

UNIVERSITY OF CINCINNATI

August 29, 1953

I hereby recommend that the thesis prepared under my supervision by ALBERT GOODWIN THOMSON

entitled AN ANALYSIS OF DIFFICULTIES IN SIGHT READING

MUSIC FOR VIOLIN AND CLARINET

be accepted as fulfilling this part of the requirements for the degree of DOCTOR OF EDUCATION

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AN ANALYSIS OF DIFFICULTIES IN
SIGHT READING MUSIC FOR VIOLIN AND CLARINET

A dissertation submitted to
The Graduate Faculty of the Teachers College
of the University of Cincinnati
in partial fulfillment of the
requirements for the degree of

DOCTOR OF EDUCATION

1953

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ACKNOWLEDGMENT

The writer wishes to express appreciation to his advisory committee, Dr. Gordon Hendrickson, chairman, Dr. Harold W. See, and Dr. Robert D. Price, for their discerning criticism and valuable guidance in the preparation of this dissertation.

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CHAPTER I

THE PROBLEM

In general terms, the purpose of this study was to make an exploratory investigation of the errors made by performers on orchestral instruments in sight reading in music. More narrowly, the purpose was to determine the errors made by violinists and clarinetists, of four levels of performing ability, on a specially prepared sight-reading test.

The specific objectives of the study may be stated as follows:

1. To analyze and compare the errors made in four phases of performance; namely, the playing of accidentals, key, pitch, and rhythm.
2. To analyze and compare the errors made in playing each specific category of the four phases of performance.
3. To analyze and compare the errors made by performers at four levels of performing ability.
4. To analyze and compare the errors made by violinists and clarinetists.
5. To analyze and compare the errors made in rhythmic groups and intervals.

Significance of this Investigation

This investigation has significance primarily for the field of music education. More specifically, it presents data concerning errors made in sight reading in music, thus permitting possible diagnosis of reading difficulties, which will contribute to economy of time in remedial teaching. It provides information on the basis of which teaching material can be logically

organized for instrumental instruction. In addition, it offers criteria for measurement of the effectiveness of teaching methods. It points to a method of selection of personnel through rankings based on the number of sight-reading errors made by instrumental performers.

Because this study deals with the learning process in music, it also has some significance for the field of psychology. In this respect, it deals with such problems as measurement of growth in sight-reading ability, measurement of performance in music, and discovery of individual differences among instrumental performers.

Derivation of the Problem

This study was suggested, in part, by the experience of the writer, and, in part, by earlier investigations in music and reading.

The writer has long observed that many students who come to college for the purpose of majoring in music have lacked preparation of a type which would make them literate in their chosen field. It has been evident that students encountered difficulty in the sight reading of music, but diagnostic tests were not available for locating the particular musical elements causing the difficulty. Specialized individual aid is seriously hindered when such important facts are lacking. It could easily be possible that the instruction, intended to remedy difficulties in reading music, might ignore the most common errors. Thus, the present study was planned to provide evidence on the errors that are often made by instrumental students.

This problem was also suggested by unsettled questions left in earlier investigations, both on the reading of music and on reading in

general. Studies in the field of performance testing in instrumental music, such as those by Bean,¹ Stelzer,² and Watkins,³ which are explored more fully in Chapter II, did not include one or more of the following vital elements: detailed analysis of errors, comparison of instruments, provision for various levels of performance of subjects, and provision for musical nature of the test material. In 1950, Hendrickson and Stratemeyer⁴ indicated the need for work in regard to a method of diagnosis and treatment of children who are weak in musical performance. The present study is concerned with the first of these two problems, that of diagnosis of errors in musical performance.

Investigations of diagnostic and remedial work in the reading of literature suggested the possibility of a similar type of investigation in the field of music reading. McCallister⁵ showed that a careful analysis of oral reading performance was an essential step in the diagnosis of reading difficulties. Two oral reading tests, which have been used for diagnosis of reading difficulties, are reviewed in Chapter II. Similarly, careful analysis of actual instrumental music performance should aid in diagnosis of reading difficulties in the field of music.

¹Kenneth L. Bean, "An Experimental Approach to the Reading of Music," Psychological Monographs, 50 (No. 6, 1938), pp. 1-80.

²Theodore G. Stelzer, "Construction, Interpretation, and Use of a Sight Reading Scale in Organ Music with an Analysis of Organ Playing into Fundamental Abilities," Journal of Experimental Education, 7 (September, 1938) 35-43.

³John Goodrich Watkins, Objective Measurement of Instrumental Performance, pp. 1-88. New York: Bureau of Publications, Teachers College, Columbia University, 1942.

⁴Walter S. Monroe, Editor, Encyclopedia of Educational Research. Revised Edition, p. 771. Prepared under the auspices of the American Educational Research Association. New York: Macmillan Co., 1950.

⁵James M. McCallister, Remedial and Corrective Instruction in Reading, p. 73. New York: Appleton, Century Co., 1936.

Limitations of the Study

It was necessary to impose certain limitations on the scope of this investigation. These limitations were concerned with the selection of the subjects of the study, the instruments to be used, and the musical factors to be considered.

Selection of subjects.—The subjects of this study consisted of forty instrumental performers chosen from elementary-school pupils, high-school pupils, college students, and professional musicians. This group was limited in number because the intent was to make an intensive study of errors in performance, rather than to make an extensive survey of a large number of cases.

The subjects of the study were divided into four levels, of ten performers in each, based on their grade of playing ability. This grade was defined as the playing ability which would normally be expected of a student after a specified number of years of training, and was indicated by the teacher of each subject. The four levels, based on the following grades of playing ability, were: level A, grades one and two; level B, grades three and four; level C, grades five and six; and level D, grade seven and above.

Selection of instruments.—The study was limited to errors made by performers on the violin and clarinet. The decision to use more than one instrument was based on the desire that the results of the study might be generally applicable to all orchestral instruments. However, it was not possible in a study of this scope to include all instruments. Therefore, it was decided to use two instruments, one from each of two of the major families of instruments. The violin, a stringed instrument, and the clarinet,

a woodwind instrument, were chosen for the following reasons.

1. These instruments are the most representative and most used members of their respective families in programs of public school music.
2. The normal playing ranges of these two instruments are approximately the same; therefore, it was possible to use the same sight-reading test for performers on both instruments.

Selection of musical factors.—The material included in the sight-reading test should resemble as far as possible the music which performers are most often expected to meet in their musical experiences. Therefore, the following musical elements were included in the sight-reading test: accidentals, key, pitch, rhythm, interval, and time. The analyses given in Chapter III were used as guides in the determination of the specific items of these elements to be used in the test, as well as the determination of the particular level at which each item should be presented. The accidentals used included sharps, flats, and naturals. The key signatures were limited to the major keys, since the majority of the music performed by public school instrumental music students is written in these keys. The pitches included in the test covered only the normal playing range of each instrument. In developing the rhythmic patterns, whole, half, quarter, eighth, and sixteenth notes were used in the test. Notes and rests of a denomination smaller than sixteenths occur infrequently in music written for school pupils. Intervals, used in the study, varied in size from primes to octaves. The time signatures were limited to the four which research indicated were most commonly used: 4/4, 3/4, 2/4, and 6/8.

Definition of Terms

The following definitions are given in order to clarify the use which is made of certain terms in this study.

Accidentals include sharps, flats, or naturals when used in the body of the music to alter the pitch of any tone.

Key is used to indicate the playing of the correct sharp, flat, or natural, as indicated by the key signature.

Pitch refers to the playing of the correct note as indicated by the position of the note on the staff.

Rhythm refers to the playing of a note or rest for the correct length of time.

Rhythmic group is used to designate a note, a rest, or a group of notes. The particular rhythmic groups used in this study are shown in Chapter III.

Interval is used to designate the number of diatonic steps from one note to the next note, counting both the beginning and ending tones.

General Procedure

The method of investigation used in this study was a modified form of the normative survey technique. Criteria were first set up for the preparation of the sight-reading test, which included a preliminary exercise designed to verify the assignment of the subjects to levels. Analysis was made of the musical elements used in selected violin and clarinet studies. On the basis of this analysis, the test exercises were constructed and then subjected to a trial presentation. On the basis of the results of this presentation, the final test was developed, the method of scoring established,

the method of tabulation formulated, and the directions for administration determined.

The sight-reading test was then administered to each subject individually and a wire recording was made of his performance. It was possible to play back this recording as many times as was necessary to permit a thorough and detailed study of the test data. Until recently, a detailed analysis of performance on this type of test was not practicable, due to the expense of making other types of recordings.

Plan of the Report

The present chapter has presented a statement of the problem, the significance of the problem, its derivation, the specific questions raised, the limitations of the study, a definition of terms, and the general procedure followed in carrying out the study.

Chapter II presents a review of the literature and research related to this investigation. This review deals with sight reading in music, measurement in music, and diagnosis of reading difficulties.

Chapter III presents a detailed description of the procedure followed in this study, including the preparation of the sight-reading test, the selection of subjects, the recording procedure, the procedure used in obtaining the data from the recordings, and the method of treatment of the data.

In Chapter IV, a discussion is given regarding the performance of all subjects with regard to errors made in four phases of performance: namely, playing of accidentals, key, pitch, and rhythm. In addition, analysis

is carried out with regard to errors made by all performers in specific categories of the four phases.

An analysis is made in Chapter V of the data in terms of the effect of the level of performance on the errors made in the four phases of performance.

In Chapter VI, the data are used to provide comparisons between the performances of violinists and clarinetists with regard to the four phases of performance.

Chapter VII presents a comparison of errors made by violinists and clarinetists at each of the four levels of performance.

In Chapter VIII, consideration is given to the effect of the rhythmic group and the interval on the errors made by the violinists and clarinetists.

Chapter IX includes a summary of the investigation with conclusions and recommendations for further study.

CHAPTER II

RELATED LITERATURE AND RESEARCH

Introduction

Accurate diagnosis of sight-reading difficulties in music must be based on measurement of sight-reading performance. In order to support the purpose of this study, this chapter presents a review and synthesis of the literature and reported research which bears upon this problem.

Sight reading in music is first considered in the light of its relation to the field of music education. Opinions of music educators are given concerning the value of sight reading and the need for further research with regard to this topic, in order to indicate the need for and the value of the present study.

Past practices in the field of measurement in music provide a sound basis to be used as a guide in formulating the detailed procedures of this study. These procedures include the preparation of the test, the selection of musical factors to be analyzed, the selection of subjects, the method of administration of the test, the method of scoring, the method of tabulation, and the method of analysis of test data. With this in mind, the following types of measurement in music were investigated: achievement, vocal performance, and instrumental performance.

Evidence was found that parallels existed between the reading of music and the reading of literature. Therefore, consideration is given to procedures and tests used in diagnosis of reading difficulty, with emphasis placed on those elements which might be applicable to the present study of sight reading in music.

Sight Reading in Music

Many music educators have attested to the vital nature of the problem of sight reading in music. In order to validate the purposes of this study, reference is made to the opinions of some of these authorities regarding the value of sight reading in music, and the need for research in diagnosis of sight-reading difficulties in music.

Values of sight reading in music.---There are many advantages accruing to the performer who is a proficient sight reader in music. Learning to read music, according to Brooks and Brown,¹ is necessary for effective education. Further, Marion Flagg,² one of the educators who has discussed sight reading in music, suggests that reading of music is seen as an additional means of enriching a broadened program of musical activities.

Further substantiation of the value of reading in music is given by Gehrkins:³

And yet the pupil ought to learn to read or he will be a musical illiterate, not being able by himself to "get at" the actual sound of a vocal or instrumental composition, and missing many things in all music that are forever hidden from those who have not achieved the power of compelling the staff to divulge its secrets.

Mursell⁴ adds that facility with the score is almost essential for any significant instrumental performance and that competent mastery of the

¹Marion Brooks and Harry A. Brown, Music Education in the Elementary School, p. 177. New York: American Book Company, 1946.

²Marion Flagg, "The Written Language of Music," Music Educators Journal, 35 (January, 1949), 6.

³Karl W. Gehrkins, Music in the Grade Schools, p. 8. Boston: C. C. Birchard & Co., 1934.

⁴James L. Mursell, "Reading Music," Thirty-Fifth Yearbook of the National Society for the Study of Education, pp. 99-100. Bloomington, Ill.: Public School Publishing Co., 1936.

score is of great importance for participation in a diversified range of musical activities and experiences.

The problem of sight reading in music is considered to be of consequential importance by Dykema and Cundiff,⁵ who believe that:

The ability to read music at sight is granted by everyone to be a valuable accomplishment. That this ability opens up a world of enjoyment and produces a stimulating feeling of mastery is not to be doubted. It is the process of gaining this power, and the seeming necessity of the consequent neglect of other valuable phases of musical experience which have caused controversy among music teachers. We are coming to believe now that the problem of sight reading can itself be musical and interesting, thus strengthening instead of impairing the love of music. Consequently, sight reading is a problem in itself, needing special treatment and requiring special application.

Need for research in sight reading in music.—Since the ability to sight read in music is valuable, it might be expected that most performers would be proficient in this regard; however, this is not necessarily true for all music students, even at the professional level. Though difficulty in sight reading in music seems to exist at all levels of performing ability, little research has been carried out with regard to this problem. Mursell⁶ corroborates this statement when he states that "our knowledge of the process of music reading is incomparably less complete and exact than is our knowledge of the process of language reading. In the latter field there has been an immense amount of well controlled and fundamentally significant research, in the former, hardly any." Mursell⁷ also indicated earlier that the reading process in music had not been adequately explored and that

⁵Peter W. Dykema and Hannah M. Cundiff, New School Music Handbook, p. 149. Boston: C. C. Birchard & Co., 1939.

⁶James L. Mursell, Education for Musical Growth, p. 241. Boston: Ginn & Co., 1948.

⁷James L. Mursell, "Reading Music," Thirty-Fifth Yearbook of the National Society for the Study of Education, p. 101. Bloomington, Ill.: Public School Publishing Co., 1936.

satisfactory diagnostic reading tests did not exist. Further, Wilson⁸ states that more research should be done on the construction of tests dealing with the learning process and in the use of these tests for diagnostic purposes. Wilson⁹ also states that achievement tests deal with a much more tangible and a much more measurable quality than do the music talent tests. In addition, he indicates that we are far from knowing what standard to expect of boys and girls who have had public school musical training.

The above information would seem to indicate the need for research in the field of sight reading in music. This research could be used in determining standards of achievement and also for diagnostic purposes.

Review of Instruments for Measurement in Music

The preceding section indicated the value and need of research with regard to sight reading in music. This research must rely on measurement in music for the formulation of valid conclusions. Therefore, a general view of measurement in music is presented in order to show the types of procedures which have been followed in the construction and use of measuring instruments in music in order that these procedures may be used as a guide in the construction of the sight-reading test used in this study. These procedures include methods of construction, selection of factors for analysis, methods of scoring, and methods of analysis.

⁸Harry R. Wilson, Music in the High School, p. 278. New York: Silver Burdett Co., 1941.

⁹Ibid., pp. 305-306.

Music Achievement testing.--Many efforts have been made to measure achievement in music. Larson¹⁰ used the criterion of membership in instrumental organizations as an indication of success, while Wright¹¹ used subjective tests to measure achievement.

Reviews of two tests of achievement in music, as given by Buros,¹² are presented in this section as examples of past practices in this form of testing.

The first of these two tests of musical achievement is the Kwalwasser-Ruch Test of Musical Accomplishment. This test consists of ten parts designed to test the following items: knowledge of music symbols and terms; recognition of syllable names; detection of pitch errors in a familiar melody; recognition of pitch names; knowledge of time signatures; knowledge of key signatures; knowledge of note values; knowledge of rest values; and recognition of familiar melodies from notation. Time limits are prescribed for each part of the test and norms are provided. This test places a premium on intelligence and the mechanics of notation. It is well constructed and may be used from the fourth to the twelfth grade. It was published from 1924-1927.

The second test is the Knuth Achievement Tests in Music. Ability to recognize and to comprehend musical notation appears to be the basic

¹⁰William S. Larson, "Measurement of Musical Talent for the Prediction of Success in Instrumental Music," Psychological Monographs, 40 (No. 1, 1930), 38.

¹¹Frances A. Wright, "The Correlation between Achievement and Capacity in Music," Journal of Educational Research, 17 (January, 1928), 50.

¹²Oscar Krisen Buros, Editor, The 1940 Mental Measurements Yearbook, pp. 150-157. Highland Park, N. J.: Mental Measurements Yearbook, 1941.

function analyzed by this test. It consists of two forms at each of three levels, comprising the grades from the third to the twelfth. It was published in 1936 and included a complete manual. All responses are recorded on answer sheets so that the test may be used over and over. The piano is used to present the musical material which comprises the test. This test seems to set the pattern for future tests in musical achievement.

Performance testing in vocal music.--The previously mentioned tests made no effort to measure actual performance in music. The close analogy between vocal and instrumental performance led to a consideration of past procedures in measurement of vocal performance which might be applicable to measurement of instrumental performance. A review of these testing procedures is presented for their relation to the present study with regard to selection of test items, method of scoring, and analysis of errors. Kwalwasser¹³ indicated that only two tests of musical performance had been constructed previous to the year, 1928. These two tests, both of which are individual tests, were by Hillbrand and Mosher and were devised to measure sight singing skill.

The first of these tests, the Hillbrand test,¹⁴ is based on the singing of six songs by the student. Errors are recorded as to pitch transposition, flats or sharps, omission and time. The second, the Mosher test,¹⁵ presents excerpts arranged in order of difficulty, as judged by

¹³Jacob Kwalwasser, "Tests and Measurements in Music," Psychological Bulletin, 25 (May, 1928), 299.

¹⁴Oscar Krisen Buros, *Op. Cit.*, p. 151.

