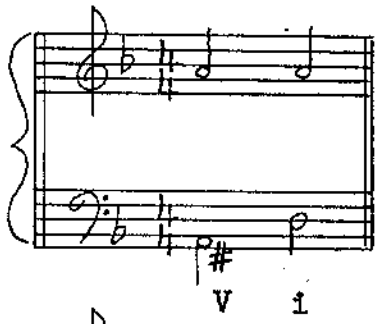

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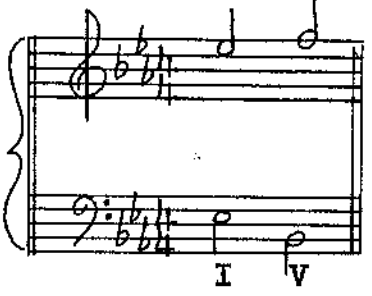
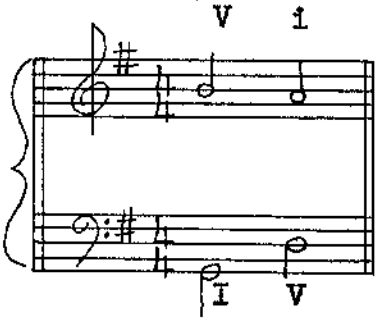
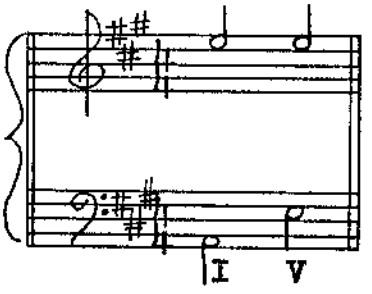


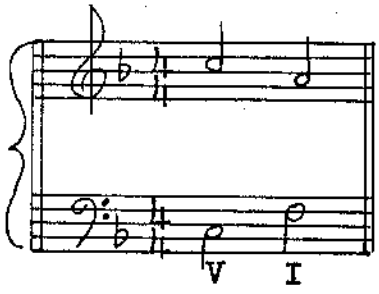
7.



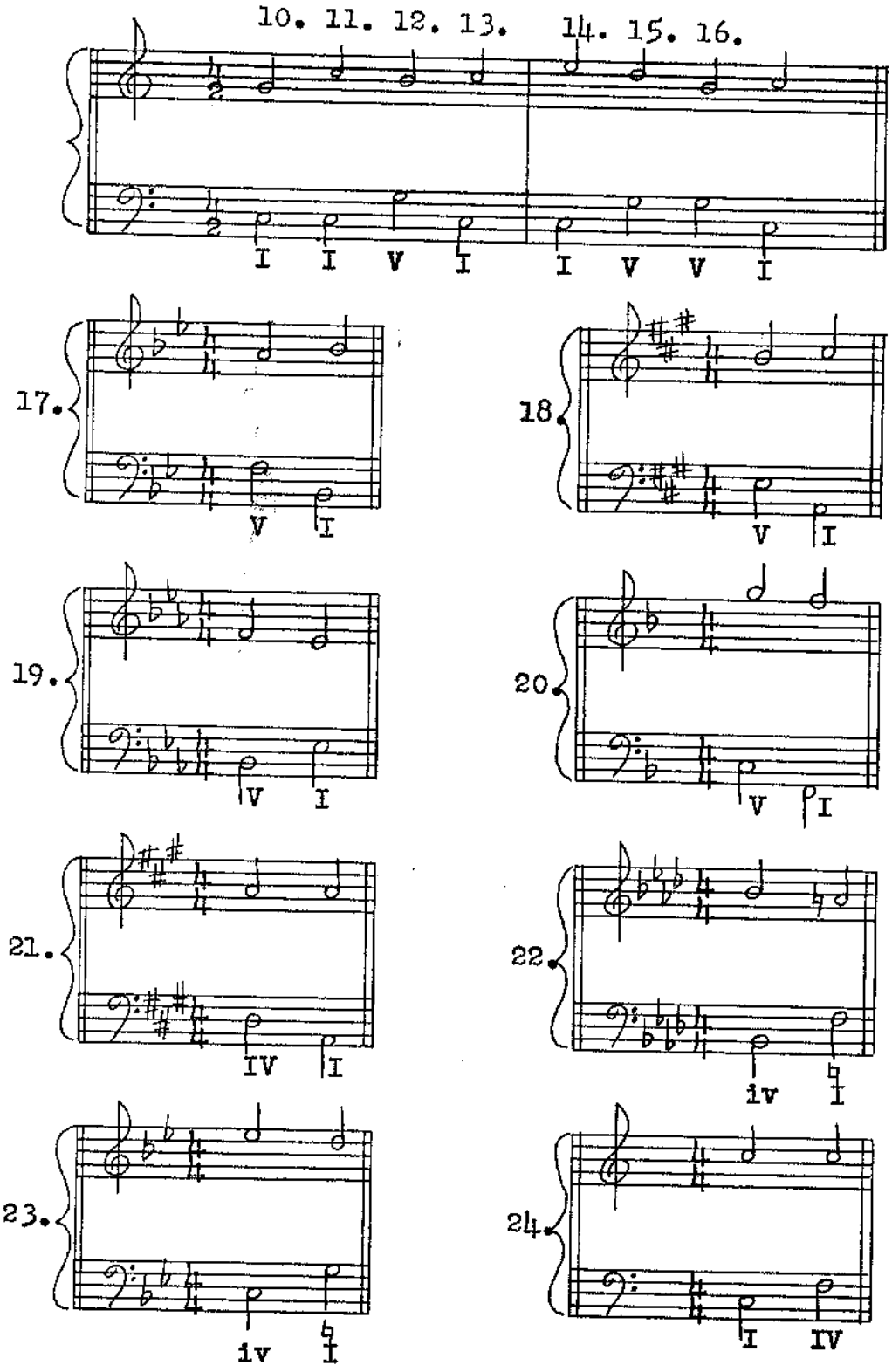
8.



9.



CONTINUE TO NEXT PAGE


10. 11. 12. 13. 14. 15. 16.
I I V I I V V I
17.
V I
18.
V I
19.
V I
20.
V I
21.
IV I
22.
iv I
23.
iv I
24.
I IV

The Part-Writing Test Scoring Key

Because the part-writing examination items were partially structured only, more than one correct solution was possible for some test questions. Each solution was scored objectively, however, since correct solutions were required to meet specific conditions. Solutions that met all of the criteria were counted correct; solutions that failed to meet all criteria were counted incorrect. Each solution was checked against the following criteria:

1. Both specified chords in each test item had to be spelled correctly in proper musical notation.

2. The doubling of tones in the chords had to comply with the rules specified in the textbook used in the music theory course. These specifications may be found on pages 268 and 269 of the 1961 edition of Elementary Harmony by Ottman.

3. The notes indicated for the alto and tenor voices had to lie within the ranges specified in the testbook used in the music theory course. These ranges may be found on page 268 of the 1961 edition of Elementary Harmony by Ottman.

4. Open or close position had to be maintained in each exercise except where a change of position was correct according to Rule 7 on page 270 of the 1961 edition of Elementary Harmony by Ottman.

5. The distance between adjacent voices in the three upper voices had to be no greater than one octave.

6. The movement of the voices in connecting chords, where chord changes were involved, had to comply with certain rules specified on page 269 of the 1961 edition of Elementary Harmony by Ottman. All chords had to be connected by one of the following rules: Rule 1, Rule 2A, Rule 2B, Rule 2C, or Rule 2D.

Transcript of Instructions for the Keyboard Recognition and Harmony Test

(Each student was provided an answer sheet, a miniature cardboard facsimile of a piano keyboard, and a copy of the examination items. The students were directed to keep the sheet of test items face down until they were told to turn the pages over and begin the test.)

The keyboard test you are about to take was designed to measure your ability to spell individual chords and cadences correctly and apply those spellings to the keyboard. Fourteen of the twenty-eight examination items specify a single particular chord to be performed. The chord to be performed is given; for example, the C major chord may be required in one of the items. Some of the chords are to be performed with the root in the bass, while other chords are to be performed in first or second inversion; the bass note is specified in each examination item. Also, the triad member--root, third, or fifth--to be performed as the soprano note is specified in each item. The remaining fourteen test items are seven cadences. The type of cadence in a particular key is specified, and the soprano line is given.

The procedure to follow in taking the test is quite simple. First, before we begin, write your name on the answer sheet in the space provided. Be sure you use pencil. (There was a pause for this to be done.) Now, place your

answer sheet so that the lines on the sheet run left to right. (The position was demonstrated at this time.) Take the keyboard and place it on top of the answer sheet so that the bottom edge of the keyboard lines up with the top line on the answer sheet. The little arrows on the ends of the keyboard should point to the two figures on the answer sheet. Be sure both question numbers show. The keyboard and answer sheet are now in the correct position for examination item one. To move on to the next test items, simply move or slide the keyboard down one line at a time. Notice that the first fourteen questions are to be answered on the front of the answer sheet, and the last fourteen questions are to be answered on the back of the answer sheet. (Both sides of the answer sheet were shown at this time.) To indicate your solution to each test item, mark an "X" on the answer sheet through the holes in the keys which would be played to produce the required chord. (The marking of a C major chord with root in the bass and the fifth in the soprano was demonstrated at this time.) The completed answer sheet will look like a meaningless set of "X" marks acattered about the page. Do not be concerned about this. If your keyboard is properly placed for each of your answers, the scoring key will translate the position of your marks into meaningful patterns.

Be sure to observe the rules for correct doubling. Each chord must have four tones. For convenience, the chords and cadences should be played in close position with the right hand performing the three upper tones of the chord. Follow part-writing rules in performing the cadences. Use two answer lines for each cadence. Use one line for the first chord, and use the following line for the last chord of the cadence.

This is a timed test, so work quickly and accurately. The test will last twelve minutes. Are there any questions? Turn the sheet of test items over and begin work. (At the end of twelve minutes the students were directed to stop work, and their papers were collected.)

The Keyboard Recognition and Harmony Test as It Was Provided to the Students

KEYBOARD RECOGNITION AND HARMONY TEST

Line up the base of your keyboard with the long lines on your answer sheet. Place "X" marks on the answer sheet through the holes in the keyboard to indicate which keys should be played in performing the keyboard harmony exercises below. Each chord must have four notes. Perform one note with the left hand and three notes with the right hand. Move the keyboard down one space for each chord. This is a timed test, so work quickly.

1. A flat major chord with root in bass and root in soprano.
2. E major chord with root in bass and fifth in soprano.
3. G flat major chord with root in bass and third in soprano.
4. B major chord with root in bass and third in soprano.
5. A major chord with root in bass and root in soprano.
6. C minor chord with root in bass and fifth in soprano.
7. F sharp minor chord with root in bass and third in soprano.
8. G minor chord with root in bass and root in soprano.
9. B minor chord with root in bass and fifth in soprano.
10. F minor chord with root in bass and root in soprano.
11. First chord } Perfect authentic cadence in D major
12. Second chord } (7-8 soprano line).

13. First chord } Perfect authentic cadence in B flat
14. Second chord } major (2-1 soprano line).

15. First chord } Perfect authentic cadence in E flat
16. Second chord } minor with major dominant (7-8 soprano line).

17. First chord } Imperfect authentic cadence in G major
18. Second chord } (5-3 soprano line).

19. First chord } Authentic half cadence in A flat minor
20. Second chord } with major dominant (1-7 soprano line).

21. First chord } Perfect plagal cadence in C minor
22. Second chord } (1-1 soprano line).

23. First chord } Imperfect plagal cadence in F major
24. Second chord } (6-5 soprano line).

25. D minor chord in first inversion with root in soprano.

26. C sharp major chord in second inversion with root in soprano.

27. B flat major chord in second inversion with third in soprano.

28. F minor chord in first inversion with fifth in soprano.

The Keyboard Recognition and Harmony Test Scoring Key

Because the Keyboard Recognition and Harmony Test items were only partially structured, more than one correct solution was possible for some test exercises. Each solution was scored objectively, however, since correct solutions were required to meet specific conditions. Answers that met all of the criteria were counted correct; answers that failed to meet all the criteria were counted incorrect. Each solution was checked against the following criteria:

1. The specified chords had to be spelled correctly in terms of keyboard keys indicated, and each chord had to contain four notes.