¹⁵Raymond A. Mosher, A Study of Group Methods of Measurement of Sight Singing, p. 17. New York: Bureau of Publications, Teachers College, Columbia University, 1925.

the author. An objective method of scoring was used with regard to certain definite errors of pitch and rhythm. The reliability of this test was over .90.

At a slightly later date, two studies of vocal performance were made by Smith and Salisbury¹⁶ and by Chadwick.¹⁷ The first of these used four short songs varying from eight to twenty measures which were graded from easy to moderately difficult. The individual note was used as the scoring unit. In the second of these studies an objective test of sight singing ability was developed by means of which Chadwick compared the effectiveness of talent tests, intelligence tests, and tests of general school knowledge in predicting success in music.

Although other studies of more recent origin have developed measures of vocal performance, research does not indicate that these measures have gained widespread usage.

Performance testing in instrumental music.—Some work has also been done in the measurement of achievement in instrumental music, but not to the extent of that in vocal music. There is a definite lack of testing material in the field of performance in instrumental music. Mursell¹⁸ showed, in 1943, that "the amount of research which had been directly concerned upon the reading of music was negligible." This conclusion is

¹⁶H. B. Smith and F. S. Salisbury, "Prognosis of Sight Singing Ability in Normal School Students," Journal of Applied Psychology, 13 (No. 5, 1929), 426.

¹⁷J. E. Chadwick, "Predicting Success in Sight Singing," Journal of Applied Psychology, 17 (1933), 671.

¹⁸James L. Mursell, Music in American Schools, p. 237. New York: Silver Burdett Co., 1943.

further substantiated by Wheelwright,¹⁹ who stated, in 1939, that only four experimental studies had been made on the problem of music reading. Reporting on research done previous to the year, 1950, Hendrickson and Stratemeyer²⁰ stated that several studies had been made of instrumental performance; however, the vast majority of the studies which they reported were concerned with performance on keyboard instruments.

The remaining portion of this section presents information concerning some of the studies which have been carried out in measurement of instrumental performance. This information was used as background material in setting up the procedures of this study. Of particular interest in these studies was the material included in the test, the performing medium, the method of scoring, the method of analysis of test data, and the conclusions which were drawn. The present analyses of these studies deal primarily with those portions of the reports which are applicable to the present study.

Classification of errors is vital to accurate diagnosis of instrumental performance. This procedure was followed by Ortmann,²¹ who evaluated the elements of chord reading from an objective standpoint, on the basis of such items as the number of notes, the vertical distances involved, and the patterns established.

¹⁹Lorin F. Wheelwright, An Experimental Study of the Perceptibility and Spacing of Musical Symbols, p. 7. New York: Bureau of Publications, Teachers College, 1939.

²⁰Walter S. Monroe, Editor, Encyclopedia of Educational Research. Revised Edition, p. 768. Prepared under the auspices of the American Educational Research Association. New York: Macmillan Co., 1950.

²¹Otto Ortmann, "Elements of Chord Reading in Musical Notation," Journal of Experimental Education, 3(September, 1934), 50-57.

A performance test was used by Lamp and Keys²² to determine aptitude for specific instruments. The test consisted of five parts, each of which contained twenty quarter notes. This test involved no changes of rhythmic pattern. The authors called it an objective test and credited the test with a decided saving of time and effort in placing students on correct instruments. Although this test may have been satisfactory for the purposes indicated by the authors, it would not be adequate for diagnostic purposes due to its failure to vary the rhythmic pattern of the five parts of the test.

A diagnostic test which is to be used for various levels of performing ability must make provision for increasing difficulty of the test as the level rises. This procedure was followed by Stelzer²³ in the construction of an instrumental music test based on performance on the organ. He computed item difficulty on the music used and developed an objective method of scoring. With regard to classification of errors, he defined them in terms of notes, time and rhythm. He concluded that his sight reading scale was a valid measure of ability in the reading of organ music.

In order to analyze the errors made by the performers, it is necessary to mark the exact note missed. This was accomplished by Bean,²⁴ who studied sources of difficulty in the reading of music at the piano. The music used in this study contained chords rather than the single melodic

²²Charles J. Lamp and Noel Keys, "Can Aptitude for Specific Musical Instruments be Predicted?" Journal of Educational Psychology, 26 (November, 1935), 590.

²³Theodore G. Stelzer, "Construction, Interpretation and Use of a Sight Reading Scale in Organ Music with an Analysis of Organ Playing into Fundamental Abilities," Journal of Experimental Education, 7(September, 1938), 35-43.

²⁴Kenneth L. Bean, "An Experimental Approach to the Reading of Music," Psychological Monographs, 50 (No. 6, 1938), 1-80.

line necessary for use by performers on orchestral instruments; however, many of the procedures which he followed are applicable, with slight variations, to the present study. He used an objective method of recording errors, indicating the exact note missed, and differentiating between errors of pitch and rhythm. His method of approach involved the use of a tachistoscope and thus removed some of the factors involved in a life situation. Reading ahead, sometimes as much as a measure or two, is an important element in the sight reading of music, and this could not be present in tests using very short passages. The number of notes involved in each item of his test varied; however, the total length was usually one measure.

It was indicated earlier that measurement of instrumental performance could be utilized for varied purposes. This is borne out by the study of Wheelwright,²⁵ who constructed a performance test on the reading of music at the piano. His study was mainly concerned with the effect of the spacing of the symbols of music in relation to difficulty in sight reading. He concluded that the notes should be spaced in consistent proportion to time values.

A valid test of sight reading in music should deal with musical materials. Such a test was developed by Watkins,²⁶ who conclusively demonstrated that objective measurement of instrumental performance is possible on instruments other than the piano and organ.

²⁵Lorin F. Wheelwright, Op. Cit., pp. 1-116.

²⁶John Goodrich Watkins, Objective Measurement of Instrumental Performance, pp. 1-88. New York: Bureau of Publications, Teachers College, Columbia University, 1942.

The instrument used in this study was the cornet. Watkins used objective measurement to evaluate instrumental performance but did not analyze the actual errors made nor the sources of difficulty in regard to their frequency of occurrence. He evaluated two aspects of performance on a musical instrument, namely those of sight reading ability and technical skill. He measured these two traits with a group of performers who had spent different periods of time in study. The performance test was constructed with two forms. The reliability for Form A in relation to Form B was .982.

Data were obtained on 153 students who took Form A and from seventy-one students, of the 153, who took Form B. From these data, growth curves were constructed for sight reading ability and for practiced performance. These growth curves showed approximately equal increments in the early periods of learning. With increasing periods of study, however, practiced performance seemed to develop faster until a period of two years had passed. After this period, the rate of progress appeared to be approximately the same. There was some evidence of negative acceleration in the growth curves.

Diagnosis of Reading Difficulties

The preceding sections of this chapter have discussed sight reading in music and measurement in music. The present discussion centers attention on the close connection between diagnosis of reading difficulties in literature and instrumental music.

Diagnosis of reading difficulties in literature.—Much research has been carried out in the field of diagnosis of reading difficulties in English discourse. This research is vital to this study through indications

of procedures which have proved valuable in that field. These procedures include method of construction of the reading material of the test, types of errors which may occur, methods of scoring, and methods of analysis of test scores.

The close connection between problems of reading literature and of reading music is indicated by Mursell and Glenn:²⁷

Recently the reading of the score has been compared to the reading of language, and much of the extensive research material in that field, together with many of the practical conclusions derived from it, have been thought to apply to music.

With this thought in mind, a survey was made of the literature concerning diagnosis of reading difficulties. McCallister,²⁸ quoted previously, showed that a careful analysis of oral reading performance was an essential step in the diagnosis of reading difficulties. In further substantiation of this statement, Betts²⁹ indicates that from oral reading diagnosis the teacher can detect reversal tendencies, word by word reading, inadequate phrasing, speech difficulties, faulty word recognition habits, inaccurate perception, omissions, substitutions, and insertions.

Strang and Rose³⁰ state that a specific list of causes and de-

²⁷James L. Mursell and Mabelle Glenn, The Psychology of School Music Teaching, p. 208. New York: Silver Burdett Co., 1938.

²⁸James M. McCallister, Remedial and Corrective Instruction in Reading, p. 73. New York: Appleton, Century Co., 1936.

²⁹Emmett Albert Betts, The Prevention and Correction of Reading Difficulties, p. 264. Evanston, Illinois: Row, Peterson and Co., 1936.

³⁰Ruth Strang and Mrs. Florence C. Rose, Problems in the Improvement of Reading in High School and College, p. 197. Lancaster, Pa.: The Science Press Printing Co., 1940.

ficiencies in reading is an aid in directing the instructor's attention toward the sources of poor reading and in subsequently taking the steps necessary to correct them. Strang³¹ also suggests the use of phonograph recording of oral reading as an aid in diagnosis.

Two oral reading tests, which are quoted by Betts,³² might provide a basis for the construction of similar tests in regard to music reading. These two tests are the Gray Standardized Oral Reading Check Tests and the Gray Standardized Oral Reading Paragraph Test.

The Standardized Oral Reading Check Tests,³³ by William S. Gray, consist of four sets of five tests of equal difficulty. The examiner records the errors and the time required for the test. Although five forms are available for this test, there is no check on comprehension. Record is made of errors of mispronunciation, omission, substitution, repetition, and insertions. This test may be used for diagnosis and may also be used to stimulate interest in oral reading.

The Standardized Oral Reading Paragraphs, by William S. Gray, include twelve brief paragraphs arranged in order of difficulty. It is an individual test, in which the scoring is based on speed and the number of errors. The scoring is objective and is provided with norms. This test also gives the opportunity to observe the types of errors for use in diagnostic work.

³¹Ruth Strang and Mrs. Florence C. Rose, Op. Cit., p. 225.

³²Emmett A. Betts, Op. Cit., p. 98.

³³Oscar Krisen Buros, Editor, The 1940 Mental Measurements Yearbook, pp. 336-380. Highland Park, N. J.: Mental Measurements Yearbook, 1941.

Diagnosis of sight-reading difficulties in instrumental music.--In contrast to other fields which have been discussed, little work has been done with regard to the diagnosis of sight-reading difficulties in instrumental music. Most of the studies have been concerned with a measurement of the end product or achievement rather than with an analysis of those elements of the process of reading which are sources of reading difficulties. Little has been done in the realms of diagnosis pointed toward remedial work to be carried out by the teacher.

Summary

The literature related to the problem of sight reading in instrumental music deals with three types: sight reading in music, measurement in music, and diagnosis of reading difficulties.

The value of sight reading in music has been verified by many leading music educators. These educators have indicated the following outcomes for those who are proficient in sight reading: enriches musical life; makes possible significant instrumental performance; opens up a world of enjoyment; provides a stimulating feeling of mastery; and strengthens the love for music. Not only have these educators indicated the value of sight reading in music, but they have also indicated the need for further research in this field. They have, in addition, pointed out the dearth of diagnostic tests in the area of sight reading in instrumental music.

Measurement in music, apropos to this study, includes achievement testing, performance testing in vocal music, and performance testing in

instrumental music. Achievement testing has been carried out primarily through a pencil and paper type of technique. Most achievement tests have concerned themselves with knowledge about music rather than with performance of music. In some cases, objective methods of scoring have been used in achievement testing, while in others, subjective methods have been used. A small number of tests have been used in the field of vocal performance testing. In these tests, the analysis of errors was not carried out in detail for all phases of performance, nor was a diagnosis of errors made for subjects of various levels of performing ability. Although objective scoring was used in some cases, little use was made of a method of recording of the performance which would allow for repeated perusal of the data for errors. Although classification of errors was used in some of these tests, none of these classifications appeared to be adequate for the present study. There is a definite lack of testing material in the field of performance in instrumental music. Most of the studies in this field have used the piano or the organ as the performing medium. Apropos to this study, these investigations have indicated methods of computation of item difficulty for music included in the test, methods of classification of errors, methods of scoring, and methods of analysis of test data. However, none of these tests included all of the following vital elements: construction of the test from true-to-life music; provision for various levels of performing ability of the subjects; detailed analysis of errors; and comparison of results in terms of various performing mediums.

A comparison of reading difficulties in the reading of literature and in the reading of music indicates the value of research in the music

field similar to that already carried out in the field of reading. The usefulness of oral reading tests in reading diagnosis points to the probable value of similar tests in the field of performance in instrumental music.

CHAPTER III

PROCEDURE

The procedures used in this study were developed to investigate the errors made by violinists and clarinetists, at four levels of performing ability, on a test of sight reading in music. The first step in the procedure was the preparation of a preliminary draft of the sight-reading test. The selection of individual items on the preliminary draft was based on a detailed analysis of selected violin studies since it was found that a remarkable degree of similarity existed between studies for both violin and clarinet. This was followed by a trial presentation of the preliminary draft to several subjects who were not included in the final study. This trial presentation resulted in the preparation of the final form of the sight-reading test, including the directions for administration, for recording, for scoring, and for tabulation.

With the completion of the sight-reading test, the subjects of the study were selected and a recording was made of the performance of each subject on the test. The errors which were made in these recordings were noted on scoring sheets, after which the data concerning the individual errors were transferred from the scoring sheets to tabulation sheets for each individual. This tabulation was followed by an analysis of the errors with regard to the four phases of performance and the other factors under consideration.

Construction of the Sight-Reading Test

The sight-reading test, given in complete form in the appendix, consisted of seventeen exercises, including a preliminary exercise to be given to all performers as a check on the assignment of level. Since this test was to be given to performers at four levels of performing ability, defined in Chapter I, as levels A, B, C, and D, provision was made to include all the musical factors under consideration in the exercises to be given to performers at each of the four levels. The subjects of each level were to play the preliminary exercise and six of the other sixteen exercises, which were within their level of performing ability. They began with an exercise which they found relatively easy and progressed until they had reached exercises which were rather difficult at their level of training and experience. This procedure parallels similar testing done in the field of oral reading.¹

In order to satisfy the foregoing conditions, it was necessary to set up criteria to be used in the preparation of the sight-reading test. Further, it was necessary to make a detailed analysis of selected study materials in order to make a correct selection of test items, and for placement of these items in the sixteen exercises.

Criteria used in the preparation of the sight-reading test.--The sight-reading test was devised for the specific purpose of determining the errors made by violinists and clarinetists in the sight reading of music. The test was to be applied to performers of four levels of playing ability

¹Oscar Krisen Buros, Ibid., pp. 336-380.

and was to be scored for errors. These general considerations led to the formulation of the following specific criteria for the construction of the test:

1. The material used at each level of performance must contain elements used in music played by performers at that level.
- ✓ 2. The material must be musical in nature and must be playable.
- ✓ 3. The individual test exercises must be short enough to prevent excessive fatigue in their performance.
- ✓ 4. The individual musical elements under consideration must be presented many times and under varying conditions.
5. The material must be so arranged as to provide for increasing difficulty as the test progresses.
6. The material must make provision for possible comparisons of the types of errors when the data is treated analytically.
- ✓ 7. The material must be usable by other music educators for similar investigations in the future.

Selection of test items.—The background information used in the selection of the test items was based on an analysis of a selected number of violin studies. A preliminary analysis of both violin and clarinet studies seemed to indicate a high degree of similarity both in content and in order of presentation of musical factors. Since the material for violin appeared to be more effectively graded than that for clarinet, a detailed analysis was made only of violin studies. These studies ranged in difficulty from easy material, for beginning students, to difficult material which would provide a challenge even for professionals.

Some of the most difficult violin studies were considered but were found to be technical in nature and not of the type which would ordinarily be sight read, either by students or artists. Each particular exercise of the difficult studies included material designed for use in the perfection of only one point of violin artistry.

Expert opinion, in the form of advice from violin teachers at two different colleges, was secured in the selection of the violin studies. The following studies were selected as representing the four levels of performing ability considered in this study: Easiest Elementary Method by Wohlfahrt,² representing levels A and B; Etudes for the Violin by Sitt,³ representing levels B and C; Sixty Studies for the Violin, Book I, by Wohlfahrt,⁴ representing levels B and C; Sixty Studies for the Violin, Book II, by Wohlfahrt,⁵ representing level C; Graded Course of Violin Playing, by Auer,⁶ representing levels C and D; and Thirty-Six Elementary and Progressive Studies for the Violin by Kayser,⁷ representing level D.

A detailed analysis of the selected studies was made with regard to the following items: key signature, time signature, accidentals,

²Franz Wohlfahrt, Easiest Elementary Method, Op. 38, pp. 1-61. New York: G. Schirmer, Inc., 1918.

³Hans Sitt, Etudes for the Violin, Op. 32, Book I, pp. 1-19. New York: G. Schirmer, Inc., 1907.

⁴Franz Wohlfahrt, Sixty Studies for the Violin, Op. 45, Book I, pp. 1-23. New York: G. Schirmer, Inc., 1905.

⁵Franz Wohlfahrt, Sixty Studies for the Violin, Op. 45, Book II, pp. 1-29. New York: G. Schirmer, Inc., 1905.

⁶Leopold Auer, Graded Course of Violin Playing, Book III, pp. 1-68. New York: Carl Fischer, Inc., 1926.

⁷H. E. Kayser, Thirty-Six Elementary and Progressive Studies for the Violin, Op. 20, pp. 1-50. New York: G. Schirmer, Inc., 1915.

interval, rhythmic patterns of the measures, and rhythmic groups.

Theoretically, it would have been preferable to have included each item an equal number of times and in like manner at each of the four levels. However, practical testing experience indicated the inability of performers at level A to execute music which would challenge professionals, and conversely the waste of time involved in having professionals play very simple music on which they would make appreciably few errors. This necessitated a decision as to the level at which each item should be included in the test. First, it was necessary that the items should have been in the realm of previous experience of each subject. No useful purpose is served by testing on material of which the subject has no knowledge. In the second place, one of the objectives of this study was to present a life-like situation, and thus it was decided to include items based on the frequency of occurrence with which they would be met by the subjects in their normal musical experiences. Thus, in key signatures, since it was not possible to include all signatures in the six exercises at each level, selection became necessary. In this regard, as in other items, it appeared desirable to include those signatures most commonly used, and when possible to sample other signatures, placing them in levels consistent with the previous experience of the subjects of that level.