2. The required bass and soprano notes when given in an exercise had to be observed strictly.

3. The doubling of triad tones had to comply with the rules specified in the textbook used in the music theory course. These rules may be found on pages 268 and 269 of the 1961 edition of Elementary Harmony by Ottman.

4. Open or close position had to be maintained in the cadence exercises as specified in the 1961 edition of Elementary Harmony by Ottman.

5. The voice movement in the cadence exercises had to comply with the part-writing rules specified in the first ten chapters of the 1961 edition of Elementary Harmony by Ottman.

Transcript of Instructions for the Fundamentals Test

The test you now have is a test of music fundamentals. One section deals with scale construction. You are asked to place accidentals to make certain scales. Notes are written on the staff, but no key signatures or accidentals are put in place. Do not put in key signatures; place accidentals only, both ascending and descending to make the scales. Do not indicate naturals; all notes on the examination will be considered naturals unless they are marked with a sharp or a flat.

The second section of the examination asks you to write certain key signatures. Each specified signature should be written in the clef indicated.

In the third section you are asked to write certain notes in the treble, bass, alto, and tenor clefs. You are asked to write two specific notes in each clef.

The fourth section of the test asks you to spell triads on the staff. The type of triad is given, and one tone is specified.

The last section of the test asks you to write certain intervals either upward or downward from given notes.

As you take the test, read the instructions for each section. This is a timed test, so work quickly. You will have twelve minutes to work. Are there any questions? Turn the examination over and begin.

The Fundamentals Test as It Was Provided to the Students

FUNDAMENTALS TEST

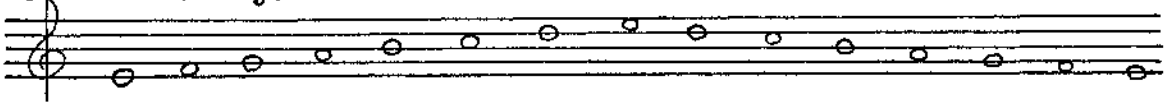
Name_____
(Last) (First)

The total time allowed for the entire test is twelve minutes.

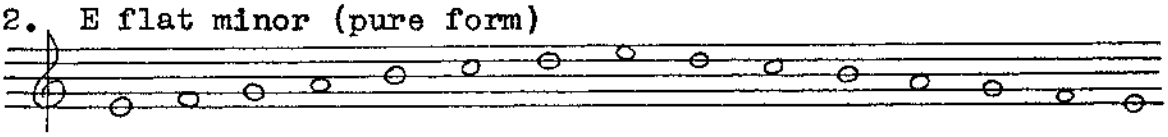
Part I

Place accidentals to make the indicated scales. Do NOT use a key signature. Place the accidentals both ascending and descending. You need not indicate naturals; all notes not marked with a sharp or a flat will be counted as naturals.

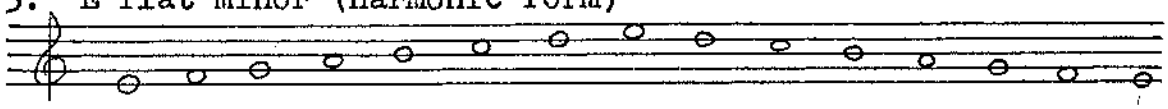
1. E flat major



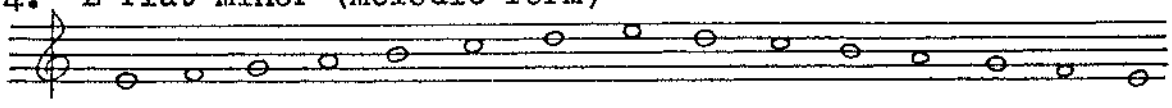
2. E flat minor (pure form)



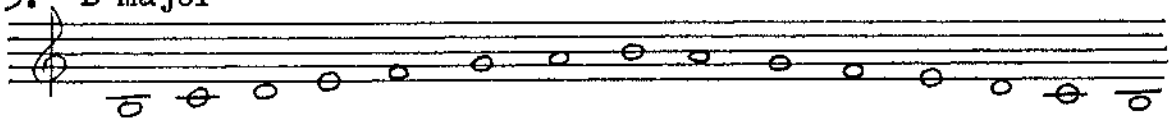
3. E flat minor (harmonic form)



4. E flat minor (melodic form)

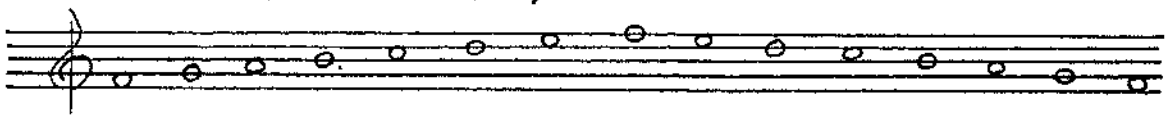


5. B major

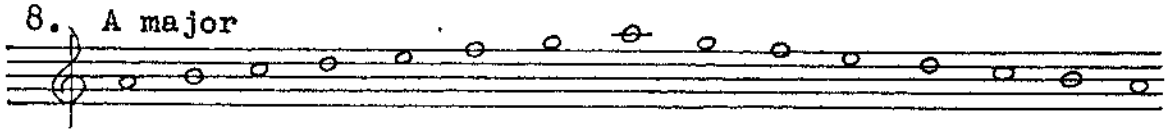


6. B minor (melodic form)

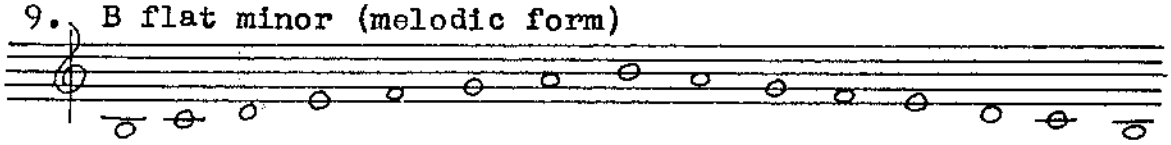
7. F minor (harmonic form)



8. A major



9. B flat minor (melodic form)

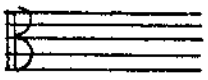


10. E minor (pure form)

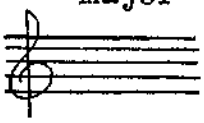
Part II

Write the indicated key signatures in the clef provided.

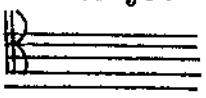
1. D major



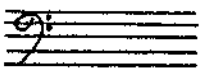
2. A flat major



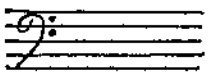
3. B flat major



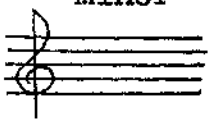
4. E major



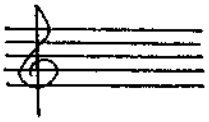
5. G flat major



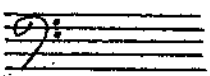
6. F sharp minor



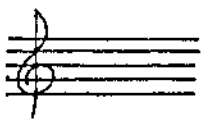
7. G minor



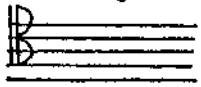
8. G major



9. F major

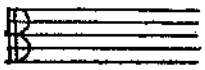


10. D flat major



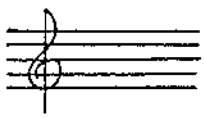
11. F minor

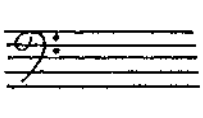
12. D minor

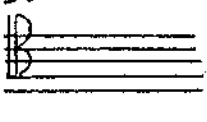


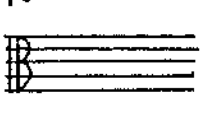
Part III

Write the notes F sharp and B flat in each clef.

1. 

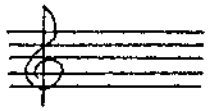
2. 

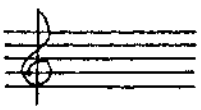
3. 

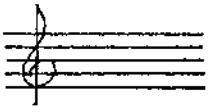
4. 

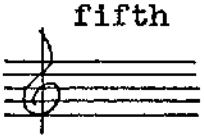
Part IV

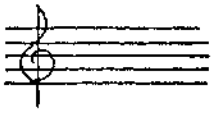
Spell the required triads on the staff. The type of chord and one triad tone is given.

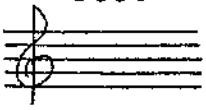
1. Major, G root 

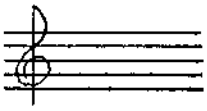
2. Minor, E third 

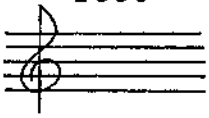
3. Minor, A flat fifth 

4. Major, F sharp fifth 

5. Major, F third 

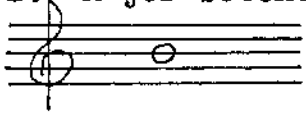
6. Minor, D flat root 

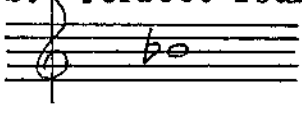
7. Minor, B root 

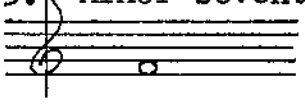
8. Major, G flat root 

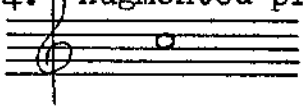
Part V

Place one note on the staff to produce the required interval. The intervals must be constructed from the given tone. The direction from the given tone is indicated.

1. Major second up 

2. Perfect fourth down 

3. Minor seventh up 

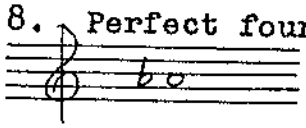
4. Augmented prime up 

5. Augmented second up

6. Augmented fourth down

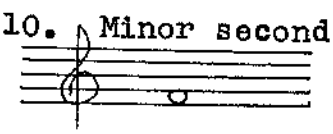
7. Diminished fifth up

8. Perfect fourth up

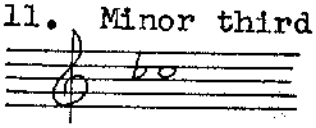


9. Major seventh down

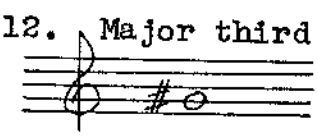
10. Minor second up



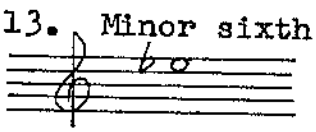
11. Minor third down



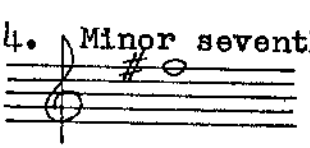
12. Major third up



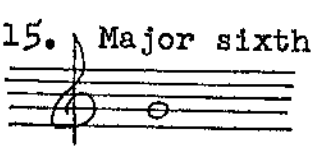
13. Minor sixth down



14. Minor seventh down



15. Major sixth up



Go back and check your work.

The Fundamentals Test Scoring Key

FUNDAMENTALS TEST

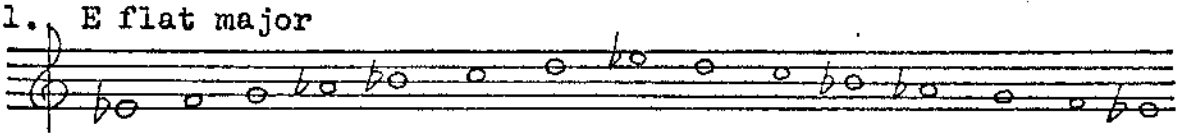
Name_____
(Last) (First)

The total time allowed for the entire test is twelve minutes.