Analysis of key signatures.—The six selected violin studies were checked as to the frequency with which various key signatures were used, and the results of this tabulation are presented in Table 1. The key signatures having no sharps or flats, or having one or two sharps or flats, were most frequently used in the studies. The earliest elementary exercises

TABLE 1
 FREQUENCY OF OCCURRENCE OF KEY SIGNATURES*
 IN SIX SELECTED VIOLIN STUDIES

Key	Wohlfahrt Op. 38 Elementary	Wohlfahrt Op. 45 Book I	Wohlfahrt Op. 45 Book II	Sitt Op. 43 Book I	Auer Book III	Kayser Op. 20	Total
C	65	7	9	5	5	5	96
G	14	9	6	5	5	5	44
F	9	3	2	3	5	5	27
D	5	4	4	3	3	5	24
Bb	5	2	4	2	5	4	22
A	4	2	1	2	3	2	14
E Flat	4	3	2	0	0	5	14
E	0	0	0	0	0	1	1
A Flat	0	0	0	0	0	2	2
a	4	0	2	0	2	1	9
e	3	0	0	0	3	0	6
d	0	0	0	0	2	0	2
b	0	0	0	0	4	0	4
g	3	0	0	0	5	0	8
f sharp	0	0	0	0	3	0	3

*Major key signatures are indicated by capital letters

while minor key signatures are indicated by small letters

used only a small number of sharps and flats in the key signatures, with a heavy weighting toward the use of no sharps or flats. In general, the number of sharps or flats in the key signature increased as the level of performing ability increased.

The seventeen test exercises, including a preliminary exercise, used the following key signatures in more than one exercise: C (no sharps or flats), in six exercises; G (one sharp), in three exercises; and F (one flat), in two exercises. The following key signatures were used in only one exercise: Bb (two flats), D (two sharps), Eb (three flats), A (three sharps), Ab (four flats), and E (four sharps).

Table 2 presents the key signatures used in each of the seventeen exercises. In accordance with the analysis of the elementary method, the preliminary exercise and the first two exercises used the key signature of C. The key signatures having a greater number of sharps or flats were principally used in the later exercises of the sight-reading test.

The actual notes of the key which were included in the sight-reading test are given, for each level, in Table 3. These do not include those notes which were altered by the placing of an accidental (flat, sharp, or natural) by the note.

Analysis of time signatures.—A tabulation of frequency of occurrence of time signatures in the selected studies is given in Table 4. Four-four time occurred most frequently, and this fact indicated that there should be a generous use of this time signature in the test exercises. The signatures of 3/4, 2/4, and 6/8 occurred more frequently in the selected studies than did the remaining time signatures. Since it was not possible

TABLE 2

**KEY SIGNATURES AND TIME SIGNATURES USED IN THE
SEVENTEEN EXERCISES IN THE SIGHT-READING TEST**

Exercise	Key Signature	Time Signature
Preliminary	C	4/4
1	C	4/4
2	C	4/4
3	F	4/4
4	G	4/4
5	D	4/4
6	C	6/8
7	F	3/4
8	A	2/4
9	C	4/4
10	C	4/4
11	G	4/4
12	E $\flat$	6/8
13	B $\flat$	4/4
14	E	3/4
15	A $\flat$	2/4
16	G	4/4

TABLE 3

NUMBER AND DISTRIBUTION OF NOTES OF THE KEY IN THE SIGHT-READING
TEST PRESENTED TO VIOLINISTS AND CLARINETISTS
OF FOUR LEVELS OF TEN PERFORMERS IN EACH

Key Note	Level				Total
	A	B	C	D	
A sharp	0	0	0	0	0
natural	71	94	120	142	427
flat	0	0	19	60	79
B sharp	0	0	0	0	0
natural	45	54	60	95	254
flat	7	10	105	121	243
C sharp	7	16	9	28	60
natural	61	89	133	127	410
flat	0	0	0	0	0
D sharp	0	0	0	7	7
natural	88	107	148	129	472
flat	0	0	0	20	20
E sharp	0	0	0	0	0
natural	73	77	66	83	299
flat	0	0	67	86	153
F sharp	17	30	19	55	121
natural	40	51	111	104	306
flat	0	0	0	0	0
G sharp	0	4	4	37	45
natural	70	92	137	148	447
flat	0	0	0	0	0
Total	479	624	998	1242	3343

TABLE 4

FREQUENCY OF OCCURRENCE OF TIME SIGNATURES
IN SIX SELECTED VIOLIN STUDIES

Time Signature	Wohlfahrt Op. 38 Elementary	Wohlfahrt Op. 45 Book I	Wohlfahrt Op. 45 Book II	Sitt Op. 43 Book I	Auer Book III	Kayser Op. 20	Total
2/4	23	5	2	2	7	5	44
3/4	19	11	4	5	10	6	55
4/4	65	13	14	17	18	18	145
5/4	0	0	0	0	4	1	5
6/4	0	0	0	0	5	1	6
3/8	4	1	0	0	1	0	6
6/8	3	2	2	2	2	2	13
9/8	0	0	0	0	0	1	1
3/2	0	0	0	0	0	1	1
2/2	0	0	0	0	3	1	4

to include all time signatures in the exercises to be played at each level, an arbitrary decision was made to use only the four above mentioned signatures in the sight-reading test. Six-eighth time which uses an eighth note as the unit of rhythmic beat, was presented in one exercise at each level. Other exercises, at each level, utilized time signatures which use a quarter note as the unit of rhythmic beat.

Four-four time was used in eleven of the seventeen exercises. This time signature was used in the preliminary exercise and in the first five of the test exercises. The following time signatures were each used in two of the remaining test exercises: $3/4$, $2/4$, and $6/8$. The time signatures which were used in each of the seventeen exercises are shown in Table 2.

Analysis of accidentals.—The occurrence of accidentals was checked in each of the selected studies and totals were found for each particular accidental. This analysis is presented in Table 5. On the basis of the totals, it was found that the following were widely used: B flat, B natural, C sharp, C natural, D sharp, E natural, F sharp, and F natural. The earliest elementary exercises used no accidentals and later elementary exercises used F sharp, C sharp, G sharp, and B natural more than all the other accidentals. This information was utilized in determining the order of presentation of accidentals in the test exercises.

The distribution of accidentals used in the construction of the sight-reading test is shown in Table 6. No accidentals were used in the preliminary exercise or in the first exercise. The number of accidentals used increased as the level of performance rose. It might have been

TABLE 5

FREQUENCY OF OCCURRENCE OF ACCIDENTALS
IN SIX SELECTED VIOLIN STUDIES

Acci- den- tal	Wohlfahrt Op. 38 Elementary	Wohlfahrt Op. 45 Book I	Wohlfahrt Op. 45 Book II	Sitt Op. 43 Book I	Auer Book III	Kayser Op. 20	Total
F##	39	88	101	99	68	184	579
C#	73	115	76	99	78	141	582
G#	38	26	93	50	85	119	411
D#	12	21	41	24	83	96	277
A#	0	5	26	1	66	75	173
E#	0	1	12	0	72	23	108
B#	0	0	16	0	19	18	53
Bb*	11	20	96	66	26	109	328
Eb	10	8	55	27	13	85	198
Ab	4	8	7	5	8	71	103
Db	0	0	0	0	0	35	35
Gb	0	0	0	0	0	15	15
Cb	2	0	0	0	0	5	7
Fb	0	0	0	0	0	0	0
A nat.*	3	17	33	4	9	119	185
B nat.	27	48	92	60	20	223	470
C nat.	19	45	42	74	26	83	289
D nat.	4	5	3	9	20	52	93
E nat.	12	25	46	27	36	138	284
F nat.	16	34	45	89	10	111	305
G nat.	10	11	14	58	24	59	176

* The symbol (#) represents sharp
The symbol (b) represents flat
The abbreviation (nat.) represents natural

TABLE 6

NUMBER AND DISTRIBUTION OF ACCIDENTALS IN THE
SIGHT-READING TEST PRESENTED TO VIOLINISTS
AND CLARINETISTS OF FOUR LEVELS OF
TEN PERFORMERS IN EACH

Accidental	Level				Total
	A	B	C	D	
A sharp	0	0	0	0	0
natural	0	0	5	5	10
flat	3	5	1	0	9
B sharp	0	0	0	0	0
natural	2	6	5	5	18
flat	5	9	10	13	37
C sharp	3	2	7	9	21
natural	4	4	1	1	10
flat	0	0	0	0	0
D sharp	7	7	3	3	20
natural	0	0	0	3	3
flat	0	1	0	0	1
E sharp	0	0	0	0	0
natural	0	0	7	10	17
flat	2	3	1	3	9
F sharp	3	7	6	3	19
natural	0	1	5	8	14
flat	0	0	0	0	0
G sharp	3	3	5	3	14
natural	0	0	0	0	0
flat	0	0	0	0	0
Total	32	48	56	66	202

preferable, theoretically, to have included an equal number of accidentals and notes at each level, but this condition is never found in actual musical material. However, it was possible to keep the proportion of accidentals to total notes approximately the same at each of the four levels. In so far as was consistent with good harmonic procedures, an attempt was made to present a variety of accidentals at each level.

Analysis of intervals.--An analysis of the earliest exercises in the Wohlfahrt⁸ elementary violin study was made to determine the occurrence of intervals of various sizes. The results of this analysis, presented in Table 7, show a preponderant use of the interval of a second. The interval of a prime, or repeated pitch, was also quite commonly used. Other intervals were used in decreasing amounts as the size of the interval increased. Provision was made in the test exercises to present the other musical factors of the test with intervals of various sizes.

The distribution of sizes of intervals used in the test exercises is shown in Table 8. This table gives the distribution in terms of the four levels of performing ability and the total number of intervals played. The melodies of the test exercises were so constructed that all intervals, from primes to octaves, were included at each of the four levels, although the intervals differ markedly in frequency of occurrence. As in other aspects of the test, the choice of intervals was dictated by the belief that the test exercises should be musical in nature. Accordingly, seconds occur most frequently in the test and sevenths least frequently, as is the case in the practice exercises which have been analyzed. (Table 7)

⁸Franz Wohlfahrt, Easiest Elementary Method, Op. 38, pp. 1-61. New York: G. Schirmer, Inc., 1918.

TABLE 7

FREQUENCY OF OCCURRENCE OF INTERVALS IN
WOHLFAHRT ELEMENTARY STUDY, OP. 38

Size of Interval	Frequency of Occurrence
Prime	467
Second	1127
Third	202
Fourth	146
Fifth	67
Sixth	85
Seventh	9
Octave	16
Total	2119

TABLE 8

NUMBER AND DISTRIBUTION OF INTERVALS IN THE SIGHT-
READING TEST PRESENTED TO VIOLINISTS AND
CLARINETISTS OF FOUR LEVELS OF TEN
PERFORMERS IN EACH

Size of Interval	Level				Total
	A	B	C	D	
Prime	146	218	462	452	1278
Second	245	272	371	510	1398
Third	89	135	225	236	685
Fourth	34	58	81	88	261
Fifth	22	22	26	38	108
Sixth	7	13	36	44	100
Seventh	3	6	10	2	21
Octave	3	5	24	24	56
Total	549	729	1235	1394	3907

Analysis of rhythmic groupings.--An analysis of rhythmic groupings was made in terms of the different measures which occurred in each of the selected violin studies. Each study was analyzed to determine the frequency of occurrence of the measure groupings, and this analysis is presented in Tables 9, 10, 11, and 12 with regard to the respective time signatures of 4/4, 3/4, 2/4, and 6/8 time.

The location of particular measures in the test exercises was based on this analysis of their occurrence in the studies. The measure was used as the unit of rhythmic grouping for the preliminary exercise and for exercises one to nine of the sight-reading test. The first nine exercises and the preliminary exercise used whole, half, quarter, and eighth notes.

The measures which were used in the construction of the preliminary exercise and the first nine test exercises are shown in Tables 13 and 14. The measures are the same, generally speaking, as those measures found in the analysis of the violin studies. All other measures were constructed from the rhythmic units which were contained in the analyzed measures. The only change represented in the new measures was a rearrangement of the rhythmic units. This rearrangement was done in an effort to insure a more complete coverage of the different rhythmic units.

The number of possible combinations of whole, half, and quarter notes would not be excessively great; however, the use of eighth and sixteenth notes with their corresponding rests would send the number of possible combinations making up the measure to astronomical heights. This fact necessitated an analysis of the frequency of occurrence of rhythmic groupings smaller than a measure. In this study, these rhythmic groupings are called

TABLE 9

FREQUENCY OF OCCURRENCE OF MEASURES OF
4/4 TIME IN SIX SELECTED VIOLIN STUDIES

Measure	Wohlfahrt Op. 38 Elementary	Wohlfahrt Op. 45 Book I	Wohlfahrt Op. 45 Book II	Sitt Op. 43 Book I	Auer Book III	Kayser Op. 20	Total
í í í í	156	8	56	41	10	28	299
p p	125	0	33	16	0	5	179
í 2 —	48	11	9	3	0	5	76
p í í	26	0	10	12	1	3	52
í í p	39	0	0	0	0	0	39
o	350	5	37	4	34	12	442
úúúú	79	265	313	63	57	132	909
í í í 2	9	0	0	0	2	0	11
úúú p	6	1	18	11	0	0	36
p úúú	8	2	12	8	0	0	30
í úúú	1	28	30	4	0	0	63
í úúú	8	0	33	7	3	1	52
p í	3	0	17	1	0	4	25
í 2 í í	4	0	0	0	0	2	6
p úúú	14	0	0	0	0	0	14
í úúú	5	0	0	0	2	0	7

TABLE 9 (Continued)

Measure	Wohlfahrt Op. 38 Elementary	Wohlfahrt Op. 45 Book I	Wohlfahrt Op. 45 Book II	Sitt Op. 43 Book I	Auer Book III	Kayser Op. 20	Total
í z z í	4	0	3	0	0	0	7
í ú í z	5	2	0	0	0	0	7
ú ú í z	2	0	5	2	1	1	11
í p í	7	0	5	0	0	0	12
í z í z	0	2	3	2	0	13	20
p í ú	15	0	0	0	0	0	15
í í z z	1	0	0	0	0	0	1
z í í í	4	0	0	0	0	0	4
í z í z	1	0	0	33	0	4	38

TABLE 10

FREQUENCY OF OCCURRENCE OF MEASURES OF 3/4
TIME IN SIX SELECTED VIOLIN STUDIES

Measure	Wohlfahrt Op. 38 Elementary	Wohlfahrt Op. 45 Book I	Wohlfahrt Op. 45 Book II	Sitt Op. 43 Book I	Auer Book III	Kayser Op. 20	Total
í í í	71	3	42	39	6	1	162
í ũ í	12	0	0	0	2	0	14
ũ ũ ũ	93	259	47	24	78	199	700
z í í	13	0	0	0	0	0	13
í ũ ũ	12	1	0	24	8	0	45
ũ ũ í	0	6	0	6	0	0	12
í í z	6	0	0	0	0	1	7
p í	24	10	0	8	0	0	42
í z z	46	4	5	3	0	16	74
ũ í í	17	0	0	0	3	0	20
í p	9	0	0	0	3	0	12
p.	43	33	1	4	13	4	98
í ũ	0	74	4	0	0	0	78
í z í	0	0	0	0	0	2	2

TABLE 11

FREQUENCY OF OCCURRENCE OF MEASURES OF 2/4
TIME IN SIX SELECTED VIOLIN STUDIES

Measure	Wohlfahrt Op. 38 Elementary	Wohlfahrt Op. 45 Book I	Wohlfahrt Op. 45 Book II	Sitt Op. 43 Book I	Auer Book III	Kayser Op. 20	Total
í ú	15	0	0	0	5	2	22
úúú	72	0	0	0	32	58	162
úúʹ	6	0	0	0	1	0	7
p	4	0	0	0	0	5	9
í í	109	0	1	0	7	7	124
í úʹ	6	0	0	0	2	0	8
í ú	9	0	0	0	5	0	14
úúú	7	0	0	0	9	0	16
ú í	11	0	0	0	3	1	15
í x	19	0	3	3	1	1	27
úʹú	0	0	0	0	1	2	3
úʹí	1	0	0	0	0	0	1

TABLE 12

FREQUENCY OF OCCURRENCE OF MEASURES OF 6/8
TIME IN SIX SELECTED VIOLIN STUDIES

Measure	Wohlfahrt Op. 38 Elementary	Wohlfahrt Op. 45 Book I	Wohlfahrt Op. 45 Book II	Sitt Op. 43 Book I	Auer Book III	Kayser Op. 20	Total
	10	25	55	5	4	80	179
	13	0	0	1	2	0	16
	2	0	0	0	0	0	2
	3	0	0	0	3	0	6
	2	6	0	0	0	0	8
	0	0	0	0	3	0	3
	6	0	0	0	0	0	6
	3	0	0	0	0	0	3
	4	0	0	0	0	1	5
	2	0	0	0	0	0	2

TABLE 13

NUMBER AND DISTRIBUTION OF MEASURES OF 4/4 TIME IN PRELIMINARY EXERCISE
AND IN FIRST NINE EXERCISES OF THE SIGHT-READING TEST PRESENTED
TO VIOLINISTS AND CLARINETISTS OF FOUR LEVELS OF
TEN PERFORMERS IN EACH