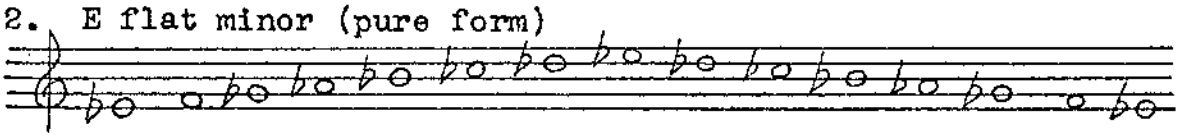
Part I

Place accidentals to make the indicated scales. Do NOT use a key signature. Place the accidentals both ascending and descending. You need not indicate naturals; all notes not marked with a sharp or a flat will be counted as naturals.

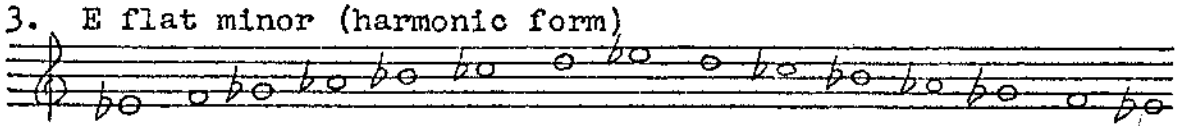
1. E flat major



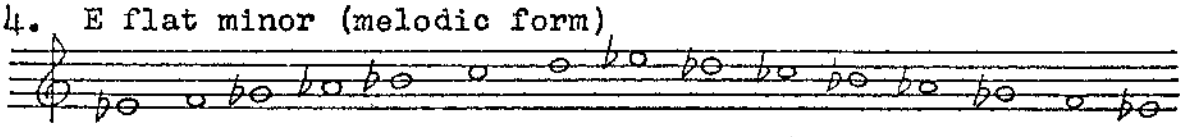
2. E flat minor (pure form)



3. E flat minor (harmonic form)



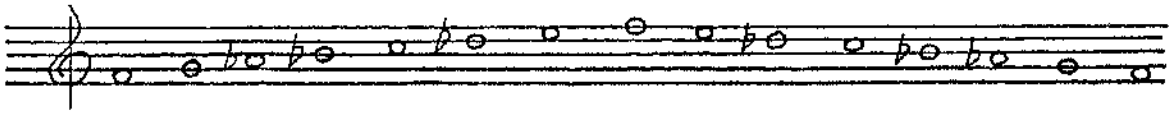
4. E flat minor (melodic form)



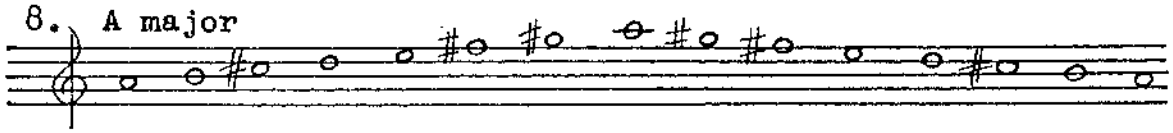
5. B major

6. B minor (melodic form)

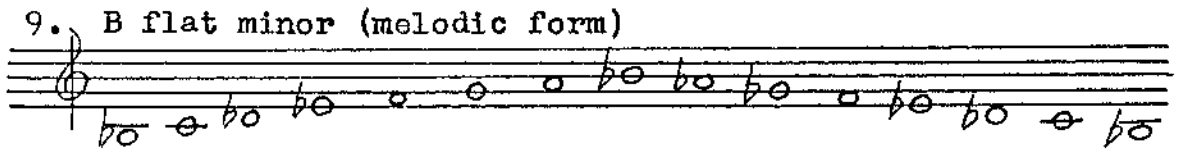
7. F minor (harmonic form)



8. A major



9. B flat minor (melodic form)

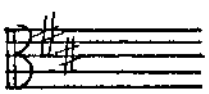


10. E minor (pure form)

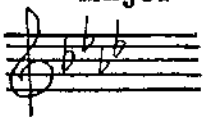
Part II

Write the indicated key signatures in the clef provided.

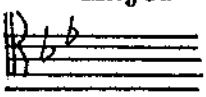
1. D major



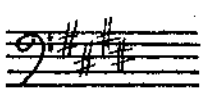
2. A flat major



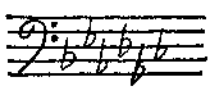
3. B flat major



4. E major



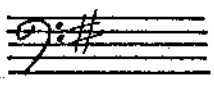
5. G flat major



6. F sharp minor

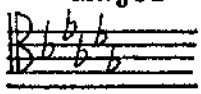
7. G minor

8. G major

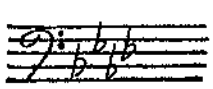


9. F major

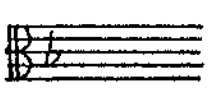
10. D flat major



11. F minor

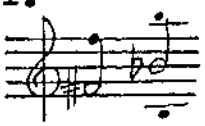


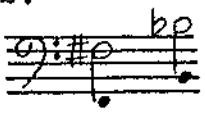
12. D minor

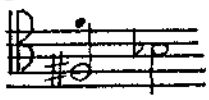


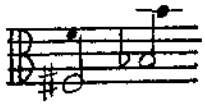
Part III

Write the notes F sharp and B flat in each clef.

1. 

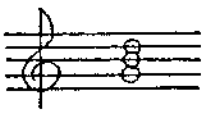
2. 

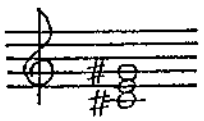
3. 

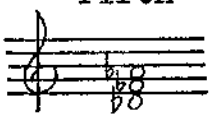
4. 

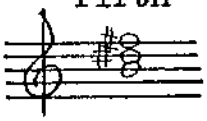
Part IV

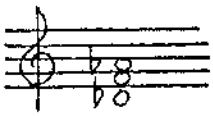
Spell the required triads on the staff. The type of chord and one triad tone is given.

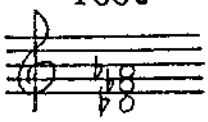
1. Major, G root 

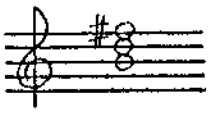
2. Minor, E third 

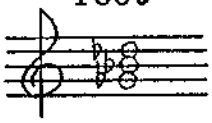
3. Minor, A flat fifth 

4. Major, F sharp fifth 

5. Major, F third 

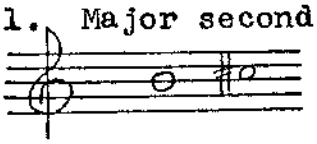
6. Minor, D flat root 

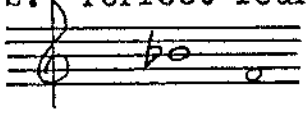
7. Minor, B root 

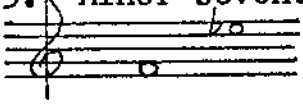
8. Major, G flat root 

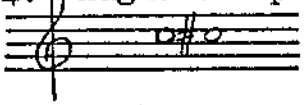
Part V

Place one note on the staff to produce the required interval. The intervals must be constructed from the given tone. The direction from the given tone is indicated.

1. Major second up 

2. Perfect fourth down 

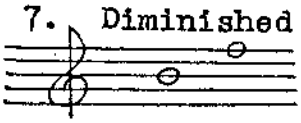
3. Minor seventh up 

4. Augmented prime up 

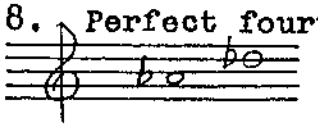
5. Augmented second up

6. Augmented fourth down

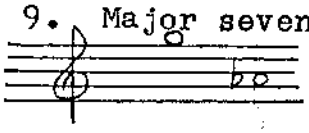
7. Diminished fifth up



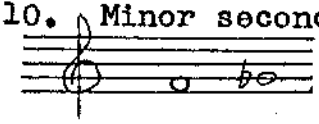
8. Perfect fourth up



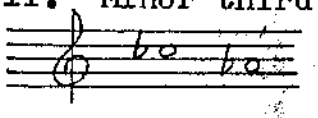
9. Major seventh down



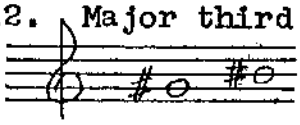
10. Minor second up



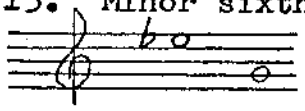
11. Minor third down



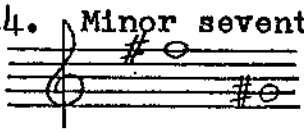
12. Major third up



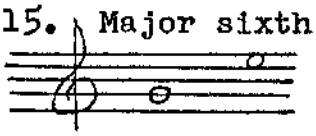
13. Minor sixth down



14. Minor seventh down



15. Major sixth up



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BIBLIOGRAPHY

Books

Aliferis, James, Aliferis Achievement Test Manual (College Entrance Level), Minneapolis, University of Minnesota Press, 1954.

Allen, Robert M., Psychological Tests and Measurements, Coral Gables, Florida, University of Miami Press, 1955.

Anastasi, Anne, Psychological Testing, New York, Macmillan Company, 1954.

Blommers, Paul and E. F. Lindquist, Elementary Statistical Methods, Boston, Houghton Mifflin Company, 1960.

Buros, Oscar Krisen, editor, The Fifth Mental Measurements Yearbook, Highland Park, New Jersey, The Gryphon Press, 1959.

_____, editor, The Fourth Mental Measurements Yearbook, Highland Park, New Jersey, The Gryphon Press, 1953.

_____, editor, The Third Mental Measurements Yearbook, New Brunswick, Rutgers University Press, 1949.

Cronbach, Lee J., Essentials of Psychological Testing, New York, Harper and Brothers, 1960.

Drake, Raleigh M., Manual for the Drake Musical Aptitude Tests, 2nd ed., Chicago, Illinois, Science Research Associates, 1957.

Garrett, Henry E., Statistics in Psychology and Education, New York, Longmans, Green and Company, 1959.

Hindemith, Paul, Elementary Training for Musicians, New York, Associated Music Publishers, Inc., 1946.

Kwalwasser, Jacob, Exploring the Musical Mind, New York, Coleman-Ross Company, 1955.

Kwalwasser, Jacob and Peter W. Dykema, Kwalwasser-Dykema Music Tests, Manual of Directions, New York, Carl Fischer, Inc., 1930.

Laas, Bill and Fred Weber, Fun With Fundamentals, First Division Band Course, Rockville Centre, Long Island, New York, Belwin Inc., 1963.

Lindquist, E. F., A First Course in Statistics, Cambridge, Massachusetts, Houghton Mifflin Company, 1942.

Lundin, Robert W., An Objective Psychology of Music, New York, The Ronald Press Company, 1953.

McNemar, Quin, Psychological Statistics, New York, John Wiley and Sons, Inc., 1959.

Monroe Calculating Machine Methods General Statistics, Orange, New Jersey, Monroe Calculating Machine Company, Inc., 1960.

Mursell, James L., The Psychology of Music, New York, W. W. Norton and Co., Inc., 1937.

Mursell, James L. and M. Glenn, The Psychology of School Music Teaching, Boston, Silver Burdett and Company, 1931.

North Texas State College, Catalog 1961-1962, Bulletin No. 323, Denton, Texas, North Texas State College, 1961.

North Texas State University, Catalog 1962-1963, Bulletin No. 332, Denton, Texas, North Texas State University, 1962.

Ottman, Robert William, Elementary Harmony, Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1961.

_____, Music for Sight Singing, Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1956.

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

Seashore, Carl E., Psychology of Music, New York, McGraw-Hill Book Company, Inc., 1938.

_____, The Psychology of Musical Talent, New York, Silver Burdett Company, 1919.

Schoen, Max, The Psychology of Music, New York, The Ronald Press Company, 1940.

Spearman, C. E., Abilities of Man, New York, Macmillan Company, 1927.

Thorndike, Robert L., Personnel Selection, New York, John Wiley and Sons, Inc., 1949.

Wing, Herbert D., Manual for Standardised Tests of Musical Intelligence, London, England, National Foundation for Educational Research, 1960.

Wood, Dorothy Adkins, Test Construction, Columbus, Ohio, Charles E. Merrill Books, Inc., 1960.