Measure	Number of Exercise							Total
	Preliminary	1	2	3	4	5	9	
1	2	21	13	11	3	2	0	52
2	1	11	15	7	2	4	0	40
3	0	0	2	0	0	0	0	2
4	0	0	2	2	1	0	0	5
5	0	0	0	2	1	0	0	3
6	0	0	0	1	0	0	0	1
7	1	0	0	0	4	0	2	7
8	0	0	0	0	4	0	0	4
9	0	0	0	0	1	0	0	1
10	0	0	0	0	1	0	0	1
11	0	0	0	0	3	4	0	7
12	2	0	0	0	4	4	0	10
13	0	0	0	0	3	0	2	5
14	1	0	0	0	0	0	0	1
15	1	0	0	4	3	4	0	12
16	0	0	0	1	1	0	2	4
17	0	0	0	2	0	0	2	4
18	0	0	0	1	0	0	1	2
19	0	0	0	1	0	0	2	3
20	0	0	0	0	0	2	0	2
21	0	0	0	0	1	2	0	3
22	0	0	0	0	0	4	0	4
23	0	0	0	0	0	2	0	2
24	0	0	0	0	0	4	0	4

TABLE 13 (Continued)

Measure	Number of Exercise							Total
	Preliminary	1	2	3	4	5	9	
25	1	0	0	0	0	0	2	3
26	1	0	0	0	0	0	0	1
27	0	0	0	0	0	0	2	2
28	2	0	0	0	0	0	0	2
29	1	0	0	0	0	0	2	3
30	0	0	0	0	0	0	2	2
31	1	0	0	0	0	0	0	1
32	0	0	0	0	0	0	2	2
33	0	0	0	0	0	0	2	2
34	0	0	0	0	0	0	2	2
35	0	0	0	0	0	0	1	1
36	1	0	0	0	0	0	0	1
37	0	0	0	0	0	0	1	1
38	0	0	0	0	0	0	1	1
39	1	0	0	0	0	0	2	3
Total	16	32	32	32	32	32	32	208

TABLE 14

FREQUENCY OF OCCURRENCE OF MEASURES OF 3/4, 2/4, AND 6/8 TIME
IN THE SIGHT-READING TEST PRESENTED TO
VIOLINISTS AND CLARINETISTS

Type Measure	3/4 Time		2/4 Time		6/8 Time	
	Measure	#	Measure	#	Measure	#
1	$\rho \cdot$	2	ρ	4	$\rho \cdot$	4
2	$\rho \dot{\rho}$	3	$\dot{\rho} \dot{\rho}$	5	$\dot{\rho} \dot{\rho}$	3
3	$\dot{\rho} \rho$	3	$\rho \rho$	5	$\dot{\rho} \rho \dot{\rho}$	2
4	$\dot{\rho} \dot{\rho} \dot{\rho}$	2	$\dot{\rho} \rho$	3	$\rho \rho \rho$	1
5	$\dot{\rho} \rho \dot{\rho}$	3	$\rho \dot{\rho}$	3	$\rho \dot{\rho}$	4
6	$\rho \dot{\rho} \dot{\rho}$	2	$\dot{\rho} \rho$	2	$\dot{\rho} \rho$	4
7	$\dot{\rho} \dot{\rho} \rho$	2	$\rho \rho \rho$	1	$\dot{\rho} \rho \rho$	1
8	$\dot{\rho} \rho \dot{\rho}$	1	$\dot{\rho} \rho \rho$	2	$\rho \rho \rho$	3
9	$\dot{\rho} \rho \rho$	2	$\dot{\rho} \rho$	2	$\rho \rho \rho$	1
10	$\dot{\rho} \rho \rho$	2	$\rho \rho \rho$	3	$\rho \rho \rho \dot{\rho}$	1
11	$\rho \rho \rho$	3	$\rho \rho \rho$	1	$\rho \rho \rho \rho$	2
12	$\rho \rho \dot{\rho}$	2	$\rho \rho \dot{\rho}$	1	$\dot{\rho} \rho \rho$	2
13	$\rho \dot{\rho} \dot{\rho}$	3		0	$\rho \rho \rho$	1
14	$\dot{\rho} \rho$	2		0	$\dot{\rho} \rho \rho$	1
15		0		0	$\dot{\rho} \rho \rho$	1
16		0		0	$\rho \rho \rho$	1

rhythmic groups in order to distinguish them from the rhythmic groupings making up a measure. The frequency of occurrence of these rhythmic groups in the Wohlfahrt elementary study is presented in Table 15. This analysis was used as a guide for the order of presentation of each of these smaller rhythmic groupings in exercises ten to sixteen of the sight-reading test. Provision was made for each group to precede and to follow each other group.

The distribution of the rhythmic groups in the sight-reading test is shown in Table 16. Totals are given for each level of performing ability in addition to totals for each rhythmic group. Performers of levels A and B did not play any test exercises numbered higher than nine. Thus, the rhythmic groups played by these two levels were, in the main, the first eight rhythmic groups. The more complicated rhythmic groups were presented primarily in levels C and D.

Selection of range.—The selection of the range for the test exercises consisted of setting the two limits of the range. The lowest note which can be played on the violin is G, written below the second added line below the staff. Using this note as the lower limit made it possible to include in the sight-reading test most of the notes which can be played in the lowest register of the clarinet.

The upper note of the second register of the clarinet is C, written on the second added line above the staff. This note was used as the upper limit of the range of the test exercises. This selection made it possible for the violinists to play all exercises in the first position, using a stretched fourth finger for the one note, high C.

TABLE 15

FREQUENCY OF OCCURRENCE OF RHYTHMIC GROUPINGS
IN WOHLFAHRT ELEMENTARY VIOLIN STUDY

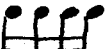
Rhythmic Grouping	Frequency of Occurrence
	2785
	1164
	1530
	369
	214
	26
	5
	3
Total	6096

TABLE 16

NUMBER AND DISTRIBUTION OF RHYTHMIC GROUPS IN THE
SIGHT-READING TEST PRESENTED TO VIOLINISTS AND
CLARINETISTS OF FOUR LEVELS OF TEN PERFORMERS
IN EACH

Rhythmic Group	Level				Total
	A	B	C	D	
1 	54	7	2	2	65
2 	13	16	5	1	35
3 	132	70	26	18	246
4 	23	37	23	11	94
5 	159	258	190	149	756
6 	26	54	335	90	505
7 	69	205	204	140	618
8 	73	73	42	132	320
9 	0	0	176	344	520
10 	0	9	162	228	399
11 	0	0	10	94	104
12 	0	0	60	106	166
13 	0	0	0	16	16
14 	0	0	0	63	63
Total	549	729	1235	1394	3907

These two limits were selected because they represent the playing range which would be normally used by public school violinists and clarinetists.

The sight-reading test.--The sight-reading test consists of one preliminary test exercise and sixteen test exercises. The performers of each level played the preliminary exercise. The subjects of the different levels played the following test exercises in addition to the preliminary exercise: level A, exercises 1-6; level B, exercises 4-9; level C, exercises 8-13; and level D, exercises 11-16.

The analysis of the items played by each level is given in Table 17. This analysis deals with the number of accidentals played, the number of notes of the key played, the total notes played, the number of rests played, the rhythmic groups played, and the number of measures played. Values are given for each level and for all performers.

The number of opportunities for pitch errors is based on the number of notes played. The number of opportunities for rhythm errors is based on the number of notes and rests played. The opportunities for errors in accidentals and in key are given under those respective headings in the table.

The values given in this table are used later in the study in terms of the number of opportunities for errors in each of the four phases of performance under consideration in the study.

Trial Presentation of the Sight-Reading Test

After the construction of the sight-reading test, a trial presentation of the test was made. The purposes of the trial presentation were as follows:

1. To develop a usable and logical recording procedure.

TABLE 17

NUMBER AND DISTRIBUTION OF ACCIDENTALS, NOTES OF
THE KEY, TOTAL NOTES, RESTS, TOTAL NOTES AND
RESTS, RHYTHMIC GROUPS, AND MEASURES IN
THE SIGHT-READING TEST PRESENTED TO
VIOLINISTS AND CLARINETISTS OF FOUR
LEVELS OF TEN PERFORMERS IN EACH

Item	Level				Total
	A	B	C	D	
Accidentals	32	48	56	66	202
Notes of the Key	479	624	998	1242	3343
Total Notes	511	672	1054	1308	3545
Rests	38	57	181	86	362
Total Notes and Rests	549	729	1235	1394	3907
Rhythmic Groups	467	575	821	648	2511
Measures	208	208	208	208	832

2. To develop a method of scoring for errors.
3. To provide a guide for the construction and placement of test items.
4. To determine the level of placement of the test exercises.

The subjects used for the trial presentation of the test consisted of fifteen members of the Garth High School Band, Georgetown, Kentucky, and three students of Georgetown College, Georgetown, Kentucky. The subjects represented each of the four levels of performance.

Results of the trial presentation of the test.--The recording procedure was subjected to a continuous process of revision during the trial presentation of the test. The physical facilities necessary for the process of recording were noted and obtained. The adaptability of a wire recorder to this study was ascertained. Correct metronome settings were determined and the final directions for administration were evolved.

The tempo of the exercises was studied through changes of metronome settings. The upper limit of the metronome setting was determined by the speed at which good performers could read the exercises and give a creditable performance. The lower limit was determined by the tendency to divide slow beats into halves, thus in reality doubling the number of beats per measure. The metronome settings were made applicable to all levels since it is possible to cause the most proficient performers to make more errors than less proficient performers if the former are forced to play at a greatly increased tempo. The final reading for the metronome setting was 80 mm. for 4/4, 3/4, and 2/4 time and 100 mm. for 6/8 time.

Several methods of scoring the errors were attempted. Errors were

first marked with colored pencil on the test exercises. This resulted in confusion and would have necessitated one complete copy of the test for each individual performer. Next, the errors were recorded on a score sheet placed next to the exercises, which involved a constant shifting of the eyes from the test exercises to the score sheet, with a resultant loss of attention from the precise notes under consideration.

The final choice of a method of scoring consisted of marking the errors on a thin sheet of paper placed over each test exercise. The use of the extra thin sheet made it possible to use the same copy of the test exercises for all performers. Figure 1 presents a sample scoring sheet for an actual performance of one of the subjects.

During the trial presentation of the test it was often found necessary to move certain items to a higher or to a lower level. For example, rhythmic groups containing sixteenths were principally placed in levels C and D. The final determination of placement of items is shown by the test, given in the appendix. The element of fatigue was given careful consideration in regard to the length of the test exercises in measures. Reactions were solicited from the subjects in this matter and preliminary scoring was scrutinized for a greater prevalence of errors as the exercise progressed. A length of thirty-two measures was finally adopted as being of the correct length to avoid excessive fatigue and yet avoid the necessity of providing too great a number of exercises.

During the trial presentation of the test it was found necessary to change the level assignment of certain test exercises. The final arrangement of test exercises is shown by the test in the appendix.

Name _____

Exercise _____

O SU 2-9

O BPK 3-5

O ANS 2-6

O ANS 1-10

O DBA 3-7

O AVN 2-10

O AVR 1-9

Figure 1. Scoring Sheet for Errors Made by Individual Subject on a Single Exercise of the Sight-Reading Test.

Recording Procedure

The recording procedure was the result of a continuous process of revision carried out during the trial presentation of the sight-reading test. The recording procedure was designed to obtain a record of the sight reading performance of the violinists and clarinetists and to allow for the re-playing of the recording in order to locate all errors made by both groups of instrumentalists. The first consideration involved in the process of recording was the provision of correct physical facilities.

The tests were given in a school room which had good lighting, either from the windows or from the electric lighting fixtures. The temperature of the room was comfortable and the room was well ventilated whenever possible. As far as was possible, disturbing noises were prevented from distracting the attention of the performer. The room was provided with a comfortable chair, a music stand, the sight-reading exercises, the directions for administration of the test, a table for a recorder, and a metronome.

The recorder used in this study was a Webster-Chicago wire recorder of the portable type. This recorder provides for recording and playing back on the same machine. During the playback period the machine may be stopped at any given point, rewound as far as desired, and then played again. Repeating this process enables the scorer to play a given passage as many times as may be necessary in locating the errors.

The fidelity of this recorder was amply sufficient for the purposes of this study. The spools of wire were used many times by recording over the previous recording. This process involved the simultaneous erasure of the old recording and the recording of the new performance.

The microphone was placed close enough to the performer to insure sufficient audibility of the recording without distortion.

Directions for administration.—The following directions for administration were evolved for this study and would be equally applicable to similar studies using the same material and procedure.

See that physical conditions are satisfactory. The exercises must be administered in a quiet room with good lighting and comfortable conditions of ventilation and heat.

Include the following items in the physical set-up: a chair, a stand, a copy of the test, the recorder placed on a table, the microphone placed in a secure location, and a metronome placed convenient to the administrator.

Allow the subject from three to five minutes to warm-up his instrument.

Secure all preliminary data concerning the subject before the first exercise is played. This data should include: name, age, grade in school, months of private instruction, months of class instruction, and months of previous playing.

The attitude of the administrator should be of such a friendly nature that the subject is encouraged to give his best performance. This does not mean the giving of any information which might aid the subject in playing the exercises.

Say to the subject: "These exercises are given in an effort to help you become a better reader of music. I want you to do your best in order that you may be proud of how much you can accomplish. In these exercises you are to read each exercise exactly as written. Be sure that you hold each note and rest for its correct value and observe all signs. I will score the errors you make in order that I may help you to find ways to improve your reading and playing. No grades will be given and you will not be compared with other subjects. You will be allowed one minute in order to look over each exercise. During this minute you are not to play any portion of the test on your instrument but rather to look for the key and time signatures and any unusual measures which may be in the exercises. Should you be forced to stop on any exercise, begin again at the last note played and continue playing the remainder of that exercise."

The administrator should call attention to each key and time signature during the first three exercises. Explain to the subject that you will not call his attention to these signatures on the later exercises.

Set the metronome at 80 mm. for 4/4, 3/4, and 2/4 time and at 100 mm. for 6/8 time.

After the one minute period, say to the subject: "I will start the metronome and count one measure for you after which you are to start immediately in the tempo set by the metronome. After you have played one measure, I will cut off the metronome and you will continue to play in the same tempo."

After each exercise has been played the subject should be encouraged by praising him for the amount played correctly.

The administrator should now turn to the next exercise and again allow the one minute period for scrutiny and then follow the above procedure.

No help is to be given to the subject at any time during the playing of the test exercises.

Selection of Subjects

The subjects of this investigation were forty performers on orchestral instruments. Twenty of the subjects were performers on the violin and twenty of them were performers on the clarinet. The twenty performers on each instrument were divided into four groups, five performers being in each of the levels; A, B, C, and D.

The performers were chosen from cities and towns in five states, not more than seven performers being from any one town or city. None of the subjects were drawn from the classes of the writer of this study, since the majority of his students were used in the preliminary testing carried out to develop the sight-reading test.

The preliminary classification of performance level was determined through an approximation of the number of months of previous playing, the number of months of private or class instruction, and the estimate of the teacher of the pupil. The results of the preliminary test were used as a criterion of the validity of the original assignment of level. In some cases

it was necessary to reclassify a performer to a higher or a lower level on the basis of the results of the preliminary test. This was necessitated by the varying amounts of progress made by different performers who might have played and studied for the same length of time.

Tables 18 and 19 present pertinent data concerning the subjects, including instrument played, level of performance, chronological age, grade in school, months of private instruction, months of class instruction, and months of previous playing.

Classification of Errors.

Errors were classified in terms of the following general categories: accidentals, key, pitch, and rhythm. The errors were further classified in terms of rhythmic group and interval.

Errors of accidentals concerned failure to play the sharps, flats, or naturals indicated by accidentals placed by individual tones. These errors were classified according to the accidental which was missed in the error.

Errors of key concerned failure to play the sharps, flats, or naturals indicated in the key signature. These errors were classified according to the name of the note which was missed in the error.

The following statements were set up as guides for determining errors of pitch.

1. A tone added or a tone omitted constitutes an error.
2. A pitch error occurring on the first note of the first measure of each exercise is not to be counted as an error, provided the subject begins again on the right note. The subject may be allowed to find the first note of the exercise before beginning to play the whole exercise.

TABLE 18

CHRONOLOGICAL AGE, GRADE IN SCHOOL, MONTHS OF PRIVATE
INSTRUCTION, MONTHS OF CLASS INSTRUCTION, AND
MONTHS OF PREVIOUS PLAYING OF VIOLINISTS
OF FOUR LEVELS

Violinist	Chrono- logical Age	Grade in School	Months Private Instruc- tion	Months Class Instruc- tion	Months Previous Playing
Level A					
1	14	8	32	0	32
2	12	7	12	12	24
3	12	7	12	36	36
4	12	7	0	24	24
5	12	7	0	30	36
Level B					
1	13	7	24	0	36
2	12	8	0	27	36
3	8	4	30	36	40
4	12	7	0	18	24
5	13	7	48	12	60
Level C					
1	17	12	0	72	72
2	19	14	24	0	84
3	16	11	84	96	96
4	18	12	0	72	72
5	16	11	0	40	44
Level D					
1	23	16	48	48	96
2	35	19	180	0	324
3	21	16	66	0	84
4	26	17	108	0	180
5	18	13	120	84	132

TABLE 19

CHRONOLOGICAL AGE, GRADE IN SCHOOL, MONTHS OF PRIVATE
INSTRUCTION, MONTHS OF CLASS INSTRUCTION, AND
MONTHS OF PREVIOUS PLAYING OF CLARINETISTS
OF FOUR LEVELS

Clarinetist	Chrono- logical Age	Grade in School	Months Private Instruc- tion	Months Class Instruc- tion	Months Previous Playing
Level A					
1	15	10	0	12	12
2	12	7	3	12	12
3	14	9	0	12	12
4	12	7	0	24	24
5	11	6	0	24	24
Level B					
1	13	8	1	24	24
2	15	10	0	30	36
3	16	11	0	40	44
4	15	10	0	36	48
5	15	11	0	30	38
Level C					
1	23	16	0	60	96
2	14	11	12	48	54
3	15	9	0	30	40
4	15	10	0	36	45
5	21	16	0	96	96
Level D					
1	18	13	12	72	96
2	28	13	0	0	156
3	29	14	24	0	168
4	19	14	24	72	96
5	19	14	72	0	96

3. A fuzzy or irregular tone shall not be counted an error of pitch.
 4. Slight errors of intonation are not to be counted as errors of pitch.
 5. All other playing of incorrect pitch shall be counted as an error.
- Errors of pitch were classified as addition of notes, substitution of notes, reversals, and indefinite.