Articles

Aliferis, James and J. E. Stecklein, "The Development of a College Entrance Test in Music Achievement," Journal of Research in Music Education, I (Fall, 1953), 83-96.

American Psychological Association, "Technical Recommendations for Psychological Tests and Diagnostic Techniques," Psychological Bulletin, Vol. LI (March, 1954), Supplement No. 2, Part 2.

Beinstock, S. F., "A Predictive Study of Musical Achievement," Journal of Genetic Psychology, LXI (September, 1942), 135-145.

Brown, A. W., "The Reliability and Validity of the Seashore Tests of Musical Talent," Journal of Applied Psychology, XII (October, 1928), 468-476.

Burt, C., "Review of Publications Recently Received: Tests of Musical Ability and Appreciation by Herbert Wing," British Journal of Psychology, General Section, XXXIX (December, 1948), 112-113.

Chadwick, J. Elbert, "Predicting Success in Sight Singing," Journal of Applied Psychology, XVII (December, 1933) 671-674.

Drake, Raleigh M., "The Validity and Reliability of Tests of Musical Talent," Journal of Applied Psychology, XVII (August, 1933), 447-458.

Farnsworth, Paul R., "Are Music Tests More Important Than Intelligence Tests in the Prediction of Several Types of Music Grades?" Journal of Applied Psychology, XIX (June, 1935), 347-350.

_____, "An Historical, Critical, and Experimental Study of the Seashore-Kwalwasser Test Battery," Genetic Psychology Monograph, IX (May, 1931), 291-393.

Highsmith, J. A., "Selecting Musical Talent," Journal of Applied Psychology, XIII (October, 1929), 486-493.

Holmes, J. A., "Increased Reliabilities, New Keys, and Norms for a Modified Kwalwasser-Dykema Test of Musical Aptitude," Journal of Genetic Psychology, LXXXV (September, 1954), 65-73.

Lehman, Charles F., "A Comparative Study of Instrumental Musicians on the Basis of the Otis Intelligence Test, The Kwalwasser-Dykema Music Test, and the Minnesota Multiphasic Personality Inventory," Journal of Educational Research, XLIV (September, 1950), 57.

_____, "An Investigation of Musical Achievement and Its Relationship to Intelligence and Musical Talent," Journal of Educational Research, XLV (April, 1952), 623.

McCarthy, D., "A Study of the Seashore Measures of Musical Talent," Journal of Applied Psychology, XIV (October, 1930), 437-455.

Manzer, Charles W. and Samuel Morowitz, "The Performance of a Group of College Students on the K-D Tests," Journal of Applied Psychology, XIX (June, 1935), 331-348.

More, Grace Van Dyke, "Prognostic Testing in Music on the College Level," Journal of Educational Research, XXVI (November, 1932), 199-212.

"Motivation Tests," News, Notes, and Quotes, The Newsletter of Phi Delta Kappa Fraternity, VI (August, 1961), 6, citing the "Newsletter" of Alpha Psi Campus Chapter of Phi Delta Kappa Fraternity, University of Buffalo, Buffalo, New York.

Mursell, James L., "Intelligence and Musicality," Education, LIX (May, 1939), 559-562.

_____, "Measuring Musical Ability and Achievement: A Study of the Correlations of the Seashore Test Scores and Other Variables," Journal of Educational Reasearch, XXV (February, 1932), 116-126.

_____, "What About Music Tests?" Music Educators Journal, XXIV (October, 1937), 16-18.

Newton, G., Selection of Junior Musicians for Royal Marine School of Music: An Evaluation of H. D. Wing's Test, London, England, Senior Psychologist's Department, British Admiralty, 1959, cited by Herbert D. Wing, "A Revision of the Wing Musical Aptitude Tests," Journal of Research in Music Education, X (Spring, 1962), 39-46.

Pflederer, Marilyn, "The Nature of Musicality," Music Educators Journal, XLIX (June-July, 1963), 49-52.

"Recommendations in Theory, Music History, and Literature," Bulletin of the National Association of Schools of Music, XLV (January, 1958), 1-7.

Roby, A Richard, "A Study in the Correlation of Music Theory Grades with the Seashore Measures of Musical Talents and the Aliferis Music Achievement Tests," Journal of Research in Music Education, X (Fall, 1962), 137-142.

Salisbury, F. S. and H. R. Smith, "Prognosis of Sight Singing Ability of Normal School Students," Journal of Applied Psychology, XIII (October, 1929), 425-439.

Taylor, Elizabeth M., "A Study of the Prognosis of Musical Talent," Journal of Experimental Education, X (September, 1941), 1-28.

Tilson, L. M., "Music Talent Tests for Teacher-Training Purposes," Music Supervisors Journal, XVIII (February, 1932), 26.

Whitley, M. T., "A Comparison of the Seashore and K-D Tests," Teachers College Record, VIII (May, 1932), 731-751.

Wing, Herbert D., "A Revision of the Wing Musical Aptitude Test," Journal of Research in Music Education, X (Spring, 1962), 39-46.

_____, "A Revision of the Wing Musical Aptitude Tests," Journal of Research in Music Education, X (Spring, 1962), 44, citing R. Cleak, "A Study of Musical Aptitudes in Children in a Secondary School," unpublished diploma in education thesis, Department of Education, University of Bristol, Bristol, England, 1958.

_____, "A Revision of the Wing Musical Aptitude Test," Journal of Research in Music Education, X (Spring, 1962), 39, citing Papesch, a music teacher in New Zealand, source not indicated.

Wright, F. A., "The Correlation Between Achievement and Capacity in Music," Journal of Educational Research, XVII (January, 1928), 50-56.

Reports

Saetveit, J. G., D. Lewis and C. E. Seashore, "Revision of the Seashore Measures of Musical Talents," University of Iowa Studies, Aims and Progress of Research, University of Iowa, Iowa City, Iowa, 1940.

Stanton, Hazel M., "Measurement of Music Talent: the Eastman Experiment," University of Iowa Studies in the Psychology of Music, Vol. II, University of Iowa, Iowa City, Iowa, 1935.

Publications of Learned Organizations

Larson, William S., compiler, Bibliography of Research Studies in Music Education 1932-1948, Chicago, Illinois, The Music Education Research Council of the Music Educators National Conference, National Education Association, 1949.

_____, compiler, Bibliography of Research Studies in Music Education 1949-1956, Washington, D. C., The Music Education Research Council of the Music Educators National Conference, National Education Association, 1957.

National Association of Schools of Music, Bylaws and Regulations, Galesburg, Illinois, National Association of Schools of Music, 1953.

Thorpe, Louis P., "Learning Theory and Music Teaching," Basic Concepts in Music Education, Fifty-seventh Yearbook of the National Society for the Study of Education, Part I, Chicago, National Society for the Study of Education, 1958.

Wing, Herbert D., "Tests of Musical Appreciation: An Investigation into the Measurement, Distribution, and Development of Musical Capacity," British Journal of Psychology Monograph Supplements, Vol. VIII, No. 27, Cambridge University Press, 1948.

Encyclopedia Articles

Larson, William S., "Kwalwasser-Dykema Music Tests," The Third Mental Measurements Yearbook, Oscar K. Buros, editor, New Brunswick, Rutgers University Press, 1949.

Lundin, Robert W., "Drake Musical Aptitude Tests," The Fifth Mental Measurements Yearbook, Oscar K. Buros, editor, Highland Park, New Jersey, The Gryphon Press, 1959.

McLeish, John, "Wing Standardised Tests of Musical Intelligence," The Fourth Mental Measurements Yearbook, Oscar K. Buros, editor, Highland Park, New Jersey, The Gryphon Press, 1953.

Mainwaring, James, "Drake Musical Aptitude Tests," The Fifth Mental Measurements Yearbook, Oscar K. Buros, editor, Highland Park, New Jersey, The Gryphon Press, 1959.

Wing, Herbert D., "Aliferis Music Test," The Fifth Mental Measurements Yearbook, Oscar K. Buros, editor, Highland Park, New Jersey, The Gryphon Press, 1959.

Tests

Drake, Raleigh M., Drake Musical Aptitude Tests, Chicago, Illinois, Science Research Associates, Inc., 1954.

Gordon, Roderick D., Gordon Index of Musical Insight, Denton, Texas, North Texas State University Press, 1960.

Mainous, Frank D. and Robert W. Ottman, Freshman Placement Theory Examination, Denton, Texas, North Texas State University Press, 1957.

Otis, Arthur S., Otis Quick-Scoring Mental Ability Tests, Yonkers-on-Hudson, New York, World Book Company, 1937.

Seashore, Carl E., Seashore Measures of Musical Talent, Chicago, Illinois, C. H. Stoelting and Company, 1919.

Seashore, Carl E., D. Lewis and J. G. Saetveit, Seashore Measures of Musical Talents, rev. ed., Camden, New Jersey, Department of Education, RCA Manufacturing Company, 1939.

Wing, Herbert D., Standardised Tests of Musical Intelligence, 5th ed., London, England, National Foundation for Educational Research in England and Wales, 1961.

Unpublished Materials

Bentley, Richard R., "A Critical Comparison of Certain Musical Aptitude Tests," unpublished doctoral dissertation, School of Music, University of Southern California, Los Angeles, California, 1956.

Christy, Leo John, "A Study of the Relationship Between Musicality, Intelligence and Achievement," unpublished doctoral dissertation, School of Music, Indiana University, Bloomington, Indiana, 1956.

Gordon, Roderick Dean, "GIMI: A Measure of Musical Insight," unpublished paper read before the Research Council of the Music Educators National Conference Convention, Atlantic City, New Jersey, March, 1960.

_____, "GIMI: A Measure of Musical Insight," unpublished test manual, Department of Music Education, School of Fine and Applied Arts, Boston University, Boston, Massachusetts, June 19, 1963.

_____, unpublished class lecture presented as a part of course Music 512, "Applied Research in Music Education," School of Music, North Texas State University, Denton, Texas, June, 1960.

Gray, John Justin, "Subject Matter Testing Practices in State University Music Education Curricula," unpublished doctoral dissertation, School of Music, University of Southern California, Los Angeles, California, 1960.

Jenkins, Thomas V., "A Study of the Relationship Between Music Aptitudes and Mental Ability, Science Aptitudes, and Mathematics Aptitudes Among Secondary School Pupils in Texas," unpublished doctoral dissertation, School of Education, University of Texas, Austin, Texas, 1960.

Langsford, Harry Marble, "An Experimental Study of the Effect of Practice Upon Improvement in Melodic Dictation," unpublished doctoral dissertation, School of Music, Michigan State University, East Lansing, Michigan, 1959.

Neely, James Kilford, "An Evaluation of Tests Given to Interrelate Intelligence, Aural Acuity and Musical Achievement for Purposes of Prognosis in Ear-Training," unpublished doctoral dissertation, School of Music, Northwestern University, Evanston, Illinois, 1959.

Ottman, Robert William, "A Statistical Investigation of the Influence of Selected Factors on the Skill of Sight Singing," unpublished doctoral dissertation, School of Music, North Texas State College, Denton, Texas, 1955.

Poland, Bernard William, "An Investigation of Some Aural and Notational Elements in Music Theory," unpublished doctoral dissertation, School of Music, Ohio State University, Columbus, Ohio, 1960.

Schlesser, George E. and John A. Finger, "Preliminary Information on the Interpretation of the Personal Values Inventory," unpublished syllabus, School of Education, Colgate University, Hamilton, New York, October, 1961.

Schmitz, Sylvester M., "An Investigation of the Prognostic Value of the Revised Seashore Tests and the Kwalwasser-Ruch Test of Musical Accomplishment for Academic Success in a Music Education Program," unpublished doctoral dissertation, School of Music, Northwestern University, Evanston, Illinois, 1956.

"Theory," unpublished syllabus, School of Music, North Texas State University, Denton, Texas, 1961.

Wheeler, Ronald W., Jr., "A Study in the Measurement of Musical Aptitude," unpublished doctoral dissertation, School of Music, University of Oklahoma, Norman, Oklahoma, 1959.