Errors of rhythm concerned failure to hold a note or rest for the correct length of time. All sustained notes must be held within less than one beat of the correct length. Thus a four-beat note must be held for more than three beats and less than five. All rests must be observed and held long enough (within less than one beat of the correct amount). The following types of rhythmic errors were classified: omission of notes or rests, addition of rests, addition to the value of notes or rests, and subtraction from the value of notes or rests. Errors of rhythmic group were also classified in terms of the rhythmic group in which the error occurred.

Errors of interval were classified according to the size of the interval which occurred in the test exercise at the point an error was made.

Treatment of Data

The data in this study were obtained from the recordings of the performance of the violinists and clarinetists on the sight-reading test. Each recording was played back a sufficient number of times to insure the detection of the errors made by the performer.

The errors were marked on a very thin sheet of paper placed over the test exercises. The piece of paper was so placed on the page as to permit it to be replaced over the test exercise at any later time for further re-checking.

The use of the code system which was evolved for marking the errors was shown in Figure 1. This code may be illustrated by ANS 2, 6. This, decoded, would read; added note, same, interval of a second, error occurring in rhythmic group 6. Similarly, DbA 3, 7, would indicate an error in accidentals in playing Db, the interval of a third being involved, the error occurring in rhythmic group 7. This code system provided a concise method of marking the errors in order to place all needed information on one page for each exercise. A separate page was provided for each exercise for each subject.

The information concerning each error was transferred from the individual scoring sheets to a tabulation sheet for each subject. This tabulation sheet gave subtotals for each individual exercise played by the performer and also gave the total number of errors of each type made by the performer. This tabulation sheet is shown in Figure 2. Information concerning the rhythmic group and the interval, involved in the error was placed on a tabulation sheet similar to Figure 3.

The totals of each tabulation sheet were then placed in tables presenting each level of performance and each of the two instruments. The totals from these tables were then presented in tables which gave the totals for each type of error and each factor under consideration. These tables are presented in subsequent chapters of this report.

Summary

The procedures followed in this study were devised for the purpose of determining and interpreting the errors made by violinists and clarinetists on a test of sight reading in music. The procedures included the construction

Name _____

Types of Errors		Exercise						Total
		Preliminary	1	2	3	4	5	6
Acci- dentals	A#							
	N							
	b							
	B#							
	N							
	b							
	C#							
	N							
	b							
	D#							
	N							
	b							
	E#							
	N							
	b							
	F#							
	N							
	b							
	G#							
	N							
	b							
Total Accidentals								
Key	A#							
	N							
	b							
	B#							
	N							
	b							
	C#							
	N							
	b							
	D#							
	N							
	b							
	E#							
	N							
	b							

Name _____

Types of Errors		Exercise						Total
		Preliminary	1	2	3	4	5	6
Key	F#							
	N							
	b							
	G#							
	N							
	b							
Total Key								
Added Note	Same							
	Up							
	Down							
Substituted	Up							
	Down							
Reversal								
Indefinite								
Total Pitch								
Omitted	Note							
	Rest							
Add Rest	In Group							
	Between Groups							
	Between Measures							
Add Value	Note							
	Rest							
Subtract Value	Note							
	Rest							
Total Rhythm								

Figure 2. Tabulation Sheet for Errors Made by Individual Subject in Playing Accidentals, Key, Pitch, and Rhythm.

Name _____

Rhythmic Group	Interval								Total
	1	2	3	4	5	6	7	8	
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
Total									

Figure 3. Tabulation Sheet for Errors Made by Individual Subject in Playing Rhythmic Groups and Intervals.

of the sight reading test, the trial presentation of the test, the formulation of a recording procedure, the selection of the subjects of the study, the classification of errors, and the treatment of the data.

The first step in the construction of the sight-reading test consisted in the setting up of criteria for its preparation. Sixteen test exercises were constructed on the basis of the criteria, using additional information gained through a detailed analysis of six selected violin studies in regard to key signatures, time signatures, accidentals, intervals, and rhythmic groupings. The range of pitches in the test exercises was within the normal playing range of each of the two instruments. A preliminary test exercise was constructed to be used to check the validity of the level assignment of subjects.

The trial presentation of the sight reading test was used to develop the recording procedure, to develop a method of scoring, to guide in the construction and placement of test items, and to determine the level placement of each test exercise. Eighteen subjects were used for the trial presentation of the test. The directions for administration were evolved as a result of the trial presentation and included instructions both for the administrator and for the subject.

The first step in the recording procedure consisted of the procurement of the necessary equipment. The equipment included the physical facilities of the room, a wire recorder, a metronome, the test exercises, a music stand, and the directions for administration. The directions for administration were read to the subject, after which the performance of the subject on the sight-reading test was recorded on a Webster-Chicago wire recorder.

The subjects of the investigation were twenty performers on the violin and twenty performers on the clarinet. Each group of twenty was divided into four groups containing five at each of the levels; A, B, C, and D.

The types of errors were defined and instructions given for scoring each type. Errors were classified in terms of the following categories: accidentals, key, pitch, rhythm, rhythmic group, and interval.

The method of scoring consisted of placing a very thin sheet of paper over the test exercises and marking all errors on the thin sheet, using coded symbols for each error. The recordings were played back a sufficient number of times to insure detection of all errors made by the performer.

The errors were then transferred from the thin sheet of paper to tabulation sheets. Totals were shown on the tabulation sheets for errors on each test exercise and for each type of error.

The totals from each individual tabulation sheet were then recorded in tables representing each level of performance and each of the two instruments. The results of this tabulation and the conclusions reached from the data in the tables are presented in succeeding chapters.

CHAPTER IV

ANALYSIS OF ERRORS IN FOUR PHASES OF PERFORMANCE

The general purpose of this study, as indicated in Chapter I, was to ascertain the difficulties encountered by violinists and clarinetists in the sight reading of music. The presence of a difficulty is determined through the location of an error made by the performers, with the amount of difficulty measured in terms of the number and percentage of errors made on the sight-reading test discussed in Chapter III.

The present chapter presents an analysis of the errors made by all subjects with regard to the four phases of performance that were defined in Chapter I as the playing of accidentals, key, pitch, and rhythm. This analysis is presented in order to provide comparisons between the relative frequencies of errors which may be attributed to each of the four phases.

A variety of specific errors is possible in each of the four phases. Accordingly, the analysis of this chapter further presents the number and percentage of these specific errors made in accidentals, key, pitch, and rhythm. The percentage of errors is here used as a criterion of the difficulty experienced by the instrumentalists in meeting the specific problems of each of the four phases of performance. Location of the problems most commonly demanding attention may lead to economy of time in remedial teaching in music.

Analysis of Errors in Four Phases of Performance

Progress in ability to sight read is dependent on locating difficulties experienced by the performer and the proper prescription of corrective measures to eliminate the difficulties. This section presents the data

bearing on the amount of difficulty attributable to the playing of accidentals, key, pitch, and rhythm. The determination of the extent to which difficulties in each of the four phases may hinder sight reading should aid in the selection of proper corrective exercises and studies. The present section discusses this problem in a general way as applied to performers on both violin and clarinet, and to performers at all stages of musical development.

Data concerning the errors made by all performers are given in Table 20. This table shows the number of errors and gives the percentages of errors based on the opportunities for errors of each type. It should be noted that variations occur in the number of opportunities for errors. These variations were accounted for in previous discussions, in Chapter III, of the method of construction of the test exercises.

Accidentals.--In any given key, eight separate notes are used, varying according to the flats or sharps included in the key signature. When an accidental occurs in the score, the player must change, momentarily, one of the notes of the key in which the music is written. In many cases, accidentals are used to add variety to the harmonic progressions of the music. An error in accidentals may not only change the melodic line but may also alter drastically the harmonic structure, and thus destroy much of the meaning of the music.

Errors in accidentals, as shown in Table 12, were least in absolute frequency of any of the four phases of performance. This was probably the result of the relatively small number which were played. It was also true, however, that the largest percentage of errors was registered in the playing

TABLE 20

NUMBER AND PERCENTAGE OF ERRORS IN ACCIDENTALS,
KEY, PITCH, AND RHYTHM MADE BY ALL PERFORMERS

Types of Errors	Number of Opportunities for Errors	Number of Errors	Per Cent of Errors
Accidentals	2020	122	6
Key	33430	770	2
Pitch	35450	468	1
Rhythm	39070	1494	4
Total	39070*	2854	7

*It is possible for the performers to make an error on each note and each rest as they are played. Therefore, the total number of opportunities for errors is the same as the total number of notes and rests.

of accidentals. Although the actual number of errors in accidentals was smaller than the number of errors of the other three phases of performance, it appears evident that the playing of accidentals presents the most difficult problem of any of the four phases. This difficulty in playing accidentals may, in part, be explained through lack of experience in playing them, since only a few accidentals are normally played in music that is easy or of medium difficulty. The large percentage of errors made in playing accidentals appears to indicate that performers may not learn to play accidentals through the music they might commonly play, but that special exercises might profitably be used to bear on this subject alone. Later in this chapter, there will be a discussion of the problem met by the performers in playing specific accidentals.

Key.—Playing in the correct key gives music a logical and meaningful basis. An error in key may give the listener the impression that the note played does not belong to that composition. Thus, the key refers to a family of tones, whose association is closely related.

More than one fourth of all errors, as shown in Table 20, were errors in key. These totaled more than the combined errors in pitch and accidentals, but were much less numerous than errors in rhythm. In terms of opportunities for errors, errors in key totaled only two per cent of the total opportunities. The notes of the key appeared to be relatively easier to play than accidentals or rhythm, but more difficult to play than the correct pitch.

The frequency of errors of this type would indicate that this phase of performance demands careful attention from all performers. In a later chapter, data will be presented on the acuteness of this problem at the

various levels of performance. Comparisons will also be made between the difficulty encountered in this respect by violinists and clarinetists.

Pitch.—Failure to observe an accidental or to observe the key signature has been discussed in the two previous sections. Although these errors have a definite relation to pitch, they are treated separately in this study. Errors of pitch were defined in Chapter III as substitutions, additions, reversals, and indefinite notes.

Errors in pitch were registered on only one per cent of the opportunities for errors. The playing of the indicated pitch appeared to present the least difficulty of any of the four phases of performance. In addition to the fact that the smallest per cent of errors was registered for the playing of pitch, there were fewer errors made in this regard than in any of the phases save accidentals. These observations seem to indicate that the problem of playing the correct pitch is relatively easy of solution or the performers have received more adequate instruction with regard to this phase of performance than with regard to the other phases. Analyses, given in later chapters, will deal with the acuteness of this problem at the various levels of performing ability and to performers on both violin and clarinet.

Rhythm.—Rhythm in music is inextricably tied to the bodily response of the listener. Thus, an error in rhythm produces an immediate reaction in the listener, as if his musical progress had been rudely stopped or unduly hastened. More than half of the errors made by the performers were errors in rhythm. This fact, shown in Table 12, would seem to indicate that, in actual music reading, a major problem appears to exist in the

playing of the correct rhythmic pattern. In terms of percentage of errors, rhythm was relatively more difficult to play than were key and pitch but less difficult than accidentals. The high frequency and large percentage of errors made in playing the correct rhythm both point to the need for more stress in learning to play rhythm in order to sight read well.

Analysis of Errors in Accidentals

Accidentals were shown previously in this chapter to present the greatest difficulty of any of the four phases of performance in the sight reading of music. This section is concerned with the determination of the difficulty presented by the playing of the particular accidentals which were included in the sight reading test. This difficulty is again measured in terms of the number and percentage of errors made in playing each accidental, as is shown in Table 21.

In general, the performers encountered the least difficulty in playing naturals, which correspond to the white notes of the piano keyboard. A single exception to this statement is observed with regard to B natural. The large percentage of error in playing B natural suggests further consideration as to the level of performance or the instrument contributing to this difficulty and also consideration of the ways in which this note was used in the test exercises.

The percentage of errors made in playing the sharps and flats increased directly with the order of presentation of that sharp or flat in the key signatures. Thus, E flat, which follow B flat in the key signature, was more difficult to play than was B flat. Large percentages of errors were registered in the playing of E flat, A flat, G sharp, and D sharp.

TABLE 21

NUMBER AND PERCENTAGE OF ERRORS IN ACCIDENTALS
MADE BY ALL PERFORMERS

Accidentals	Number of Opportunities for Errors	Number of Errors	Per Cent of Errors
A Natural	100	1	1
Flat	90	18	20
B Natural	180	14	8
Flat	370	16	4
C Sharp	210	9	4
Natural	100	2	2
D Sharp	200	22	11
Natural	30	0	0
Flat	10	0	0
E Natural	170	2	1
Flat	90	15	17
F Sharp	190	3	2
Natural	140	4	3
G Sharp	140	16	11
Total	2020	122	6

The only exception to the above statements was in the playing of D flat. The total number of accidentals played was 2020, of which six per cent, or 122, were incorrectly played.

The results of this analysis point to a need for additional training in playing those accidentals which are least frequently used, but yet are critically important when they do occur. Since these accidentals are infrequently used in music, it appears that special exercises might be devised to speed up the learning process.

Analysis of Errors in Key

Errors in key were shown in Table 12 to rank third in difficulty of the four phases of performance in sight reading. An opportunity for an error in key is found on each note which is not marked with an accidental. This section is concerned with the difficulty encountered by all performers in playing correctly each note of the keys which were used. The number and percentages of errors made in playing each note of the keys is shown in Table 22.

The least difficulty was encountered by the performers in playing naturals. Slight exceptions to the above were found with regard to F natural and B natural. This may be attributed, in part, to an indecision in the mind of the performer concerning these two notes. The first flat used in a key signature is always B flat and the first sharp is F sharp. Thus any indecision concerning the key signature would likely result in indecision concerning these two notes. The difficulty encountered in playing flats and sharps seemed to increase directly with the order in which the sharps and flats are introduced in the key signature. There is an indication that the

TABLE 22

NUMBER AND PERCENTAGE OF ERRORS IN KEY
MADE BY ALL PERFORMERS

Notes of the Key	Number of Opportunities for Errors	Number of Errors	Per Cent of Errors
A Natural	4270	14	0*
Flat	790	31	4
B Natural	2540	137	5
Flat	2430	47	2
C Sharp	600	87	14
Natural	4100	45	1
D Sharp	70	17	24
Natural	4720	8	0*
Flat	200	24	12
E Natural	2990	9	0*
Flat	1530	50	3
F Sharp	1210	119	10
Natural	3060	97	3
G Sharp	450	69	15
Natural	4470	16	0*
Total	33430	770	2

*Less than half of one per cent

playing of flats constituted less of a problem than the playing of sharps. Further analyses will deal with this hypothesis in terms of level of performance and the instrument played. All performers played 33,430 notes other than accidentals, making only 770 errors. These errors were two per cent of the total number played.

It would appear, on the basis of the results given, that attention might profitably be given to the problem of consciousness of whether sharps or flats were being used in the signature, and thus whether B natural or F natural was being used. The wise selection of instructional materials might include the use of a variety of keys, since it was indicated earlier that keys with a small number of sharps and flats are most commonly used in practice exercises.

Analysis of Errors in Pitch

The two previous sections have discussed the difficulty experienced by the performers in accidentals and key. It has previously been pointed out that the playing of the correct pitch presented the least difficulty of any of the four phases of performance. This observation is clearly substantiated by Table 23, which shows that less than one half of one per cent of errors were made in any particular specific pitch error.

More than three fourths of all the errors in pitch were located in these three categories: substituting a note upward, substituting a note downward, and adding a note the same as was being played. The performers exhibited a tendency to substitute in equal amounts in an upward and in a downward direction. Thus, no significance can be attributed to the direction in which the substitution is made. The relatively large proportion of errors

TABLE 23

NUMBER OF ERRORS IN PITCH
MADE BY ALL PERFORMERS

Types of Pitch Errors	Number of Opportunities for Errors	Number of* Errors
Add Note		
Same	33430	123
Up	33430	25
Down	33430	15
Substitute Note		
Up	33430	164
Down	33430	133
Reversal	33430	7
Indefinite	33430	1
Total	33430	468

*Per cent of errors is less than half of one per cent for all types
of Pitch Errors

in addition might possibly be explained through a failure to grasp the numerical values of groups of notes.

The total number of errors of pitch was 468, based on an opportunity for errors of 33,430. These errors represent approximately one per cent of the total number of notes which were played. The sight reading ability of the performers did not appear to be greatly handicapped because of inability to play the correct pitch. It did appear, however, that attention might well be called to the problem of substitution.

Analysis of Errors in Rhythm

The phase of performance demanding most attention was shown to be rhythm. More than half of all errors were made in playing the rhythmic pattern. Thus, the playing of rhythm presents the greatest challenge both to the teacher and performer in eliminating errors of this type in sight reading. Each note and each rest, as they were played, presented an opportunity for an error in rhythm. The opportunities for errors in each category of rhythm are shown in Table 24. This table also gives the number and percentage of errors of each type based on the opportunities for errors.

The subjects performed best in these categories of rhythm: omission of notes, addition of rests in a rhythmic group, and addition of rests between groups. The largest percentage of errors was registered with regard to the addition to the value of a rest. More than two-thirds of the total errors were registered in adding to and subtracting from the value of a note. Adding to value refers to playing a note for too long a period of time, while subtraction from value indicates that the note was not played long enough. Rests were omitted relatively more often than were notes. There is a possi-

TABLE 24

NUMBER AND PERCENTAGE OF ERRORS IN RHYTHM
MADE BY ALL PERFORMERS

Types of Rhythm Errors	Number of Opportunities for Errors	Number of Errors	Per Cent of Errors
Omit:			
Note	35450	94	0*
Rest	3620	75	2
Add Rest:			
In Group	25110	6	0*
Between Groups	25110	26	0*
Between Measures	8320	53	1
Add to Value:			
Of Note	35450	440	1
Of Rest	3620	94	3
Subtract From Value:			
Of Note	35450	656	2
Of Rest	3620	50	1
Total	39070	1494	4

*Less than half of one per cent

bility that rests are more difficult to execute than are notes. It might also be true that music teachers had placed more emphasis on the playing of notes than on rests. Rests were mainly added between measures rather than in the rhythmic group or between rhythmic groups. This might indicate the presence of faulty reading habits with regard to progress from measure to measure. The measure bar in music does not indicate a pause in the music but is used for convenience in grouping the notes according to rhythmic stresses. There were 1494 errors in rhythm, which represented four per cent of the total number of opportunities for errors in rhythm.

Summary

The performers made the largest percentage of errors in playing accidentals; however, since only a small number were played, the frequency of errors in accidentals was the lowest of any of the four phases of performance. It appeared probable that lack of experience with accidentals was a contributing factor in the large percentage of errors in that phase. Since accidentals are infrequently met in music which is commonly played, specially prepared instructional materials might profitably be devised to deal with this problem. Errors in key, totaling more than one-fourth of all errors, were more numerous than for any phase save rhythm. In terms of the opportunities for errors, the playing of the notes of the key seemed to be relatively easier to play than accidentals or rhythm, but more difficult to play than the correct pitch. The large number of errors made in key suggest the need for careful attention by both teacher and student to this phase of performance. In terms of opportunity, errors in pitch were registered on only one per cent of the opportunities for errors. Thus, the playing of the

indicated pitch appeared to present the least relative difficulty of any of the four phases of performance. It could be that the problem of playing the correct pitch is comparatively easy of solution or that the performers had received more adequate instruction with regard to this phase of performance than with regard to the other phases. More than half of the errors made by the performers were errors in rhythm. In terms of percentage of errors, rhythm was relatively more difficult to play than were key and pitch but less difficult than accidentals. The high frequency and the large percentage of errors made in playing the correct rhythm both point to the need for more stress in learning to play rhythm in order to sight read well.

In the playing of accidentals, little difficulty was found in playing naturals, save for the one note B natural. With regard to the playing of other accidentals, there seemed to be a direct relationship between difficulty and the order of presentation of the sharps or flats in the key signature. The results seemed to point to the need for additional training in playing those accidentals which might not be met in the music which the students would most commonly play.

The difficulties found in playing the notes of the key showed a close parallel to those found in playing accidentals. Thus, naturals were easiest to play, save for F natural and B natural, and the difficulty encountered in playing sharps or flats seemed to increase directly with the order of presentation of the sharps or flats in the key signature. The playing of sharps appeared to present slightly more difficulty than the playing of flats. Again, as in accidentals, there seemed to be a need for additional instruction on those keys not commonly played by the performers, and for instructional

materials which make use of a wider variety of keys.

The performers of this study appeared to be relatively most proficient in the playing of pitch. Errors in this phase of performance were low in frequency and small in percentage values. Substitutions, made equally in an upward or a downward direction, accounted for the majority of errors in pitch. Inability to play the correct pitch did not seem to greatly handicap the sight-reading ability of these performers.

In the playing of rhythm, more than two-thirds of all errors were registered in adding to and subtracting from the length of time which a note was held. Although a much smaller number of rests were played than notes, the former appeared more difficult to play than did the latter. This was particularly evident in the large percentage of errors made in holding a rest too long. It seems probable that teachers should give more emphasis to rests than has been done in the past. An indication was found of faulty reading habits in the percentage of errors made in placing a rest before the measure bar.

CHAPTER V

ANALYSIS OF ERRORS AT FOUR LEVELS OF PERFORMING ABILITY

The discussion of Chapter IV was concerned with the difficulty experienced by all subjects in playing accidentals, key, pitch, and rhythm, and the specific errors which were made in the playing of each of these four phases of performance. It seemed appropriate to also consider the errors in terms of the level of performing ability of the subjects.

Accordingly, this chapter presents the data concerning the performance of the subjects at each of the four levels of performing ability, as defined in Chapter III. Comparison is first made of the relative difficulty attributable to each of the four phases at each of the four levels. This comparison gives an indication of the phases which demand greater attention to remedial instruction at each level. It also provides information concerning the amount of progress which should be expected from level to level in each of the phases. Further analysis is made of the specific errors made in each phase of performance at each of the levels. This analysis should aid in selecting the exact points of emphasis which must be stressed in order to reduce the number of errors made in sight reading music.

Four Phases of Performance

The selection of subjects, as described in Chapter III, made provision for the inclusion of performers at four levels of playing ability, ranging from level A to level D. Level A was defined as that ability which would be expected of pupils after one or two years of training and experience.

Level D was the ability expected of those subjects whose training and experience covered more than six years. Some professional musicians were included in the group at level D.

Analysis of errors in level A.—Table 25 presents a picture of the percentages of errors registered by the subjects at each level in playing accidentals, key, pitch, and rhythm. The values given in this table indicate that the performers of level A had acquired more proficiency in playing pitch and key than in playing accidentals and rhythm. The range of percentages, from three to twenty-one, is the greatest of any of the four levels. The greatest relative difficulty, as shown by the largest percentage of errors, twenty-one per cent, was registered in accidentals. This may, in part, be explained through the fact that few accidentals are included in elementary music, and thus the members of this level had limited experience in this phase of performance.

Previous discussions of Chapter III have indicated that many more opportunities for errors in rhythm were included in the sight-reading test than for accidentals. This was true for all levels of performance. Therefore, taking into account the small number of accidentals which were played, the most pressing problem for level A appeared to be rhythm, on which nine per cent of errors were made on the relatively large number of opportunities for errors. A later section of this chapter will discuss the specific errors contributing to the frequency of errors in rhythm.

Much emphasis has often been placed, in teaching, on the playing of the correct pitch. It appears noteworthy that the students of this level had little difficulty with this problem. The ability to play the correct

TABLE 25

PERCENTAGE OF ERRORS IN ACCIDENTALS, KEY,
PITCH, AND RHYTHM MADE BY SUBJECTS
AT EACH OF FOUR LEVELS OF
PERFORMANCE

Types of Errors	Level				Total
	A	B	C	D	
Accidentals	21	5	2	2	6
Key	5	3	2	1	2
Pitch	3	2	1	1	1
Rhythm	9	4	4	2	4
Total	17	9	6	3	7

pitch and the notes of the key appears to develop earlier than the ability to play accidentals and rhythm.

Analysis of Errors in Level B.—The subjects of level B have approximately two years more of training and experience than do those of level A. The results shown in Table 25 indicate that very rapid progress was made from level A to level B in regard to the playing of accidentals and rhythm. In spite of this progress, these performers show greater proficiency in pitch and key than in accidentals and rhythm. The range of percentages of errors, two to five, is small in comparison with that of level A; however, the rank of the four phases in difficulty is the same for both levels. Although accidentals are still the most difficult to play, they are not as greatly so as they were in the previous level. With the exception of accidentals, of which only a few were played, the greatest difficulty was again found in rhythm. As in level A, not only did rhythm present the most difficulty, but pitch presented the least difficulty.

Analysis of Errors in Level C.—Level C was defined as that level which would be expected of performers with five or six years of training. The picture given in Table 25 seems to indicate a substantial growth in ability in each phase save rhythm, with the most pronounced progress being made in accidentals. These performers, making only one per cent of errors, appeared to be most proficient in playing the correct pitch. The range of percentages, one to four, is approximately the same in extent as for level B. Rhythm, in which four per cent of errors was registered, was relatively the most difficult of the four phases. Even at this level, the number of accidentals played in a given composition would not be great; hence most of the opportunity

for improvement in sight reading is to be found in the realms of rhythm and key. It is noteworthy that in this level accidentals are not the most difficult of the four phases, and that they have reached the lowest percentage of errors which they are to reach.

Analysis of Errors in Level D.—It would be expected that the subjects of level D would make a smaller per cent of errors than would the other three levels if the music had been the same for each level. However, in this test, the music became progressively more difficult as the level increased. Thus, the performance of the subjects of level D, as given in Table 25, is remarkable, both in terms of the difficulty of the music played and the small percentages of errors which were registered. The range of percentages of errors, one to two, is smaller than for any of the other three levels. Accidentals, while not numerous even for this level, were relatively as difficult for these subjects as was rhythm. The other two phases were relatively easier to play. Previous analyses have shown that the total rhythm errors were greater than all other errors combined for the other three phases. Thus, even at the professional level, it appears that most attention should be given to instruction in rhythm in order to improve the ability to sight read music. Even at this level, it might be true that not enough experience would normally be gained in playing accidentals, and thus special exercises might be devised to help solve this problem.

Analysis of Errors in Accidentals

In the construction of the sight reading test, a limited number of accidentals were included, even for the performers of level A. These accidentals were selected with regard to their fitness in the keys being played.

Thus, as shown in Table 26, only nine different accidentals were used, with a total of 320 being played by all the performers of this level. It should be noted that only a few naturals occurred as accidentals. This may be accounted for by the fact that the performers of level A played principally in the key of C (no sharps or flats), and thus naturals would be in the key and would not then appear as accidentals. A more accurate comparison of the performances of the four levels could have been made had the subjects of each level played the same accidentals. The discussions of Chapter III explained the use of various key signatures throughout the sight-reading test, and thus showed the necessity for a variation in the accidentals to be used. More accurate comparisons would also have been possible if a much greater number of accidentals had been played; however, the construction of this particular test did not allow this to be done.

The performers of level A had considerable difficulty in playing the vast majority of the accidentals, registering twenty-one per cent of errors on the total number played. C natural, with zero per cent of errors, and F sharp, with seven per cent of errors, were most accurately played. Subjects of level A experienced considerable difficulty with all other accidentals played, registering their worst performance in playing E flat, on which they made fifty-five per cent of errors.

The acuteness of the problem of playing accidentals, as shown for level A, leads to consideration of the specific errors made by the performers of higher levels. It has already been shown that this problem becomes relatively less acute as the level rises.

The previous discussion indicated that performers with one and two

TABLE 26

NUMBER AND PERCENTAGE OF ERRORS IN ACCIDENTALS
MADE BY SUBJECTS OF LEVEL A

Accidentals	Number of Opportunities for Errors	Number of Errors	Per Cent of Errors
A Flat	30	9	30
B Natural	20	3	15
Flat	50	11	22
C Sharp	30	6	20
Natural	40	0	0
D Sharp	70	20	29
E Flat	20	11	55
F Sharp	30	2	7
G Sharp	30	5	17
TOTAL	320	67	21

years training had difficulty, in general, in playing all accidentals. This discussion concerns the performance of the subjects of level B, as given in Table 27. They played more different accidentals and a greater total of accidentals than did the previous group; however, they made a much smaller percentage of errors in playing them, registering only five per cent of errors in playing 480 accidentals.

F natural, although played only ten times, was incorrectly played three times. Eighteen per cent of errors was recorded in the playing of A flat. B natural was missed eight per cent of the times it was played. It appears noteworthy that B natural and F natural were more difficult to play than were many of the sharps or flats. No explanation of this fact can be ascertained from the present data; however, consideration will be given later to the effect of the instrument played on the errors made on these two notes. There appeared the likelihood that sharps caused less difficulty to the group than did flats. The best performance was shown in playing C sharp and D flat, which are the same note, written in two different ways. With the exception of the above mentioned notes, level B experienced only a moderate amount of difficulty in playing accidentals.

The picture of difficulty in playing accidentals, as shown in Table 28, for level C, differs from that shown for the two previous groups. While those groups showed a tendency to make errors on most of the accidentals played, this group made errors on only four out of the twelve different accidentals which were played. The most difficult accidentals to play were B natural and G sharp. Only two other accidentals were missed, these being C sharp and E natural. A possible explanation for

TABLE 27

NUMBER AND PERCENTAGE OF ERRORS IN ACCIDENTALS
MADE BY SUBJECTS OF LEVEL B

Accidentals	Number of Opportunities for Errors	Number of Errors	Per Cent of Errors
A Flat	50	9	18
B Natural	60	5	8
Flat	90	4	4
C Sharp	20	0	0
Natural	40	1	3
D Sharp	70	2	3
Flat	10	0	0
E Flat	30	1	3
F Sharp	70	1	1
Natural	10	3	30
G Sharp	30	1	3
Total	480	27	5

TABLE 28

NUMBER AND PERCENTAGE OF ERRORS IN ACCIDENTALS
MADE BY SUBJECTS OF LEVEL C

Accidentals	Number of Opportunities for Errors	Number of Errors	Per Cent of Errors
A Natural	50	0	0
Flat	10	0	0
B Natural	50	4	8
Flat	100	0	0
C Sharp	70	2	3
Natural	10	0	0
D Sharp	30	0	0
E Natural	70	1	1
Flat	10	0	0
F Sharp	60	0	0
Natural	50	0	0
G Sharp	50	5	10
Total	560	12	2

the errors on B natural may be found by a later comparison of the errors made by the violinists and clarinetists. The performers of level C registered only two per cent of errors on the total number played. This seems to indicate that as training reaches level C the difficulty in playing accidentals becomes rather small.

Table 29 shows that the performers of level D, like the previous group, played twelve different accidentals. They made two per cent of errors based on the total number played. In general, these subjects seemed very proficient in playing accidentals. No errors were made in playing three accidentals; D sharp, D natural, and F sharp. B natural, which was relatively difficult for each of the other three groups, presented only moderate difficulty to these performers. The largest percentages of errors were made in playing C natural, E flat, and G sharp. It might be noted that G sharp presented considerable difficulty to performers at all levels.

The small number of opportunities for errors in playing accidentals makes it extremely difficult to reach conclusions concerning each individual accidental. As stated previously, an increase in the number of accidentals included in the study would have been desirable, but was not practical. It has been shown previously that the frequency of errors in accidentals is low in comparison with the errors in the other three phases.

Analysis of Errors in Key

It was shown in Chapter III that elementary music used keys with either no sharps or flats in the key signature or a small number of them. Therefore, the subjects of level A played mainly in the key of C (no sharps

TABLE 29

NUMBER AND PERCENTAGE OF ERRORS IN ACCIDENTALS
MADE BY SUBJECTS OF LEVEL D

Accidentals	Number of Opportunities for Errors	Number of Errors	Per Cent of Errors
A Natural	50	1	2
B Natural	50	2	4
Flat	130	1	1
C Sharp	90	1	1
Natural	10	1	10
D Sharp	30	0	0
Natural	30	0	0
E Natural	100	1	1
Flat	30	3	10
F Sharp	30	0	0
Natural	80	1	1
G Sharp	30	5	17
Total	660	16	2

or flats), or used one flat or one or two sharps in the key signature. The tabulation of errors shown in Table 30 bears out the lack of experience of the members of this group in playing in keys other than C, since F sharp, C sharp, and B flat were the most difficult notes to play. Little difficulty was encountered by these performers in playing naturals, save for B natural and F natural. The present data offer no explanation for this fact; however, later chapters will deal with this problem as it may be related to the instrument played.

The subjects of level A played 4790 notes of the key and played incorrectly five per cent, or 250, of them. There seems to be a likelihood that had more flats and sharps been used in the key signatures, a larger per cent of errors would have been made in key.

The previous discussion indicated that the use of sharps and flats in the signature presented a major problem to performers of limited training. This is again borne out by the data shown in Table 31. Although registering only three per cent of errors on the total number of notes of the key which were played, the subjects of level B found much more difficulty in playing sharps and flats than in playing naturals. These subjects, as did those at level A, found difficulty in playing F natural and B natural. Explanation for this fact will be sought in later chapters. Although playing only a few G sharps, they erred on seventy per cent of them. There is a slight indication that sharps are more difficult to play correctly than flats. Consideration will be given to this problem with regard to the errors made by violinists and clarinetists. Although the overall performance of the group was excellent, it appears evident that this group would find much

TABLE 30

NUMBER AND PERCENTAGE OF ERRORS IN KEY
MADE BY SUBJECTS OF LEVEL A

Notes of the Key	Number of Opportunities for Errors	Number of Errors	Per Cent of Errors
A Natural	710	0	0
B Natural	450	50	11
Flat	70	13	19
C Sharp	70	43	61
Natural	610	17	3
D Natural	880	0	0
E Natural	730	5	1
F Sharp	170	78	46
Natural	400	38	10
G Natural	700	6	1
Total	4790	250	5

TABLE 31

NUMBER AND PERCENTAGE OF ERRORS IN KEY
MADE BY SUBJECTS OF LEVEL B

Notes of the Key	Number of Opportunities for Errors	Number of Errors	Per Cent of Errors
A Natural	940	5	1
B Natural	540	28	5
Flat	100	18	18
C Sharp	160	38	23
Natural	890	24	3
D Natural	1070	3	0*
E Natural	770	0	0
F Sharp	300	11	4
Natural	510	54	11
G Sharp	40	28	70
Natural	920	9	1
Total	6240	218	3

*Less than half of one per cent

difficulty in playing in those keys having a large number of flats or sharps.

The presence of sharps and flats in the key signature was shown to cause considerable difficulty to the two previous groups. The percentages of errors shown in Table 32 show that naturals are again less difficult to play than are sharps or flats. The order of presentation of the sharp or flat in any given signature seemed to have a direct relationship to the difficulty of playing that sharp or flat. In other words, the fourth sharp which is added in the signature, D sharp, is more difficult to play than is F sharp, which is always the first sharp to be placed in the signature. As was reported for the previous group, there is an indication that sharps are more difficult to play than are flats. This group, unlike the two previous groups, did not greatly err on F natural, although they did find difficulty in playing B natural. An explanation for the errors made in playing B natural will be sought in the comparisons to be made later between the errors of the violinists and clarinetists. The performers of level C made only two per cent of errors on the 9,980 notes which were played.

Playing in the correct key was shown to be difficult to previous groups when sharps and flats were used. The values shown in Table 33 seem to indicate that the performers of level D find most difficulty in playing those sharps or flats which are least commonly used. The poorest performance was on D sharp and D flat, which, in this study, represent the sharps and flats least commonly used. This group appears to find more difficulty in playing sharps than in playing flats. There is a possibility that an explanation for this fact may be found in the past experience of the performers;

TABLE 32

NUMBER AND PERCENTAGE OF ERRORS IN KEY
MADE BY SUBJECTS OF LEVEL C

Notes of the Key	Number of Opportunities for Errors	Number of Errors	Per Cent of Errors
A Natural	1200	5	0*
Flat	190	19	10
B Natural	600	54	9
Flat	1050	13	1
C Sharp	90	1	1
Natural	1330	3	0*
D Natural	1480	4	0*
E Natural	660	3	0*
Flat	670	38	6
F Sharp	190	14	7
Natural	1110	5	0*
G Sharp	40	15	38
Natural	1370	0	0
Total	9980	174	2

*Less than half of one per cent

TABLE 33

NUMBER AND PERCENTAGE OF ERRORS IN KEY
MADE BY SUBJECTS OF LEVEL D

Notes of the Key	Number of Opportunities for Errors	Number of Errors	Per Cent of Errors
A Natural	1420	4	0*
Flat	600	12	2
B Natural	950	5	1
Flat	1210	3	0*
C Sharp	280	5	2
Natural	1270	1	0*
D Sharp	70	17	24
Natural	1290	1	0*
Flat	200	24	12
E Natural	830	1	0*
Flat	860	12	1
F Sharp	550	16	3
Natural	1040	0	0
G Sharp	370	26	7
Natural	1480	1	0*
Total	12420	128	1

*Less than half of one per cent

however, this problem will be considered later in the analyses of the performances of the violinists and clarinetists.

The foregoing statements point to the fact that all groups have difficulty in playing those keys with which they are not familiar. Had the test been constructed using all keys at each level, the results might have indicated this more clearly. There is need for more training in key at all levels, since the music most commonly played may not provide for certain critical uses.

Analysis of Errors in Pitch

The playing of pitch has consistently been the least difficult of the four phases. A picture of the performance of the members of level A is shown in Table 34. This group registered only 149 errors in pitch, which represented three per cent of the total pitches played. More than two-thirds of these errors were in substitution of notes. Notes were substituted upward as often as downward. The next most frequent type of error was addition of a note like the one being played. The above errors might well be caused by faulty reading of either the spatial relation of the notes or the numerical grouping of the notes. Less than one half of one per cent was registered in any of the remaining types of pitch errors. Even at level A, the playing of pitch does not appear to present a grave problem to the performers.

Playing of pitch was shown, in the preceding section, to present little difficulty to the subjects of level A. The data, given in Table 35, indicate the same conclusion concerning the subjects of level B. They registered less than one half of one per cent on any specific error, save

TABLE 34
NUMBER AND PERCENTAGE OF ERRORS IN PITCH
MADE BY SUBJECTS OF LEVEL A

Types of Pitch Errors	Number of Opportunities for Errors	Number of Errors	Per Cent of Errors
Add Note			
Same	5110	29	1
Up	5110	11	0*
Down	5110	3	0*
Substitute Note			
Up	5110	51	1
Down	5110	52	1
Reversal	5110	2	0*
Indefinite	5110	1	0*
Total	5110	149	3

*Less than half of one per cent

TABLE 35

NUMBER AND PERCENTAGE OF ERRORS IN PITCH
MADE BY SUBJECTS OF LEVEL B

Types of Pitch Errors	Number of Opportunities for Errors	Number of Errors	Per Cent of Errors
Add Note			
Same	6720	36	1
Up	6720	5	0*
Down	6720	5	0*
Substitute Note			
Up	6720	32	0*
Down	6720	23	0*
Reversal	6720	0	0
Indefinite	6720	0	0
Total	6720	101	2

*Less than half of one per cent

in the addition of a note like the one being played. Substitutions were made upward slightly more than downward. No errors were made in reversals or indefinite. The small number of errors in pitch seem to indicate that this problem is minor by the time a student has reached level B. The specific types of errors causing most trouble in pitch were the same for levels A and B.

This section discusses the specific errors made in pitch by the subjects of level C. A picture of the distribution of the errors in pitch for this level is shown in Table 36. The performers made less than one half of one per cent of errors on any one category of pitch errors and made only one per cent based on total errors. They substituted equally in an upward or downward direction. Additions were noticeably made on the same note rather than upward or downward. It would appear that at this level of performance, the problem of playing the correct pitch is minor.

Previous discussions have emphasized the lack of difficulty encountered by the performers in playing pitch. The values given in Table 37, for performers of level D, clearly substantiate this conclusion. Even the total number of errors made by all the subjects of level D was less than one per cent of the total number of opportunities. Similarly, the percentages of errors of each specific type were less than one half of one per cent. The greatest frequency of errors was found in substitution of a note upward. This frequency was much greater than for substitution downward. Performers of level D, like those of other levels, added mainly the same notes as were being played. Had this study included problem readers, there is a possibility that the errors in pitch might have shown much more

TABLE 36

NUMBER AND PERCENTAGE OF ERRORS IN PITCH
MADE BY SUBJECTS OF LEVEL C

Types of Pitch Errors	Number of Opportunities for Errors	Number of * Errors
Add Note		
Same	10540	40
Up	10540	2
Down	10540	1
Substitute Note		
Up	10540	39
Down	10540	40
Reversal	10540	1
Indefinite	10540	0
Total	10540	123

*Per cent of errors is less than half of one per cent for all types of pitch errors

TABLE 37

NUMBER AND PERCENTAGE OF ERRORS IN PITCH
MADE BY SUBJECTS OF LEVEL D

Types of Errors	Number of Opportunities for Errors	Number of * Errors
Add Note		
Same	13080	18
Up	13080	7
Down	13080	6
Substitute Note		
Up	13080	42
Down	13080	18
Reversal	13080	4
Indefinite	13080	0
Total	13080	95

*Per cent of errors is less than half of one per cent for all types of pitch errors

variation than was shown by the subjects used in this study.

Analysis of Errors in Rhythm

The discussions of the previous chapter indicated the high frequency of errors in rhythm. The number of errors in rhythm made by the subjects at level A, as shown in Table 38, is greater than the errors of all the three other types made by these subjects, as shown in preceding tables. In the playing of rhythm, which is the major source of difficulty to the performers of level A, the instrumentalists made fewer errors through adding rests than in any of the other categories of rhythm. They were also proficient with regard to omitting notes, but experienced difficulty in executing rests. An explanation for this might be found in lack of experience with rests or in the failure of the teachers to emphasize rests as much as notes.

These performers tended to shorten the duration of notes rather than to hold them too long. This may, in part, be due to the large time value of the notes which they played. Over three-fourths of all errors in rhythm were made in playing a note for either too great or too small a period of time. At this stage of development of the performers, much progress could be made by emphasizing training in this regard. These subjects show a tendency to pause at the measure bar rather than to add rests during other parts of the measure. This fact should determine an additional point of stress in teaching.

The result of the tabulation of the errors in rhythm made by the subjects of level B is given in Table 39. This table shows a total number of errors of 304, which is greater than all the other errors made by subjects

TABLE 33

NUMBER AND PERCENTAGE OF ERRORS IN RHYTHM
MADE BY SUBJECTS OF LEVEL A

Types of Rhythm Errors	Number of Opportunities for Errors	Number of Errors	Per Cent of Errors
Omit:			
Note	5110	26	1
Rest	380	27	7
Add Rest:			
In Group	4670	2	0*
Between Groups	4670	7	0*
Between Measures	2080	15	1
Add to Value:			
Of Note	5110	113	2
Of Rest	380	7	2
Subtract From Value:			
Of Note	5110	277	5
Of Rest	380	15	4
Total	5490	489	9

*Less than half of one per cent

TABLE 39

NUMBER AND PERCENTAGE OF ERRORS IN RHYTHM
MADE BY SUBJECTS OF LEVEL B

Types of Rhythm Errors	Number of Opportunities for Errors	Number of Errors	Per Cent of Errors
Omit:			
Note	6720	21	0*
Rest	570	8	1
Add Rest:			
In Group	5750	0	0
Between Groups	5750	3	0*
Between Measures	2080	10	0*
Add to Value:			
Of Note	6720	117	2
Of Rest	570	23	4
Subtract From Value:			
Of Note	6720	107	2
Of Rest	570	15	3
Total	7290	304	4

*Less than half of one per cent

of level B. This number also represents four per cent of the total opportunity for error. In terms of this percentage of errors, the performers of this level showed marked progress over those of level A. As in level A, the subjects of level B made a major portion of their errors in adding to and subtracting from the length of time which notes were played. Again, at this level, this problem might well merit attention from teachers of music. The performers of this level also appeared more likely to omit rests than notes and tended to add rests mainly at the measure bar. The percentage of errors was largest in adding to and subtracting from the value of rests. If more rests had been included in the test, the number of errors of these two types might have been much greater.

Errors in rhythm have been shown to be of high frequency in the two preceding levels. Similarly, the results indicated in Table 40 show that the total number of errors made by level C was 477. This is greater than the errors previously shown for this level in the other three phases of performance. The percent of errors, four per cent, is the same as was given for level B. The percentages for each of the types of rhythm errors range from zero to two per cent. More than two thirds of all errors consisted in addition to and subtraction from the value of notes. This agrees with the results shown in the two preceding tables for levels A and B. Again, this appears to present a fruitful field for remedial work and study. The subjects of level C, like those of levels A and B, seemed more likely to omit rests than notes and more likely to add rests between measures than during the remainder of the measure. The subjects of this level were more likely to add to the value of a rest but subtract from the value of a note.

TABLE 40

NUMBER AND PERCENTAGE OF ERRORS IN RHYTHM
MADE BY SUBJECTS OF LEVEL C

Types of Rhythm Errors	Number of Opportunities for Errors	Number of Errors	Per Cent of Errors
Omit:			
Note	10540	36	0*
Rest	1810	33	2
Add Rest:			
In Group	8210	2	0*
Between Groups	8210	12	0*
Between Measures	2080	22	1
Add to Value:			
Of Note	10540	127	1
Of Rest	1810	29	2
Subtract From Value:			
Of Note	10540	200	2
Of Rest	1810	16	1
Total	12350	477	4

*Less than half of one per cent

Although the performance of the subjects of level D in rhythm, as indicated in Table 41, shows marked progress over the other three levels, the number of errors made in rhythm is still large in terms of the errors made in the other three phases. More than two-thirds of all the errors were in adding to and subtracting from the length of time which a note was played. This agrees with previous findings for the other three levels. Thus, it may be concluded that this problem is worthy of attention at all levels. This group, like the two preceding levels, showed a greater tendency to add to the time allotted to a rest rather than to subtract from the time. They also tended to add rests between measures rather than in rhythmic groups or between groups. Like the performers of the other three levels, they tended to omit rests more than notes. The largest percentage of errors was in holding a rest for too great a period of time.

Summary

The performers at each of the four levels of performing ability appeared to find approximately the same relative difficulty in each of the four phases of performance. These subjects registered most difficulty in playing accidentals and rhythm, and least difficulty in pitch and key. The percentages of errors decreased as the level rose from A to D, even though the difficulty of the exercises increased. The most rapid decrease in percentages was shown from level A to level B. In level A the range of percentages of errors was from three, in pitch, to twenty-one, in accidentals. In contrast to level A, the range of percentages for level D was from one to two per cent.

TABLE 41

NUMBER AND PERCENTAGE OF ERRORS IN RHYTHM
MADE BY SUBJECTS OF LEVEL D

Types of Rhythm Errors	Number of Opportunities for Errors	Number of Errors	Per Cent of Errors
Omit:			
Note	13080	11	0*
Rest	860	7	1
Add Rest:			
In Group	6480	2	0*
Between Groups	6480	4	0*
Between Measures	2080	6	0*
Add to Value:			
Of Note	13080	83	1
Of Rest	860	35	4
Subtract From Value:			
Of Note	13080	72	1
Of Rest	860	4	0*
Total	13940	224	2

*Less than half of one per cent

Accidentals.--In the playing of accidentals, the performers of level A experienced considerable difficulty with each accidental which they encountered. Much progress was noted from level A to level B in the playing of accidentals, with an indication that sharps, as accidentals, were less difficult for the members of level B to play than were flats. Performers of level C erred on only four out of the twelve accidentals played, and were generally proficient in playing all naturals. The members of level D made one error or none at all on all save three of the accidentals which they played. There did not appear to be any definite pattern of errors made by performers of this level. There is no definite indication that the incidence of errors, at all levels, can be attributed to the playing of one or more particular accidentals.

Key.--The performers at each of the four levels of performing ability appeared to have the same relative difficulties in key. In general, they were most proficient in playing naturals, and seemed to find that the difficulty of playing sharps and flats increased directly with the order in which that sharp appeared to find most difficulty with those sharps and flats that are least commonly used. Some indication was found that the playing of keys containing sharps might present more difficulty than the playing of those containing flats.

Pitch.--The percentages of errors in pitch were small at each of the four levels of playing ability. Even in level A, one per cent or less of errors was registered on any particular category of pitch errors. In level B, all percentages were less than one per cent in all areas save one, and that was only one per cent. In the remaining two levels, all percentages of

errors were less than half of one per cent in all areas of pitch. The errors in pitch which were most commonly made by subjects of all four levels were: substitutions, both upward and downward; and adding a note like the one being played. Although the number of errors was relatively small at each of the four levels, it appeared that the performers experienced like difficulties in pitch at each of the levels.

Rhythm.—Rhythm errors were highest in frequency of any of the four phases of performance at each of the four levels. The majority of these errors, in each case consisted of subtracting from and adding to the time allotted to the playing of a note. It seems noteworthy that the members of each level appeared to find proportionately the same difficulty with regard to the various areas of rhythm. For example, larger percentages of errors were made, generally, on rests than on notes. Also, when rests were added, they were added mainly between measures rather than in the group or between groups. Further, performers of each level made larger percentages of errors in omission of rests than in omission of notes. There also appeared to be a tendency to add to the value of rests and a tendency to subtract from the value of a note.

CHAPTER VI

ANALYSIS OF ERRORS BY VIOLINISTS AND CLARINETISTS

Certain instruments are probably more difficult to play than are others. This fact may directly influence the difficulty that performers find in the sight reading of music on the various instruments. For this reason, an equal number of performers on two different instruments, the violin and the clarinet, were used in this study. Analysis in this chapter is reported on the performances of these two groups of instrumentalists in an effort to determine those difficulties in sight reading of music which may be peculiar to performers on each particular instrument.

Analysis of Errors in Four Phases of Performance

This section is concerned with the relationship between the errors made by the violinists and clarinetists in the four phases of performance. The data of Table 42 shows the percentages of errors made by these performers in accidentals, key, pitch, and rhythm. This picture shows that the difficulty of each of the phases is approximately the same for both groups of instrumentalists, and that the percentage of total errors is approximately equal for both groups. Under the conditions of this study, the instrument which is played (violin or clarinet) appears to be unrelated to the frequency of errors in the sight reading of music. The question whether the pattern of errors is similar or different for the violinists and clarinetists will be examined further in relation to each of the four phases of performance.

Analysis of Errors in Accidentals

Previous analysis of the data revealed that the violinists and

TABLE 42

PERCENTAGE OF ERRORS IN ACCIDENTALS, KEY
PITCH, AND RHYTHM MADE BY VIOLINISTS
AND CLARINETISTS

Types of Errors	Violinists	Clarinetists
Accidentals	7	5
Key	2	2
Pitch	1	1
Rhythm	4	3
Total	8	7

clarinetists had approximately equal difficulty in playing accidentals. The data in Table 43 presents a comparison of the performance of these instrumentalists in playing each particular accidental. In this table, the percentages of errors made by the violinists and clarinetists in playing the various accidentals are very similar. This statement is borne out vividly by listing those accidentals which both groups played most proficiently. These were: A natural, C natural, D natural, D flat, and E natural. There is also definite agreement in the four accidentals which were most often incorrectly played by both groups. These were: A flat, E flat, D sharp, and G sharp. It should be noted that naturals, in general, presented little difficulty to either group, and that the largest percentages of errors were made on those sharps and flats which are least commonly used, with the single exception of D flat. Thus, little difference was noted in the difficulty encountered by the violinists and clarinetists in playing specific accidentals. The pattern of distribution of errors made in accidentals by both groups of performers seemed to be approximately the same.

Analysis of Errors in Key

Table 44 presents the errors in key made by the violinists and clarinetists. The data of this table reveal that both groups of performers made two per cent of the possible errors in key. A study of the errors made on individual notes of the keys reveals a similarity in pattern of errors by players on the two instruments. Performers on both instruments were most proficient in playing the following notes: A natural, D natural, E natural, and G natural. Further, both groups were least proficient playing D sharp, C sharp, D flat, and G sharp. Again, it appears that both groups have most

TABLE 43

NUMBER AND PERCENTAGE OF ERRORS IN ACCIDENTALS
MADE BY VIOLINISTS AND CLARINETISTS

Accidentals	Number of Opportunities for Errors	Per Cent of Errors by Violinists	Per Cent of Errors by Clarinetists
A Natural	50	2	0
Flat	45	22	18
B Natural	90	11	4
Flat	185	5	4
C Sharp	105	5	4
Natural	50	2	2
D Sharp	100	10	12
Natural	15	0	0
Flat	5	0	0
E Natural	85	2	0
Flat	45	16	18
F Sharp	95	3	0
Natural	70	3	3
G Sharp	70	10	13
Total	1010	7	5

TABLE 44

NUMBER AND PERCENTAGE OF ERRORS IN KEY
MADE BY VIOLINISTS AND CLARINETISTS

Notes of the Key	Number of Opportunities for Errors	Per Cent of Errors by Violinists	Per Cent of Errors by Clarinetists
A Natural	2135	0*	0*
Flat	395	2	6
B Natural	1270	5	6
Flat	1215	2	2
C Sharp	300	15	14
Natural	2050	2	0
D Sharp	35	29	20
Natural	2360	0*	0
Flat	100	12	12
E Natural	1495	1	0
Flat	765	1	6
F Sharp	605	8	12
Natural	1530	6	0*
G Sharp	225	10	20
Natural	2235	1	0*
Total	16715	2	2

*Less than half of one per cent

difficulty in playing those sharps and flats which are least commonly used; that is, appear only in key signatures having a large number of sharps or flats. As in the playing of accidentals, there seems to be close agreement in the distribution of errors in key made by violinists and clarinetists. Only slight variations were noted in errors in key which might be attributed to the problem of manipulation of the instrument.

Analysis of Errors in Pitch

Maintenance of correct pitch proved the least difficult phase of performance for both violinists and clarinetists. The number of errors made in pitch as shown in Table 45 was on per cent of the possible pitch errors, for both groups of instrumentalists. An analysis of types of errors in pitch, from the same table, shows no significant difference between the violinists and clarinetists. The percentage of error was less than one-half of one per cent for each type of error in pitch, with one exception for each group. The violinists made one per cent of errors in addition of a note like the one which was being played, and the clarinetists made one per cent of errors in substituting upward. Neither violinists nor clarinetists found maintenance of correct pitch much of a problem.

Analysis of Errors in Rhythm

A major portion of all the errors made by the subjects of this study were in rhythm. As shown in Table 46, the violinists and clarinetists made approximately equal numbers of errors in rhythm. Further, there were only slight differences between these groups in specific errors in rhythm. There did appear to be a tendency for rests to be omitted more often by violinists

TABLE 45

NUMBER AND PERCENTAGE OF ERRORS IN PITCH
MADE BY VIOLINISTS AND CLARINETISTS

Types of Pitch Errors	Number of Opportunities for Errors	Per Cent of Errors by Violinists	Per Cent of Errors by Clarinetists
Add Note			
Same	16715	1	0*
Up	16715	0*	0*
Down	16715	0*	0*
Substitute Note			
Up	16715	0*	1
Down	16715	0*	0*
Reversal	16715	0*	0*
Indefinite	16715	0*	0
Total	16715	1	1

*Less than half of one per cent

TABLE 46

NUMBER AND PERCENTAGE OF ERRORS IN RHYTHM
MADE BY VIOLINISTS AND CLARINETISTS

Types of Rhythm Errors	Number of Opportunities for Errors	Per Cent of Errors by Violinists	Per Cent of Errors by Clarinetists
Omit:			
Note	17725	0*	0*
Rest	1810	3	1
Add Rest:			
In Group	12555	0*	0*
Between Groups	12555	0*	0*
Between Measures	4160	0*	1
Add to Value:			
Of Note	17725	1	1
Of Rest	1810	2	3
Subtract From Value:			
Of Note	17725	2	2
Of Rest	1810	2	1
Total	19535	4	3

*Less than half of one per cent

than by clarinetists. In addition, there seemed to be a slight tendency for violinists to diminish the duration of rests, and for clarinetists to extend the time value of rests.

Summary

It is often assumed that the violin is a more difficult instrument to play than is the clarinet, and thus it might seem probable that violinists would make more errors in sight reading in music than would clarinetists. This hypothesis was not borne out, however, by the analysis of the data. Rather, the performances of the violinists and clarinetists exhibited a very close agreement in percentages of total errors and in percentages of errors in each phase of performance. Clarinetists were slightly more proficient than violinists but the difference was small.

In playing accidentals, both groups of instrumentalists experienced approximately the same degree of difficulty. In general, both groups were most proficient in playing naturals, and least proficient in playing the sharps and flats which are least commonly used. One exception to the above was noted in the difficulty experienced by violinists in playing F natural.

A close parallel existed in the observations made concerning key and accidentals. In both cases, the two groups of performers were most proficient in playing naturals and least proficient in playing the sharps and flats which are least commonly used. An exception to the above statement was found in the fact that the violinists made appreciably more errors in playing F natural than did the clarinetists.

Both violinists and clarinetists made less than one half of one per cent of errors in all but one of the areas of pitch. Both instrumental groups

registered only one per cent on one particular area: for violinists, adding a note like the one being played; and for clarinetists, substituting a note upward. It appeared that little difference existed between the difficulty encountered by the violinists and clarinetists in the playing of pitch.

In general, both groups of instrumentalists found approximately equal difficulty in rhythm; however, the violinists appeared to have more difficulty with rests than did clarinetists. Little evidence was found which would indicate that the instrument, of itself, affects the difficulty found in rhythm.

The foregoing observations would seem to indicate that the violinists and clarinetists experience approximately the same difficulties in sight reading in music. Therefore, it seems probable that practice materials, developed for performers on these two instruments, might include similar elements in the four phases of performance, and might, to some degree, serve for both instruments.

CHAPTER VII

ANALYSIS OF ERRORS BY VIOLINISTS AND CLARINETISTS AT FOUR LEVELS OF PERFORMING ABILITY

The analyses thus far made of the errors may be summarized briefly as follows. (1) The errors made by all subjects were classified and analyzed in terms of four phases of performance. (2) The errors made by subjects at each of the four levels of proficiency were analyzed in terms of the same four phases. (3) Comparison was made of the errors made by the violinists and clarinetists in each phase of performance.

In this chapter, attention is centered on comparisons between the errors made in the four phases of performance by the violinists and clarinetists, at each of the four levels of proficiency. This analysis centers on those difficulties which may be peculiar to performers on one of the two instruments studied, at any given level of proficiency. The information thus gained might be profitably used in planning instructional material to be used for either of the two instruments for any given year of instruction in sight reading.

The first of the four phases to be considered in detail is accidentals. Comparisons are made between the performances of the violinists and clarinetists at each of the four levels of proficiency. A similar type of analysis is then carried out in turn for each of the other three phases of performance, namely, key, pitch, and rhythm.

Analysis of Errors in Accidentals

It was previously shown that the number of accidentals played by the performers was very small in comparison to the number of opportunities for

errors in the other three phases of performance. Thus, it follows that the number of accidentals played by performers on either of the two instruments at any given level would be relatively small. Since the number of errors and the number of opportunities for errors were both small, there exists a strong likelihood that the factor of chance may play a large part in the observations which are made concerning the difficulty encountered by the performers in playing particular accidentals.

The picture presented by the data in Tables 47, 48, 49, and 50 is one of striking similarity with regard to the errors made by violinists and clarinetists. Even though the number of errors was small, the violinists and clarinetists made the same errors most frequently in a number of instances. In general, this observation is true for each of the four levels of proficiency. Both groups of performers at level A appeared to have difficulty, in general, in playing each of the accidentals included in their exercises. It has been indicated earlier that this difficulty may, in part, be explained through the lack of previous experience of the subjects with accidentals in the music which they have studied. The performers of level B made many fewer errors in playing accidentals than did the performers of level A. In like manner, the subjects of level C showed much improvement in playing accidentals over those of level B. The subjects of levels C and D registered approximately equal numbers of errors in playing accidentals. Although the number of errors made by the performers of levels C and D was very small, it seems noteworthy that similar errors were made by the violinists and clarinetists. It should be noted that even a small number of errors in accidentals, made by advanced performers, would be very noticeable to the

TABLE 47

NUMBER AND PERCENTAGE OF ERRORS IN ACCIDENTALS
MADE BY VIOLINISTS AND CLARINETISTS OF LEVEL A

Accidentals	Number of Opportunities for Errors	Per Cent of Errors by Violinists	Per Cent of Errors by Clarinetists
A Flat	15	20	40
B Natural	10	20	10
Flat	25	24	20
C Sharp	15	27	13
Natural	20	0	0
D Sharp	35	26	31
E Flat	10	60	50
F Sharp	15	13	0
G Sharp	15	27	7
Total	160	23	19

TABLE 48

NUMBER AND PERCENTAGE OF ERRORS IN ACCIDENTALS
MADE BY VIOLINISTS AND CLARINETISTS OF LEVEL E

Accidentals	Number of Opportunities for Errors	Per Cent of Errors by Violinists	Per Cent of Errors by Clarinetists
A Flat	25	28	8
B Natural	30	17	0
Flat	45	4	4
C Sharp	10	0	0
Natural	20	0	0
D Sharp	35	3	3
Flat	5	0	0
E Flat	15	7	0
F Sharp	35	3	0
Natural	5	40	20
G Sharp	15	0	7
Total	240	8	3

TABLE 49

NUMBER AND PERCENTAGE OF ERRORS IN ACCIDENTALS
MADE BY VIOLINISTS AND CLARINETISTS OF LEVEL C

Accidentals	Number of Opportunities for Errors	Per Cent of Errors by Violinists	Per Cent of Errors by Clarinetists
A Natural	25	0	0
Flat	5	0	0
B Natural	25	12	4
Flat	50	0	0
C Sharp	35	3	3
Natural	5	0	20
D Sharp	15	0	0
E Natural	35	3	0
Flat	5	0	0
F Sharp	30	0	0
Natural	25	0	0
G Sharp	25	4	16
Total	280	2	3

TABLE 50

NUMBER AND PERCENTAGE OF ERRORS IN ACCIDENTALS
MADE BY VIOLINISTS AND CLARINETISTS OF LEVEL D

Accidentals	Number of Opportunities for Errors	Per Cent of Errors by Violinists	Per Cent of Errors by Clarinetists
A Natural	25	4	0
B Natural	25	0	8
Flat	65	2	0
C Sharp	45	0	2
Natural	5	20	0
D Sharp	15	0	0
Natural	15	0	0
E Natural	50	2	0
Flat	15	0	20
F Sharp	15	0	0
Natural	40	0	2
G Sharp	15	13	20
Total	330	2	3

listener. Thus, these few errors would have a striking effect on the aural effect produced by the music, and are a source of difficulty for both groups of instrumentalists at each of the levels of proficiency. It appears that specific practice materials, dealing with the problem of playing of accidentals, might be made equally applicable for study by performers on both the violin and clarinet and that this problem might be dealt with in classes containing performers on both instruments.

Analysis of Errors in Key

Previous discussions have shown that the playing of naturals presented less of a problem than did sharps and flats, and that the difficulty increased directly with the order of presentation of each sharp or flat in the key signatures. The data, given in Tables 51, 52, 53, and 54, show that this is generally true for both violinists and clarinetists at each of the four levels of playing ability. There is a close similarity in the errors made by each of the two groups of instrumentalists at each of the levels of proficiency. The slight variations may, in some instances, be attributed to the past experience of the instrumentalists. These variations were most noticeable with regard to the playing of F natural and sharp, B natural and flat, and C natural and sharp. This divergence of errors is most noticeable at level A. Elementary violin studies, in some cases, emphasize sharps more than flats, while elementary clarinet studies, as used in beginning band work, emphasize flats more than sharps. Thus it might be expected that this past experience would lead to greater variations in the errors in key made by subjects at level A. A much closer agreement in numbers of errors is shown by the violinists and clarinetists at each of the other three levels. These

TABLE 51

NUMBER AND PERCENTAGE OF ERRORS IN KEY MADE
BY VIOLINISTS AND CLARINETISTS OF LEVEL A

Notes of the Key	Number of Opportunities for Errors	Per Cent of Errors by Violinists	Per Cent of Errors by Clarinetists
A Natural	355	0	0
B Natural	225	7	16
Flat	35	29	9
C Sharp	35	49	74
Natural	305	6	0
D Natural	440	0	0
E Natural	365	1	14
F Sharp	85	33	59
Natural	200	19	1
G Natural	350	2	0
Total	2395	6	5

TABLE 52

NUMBER AND PERCENTAGE OF ERRORS IN KEY MADE
BY VIOLINISTS AND CLARINETISTS OF LEVEL B

Notes of the Key	Number of Opportunities For Errors	Per Cent of Errors by Violinists	Per Cent of Errors by Clarinetists
A Natural	470	0*	1
B Natural	270	6	4
Flat	50	22	14
C Sharp	80	31	16
Natural	445	5	0
D Natural	535	1	0
E Natural	385	0	0
F Sharp	150	6	1
Natural	255	20	1
G Sharp	20	75	65
Natural	460	2	0*
Total	3120	5	2

*Less than half of one per cent

TABLE 53

NUMBER AND PERCENTAGE OF ERRORS IN KEY MADE
BY VIOLINISTS AND CLARINETISTS OF LEVEL C

Notes of the Key	Number of Opportunities for Errors	Per Cent of Errors by Violinists	Per Cent of Errors by Clarinetists
A Natural	600	1	0*
Flat	95	6	14
B Natural	300	9	9
Flat	525	0	2
C Sharp	45	0	2
Natural	665	0*	0
D Natural	740	1	0
E Natural	330	1	0
Flat	335	1	10
F Sharp	95	7	7
Natural	555	1	0
G Sharp	20	40	35
Natural	685	0	0
Total	4990	1	2

*Less than half of one per cent

TABLE 54

NUMBER AND PERCENTAGE OF ERRORS IN KEY MADE
BY VIOLINISTS AND CLARINETISTS OF LEVEL D

Notes of the Key	Number of Opportunities for Errors	Per Cent of Errors by Violinists	Per Cent of Errors by Clarinetists
A Natural	710	1	0
Flat	300	1	3
B Natural	475	1	0*
Flat	605	0*	0*
C Sharp	140	1	2
Natural	635	0*	0
D Sharp	35	29	20
Natural	645	0*	0
Flat	100	12	12
E Natural	415	0*	0
Flat	430	0*	2
F Sharp	275	2	4
Natural	520	0	0
G Sharp	185	0	14
Natural	740	0	0*
Total	6210	1	1

*Less than one half of one per cent

results appear to indicate that, at higher levels of proficiency, the problems of key are relatively the same for performers on both instruments and that similar materials might profitably be used for both groups, either in heterogeneous classes or in those grouped according to ability.

Analysis of Errors in Pitch

The problem of playing the correct pitch has been shown to be relatively minor, even for the performers of level A. It is noteworthy that the violinists and clarinetists of this level, as shown in Table 55, made the same percentages of total errors. In so far as can be shown by the small percentages of the above table, it appears that both groups of instrumentalists experience the same difficulty with regard to the various types of errors in pitch.

The observations made in the previous paragraph apply, in the main, to the data shown in Tables 56, 57, and 58, concerning the performance of the violinists and clarinetists at each of the other three levels. None of the percentages of errors given for level B appears large enough to be of consequence; however, the violinists were more likely than clarinetists to repeat one of the notes of the score, while the clarinetists were more likely to substitute a higher note for one which was written in the score. In only one instance in level C was the percentage of errors greater than one half of one per cent and that was registered by the violinists in adding a note like the one being played. In level D, no percentage of errors was as great as half of one per cent. Thus, it appears that errors in pitch occur infrequently for both violinists and clarinetists at every level of proficiency.

TABLE 55

NUMBER AND PERCENTAGE OF ERRORS IN PITCH MADE
BY VIOLINISTS AND CLARINETISTS OF LEVEL A

Notes of the Key	Number of Opportunities for Errors	Per Cent of Errors by Violinists	Per Cent of Errors by Clarinetists
Add Note			
Same	2555	1	0*
Up	2555	0*	0*
Down	2555	0*	0*
Substitute Note			
Up	2555	1	1
Down	2555	1	1
Reversal	2555	0	0*
Indefinite	2555	0*	0
Total	2555	3	3

*Less than one half of one per cent

TABLE 56

NUMBER AND PERCENTAGE OF ERRORS IN PITCH MADE
BY VIOLINISTS AND CLARINETISTS OF LEVEL B

Types of Pitch Errors	Number of Opportunities for Errors	Per Cent of Errors by Violinists	Per Cent of Errors by Clarinetists
Add Note			
Same	3360	1	0*
Up	3360	0*	0*
Down	3360	0*	0*
Substitute Note			
Up	3360	0*	1
Down	3360	0*	0*
Reversal	3360	0	0
Indefinite	3360	0	0
Total	3360	2	1

*Less than one half of one per cent

TABLE 57

NUMBER AND PERCENTAGE OF ERRORS IN PITCH MADE
BY VIOLINISTS AND CLARINETISTS OF LEVEL C

Types of Pitch Errors	Number of Opportunities for Errors	Per Cent of Errors by Violinists	Per Cent of Errors by Clarinetists
Add Note			
Same	5270	1	0*
Up	5270	0*	0*
Down	5270	0	0*
Substitute Note			
Up	5270	0*	0*
Down	5270	0*	0*
Reversal	5270	0	0*
Indefinite	5270	0	0
Total	5270	1	1

*Less than one half of one per cent

TABLE 58

NUMBER AND PERCENTAGE OF ERRORS IN PITCH MADE
BY VIOLINISTS AND CLARINETISTS OF LEVEL D

Types of Pitch Errors	Number of Opportunities for Errors	Per Cent of Errors by Violinists	Per Cent of Errors by Clarinetists
Add Note			
Same	6540	0*	0*
Up	6540	0*	0*
Down	6540	0*	0*
Substitute Note			
Up	6540	0*	0*
Down	6540	0*	0*
Reversal	6540	0*	0*
Indefinite	6540	0	0
Total	6540	1	1

*Less than one half of one per cent

Since the performers at level D are much more skilled in manipulation than those at level A, it seems likely that errors in pitch should be attributed mainly to difficulties in reading the music.

Analysis of Errors in Rhythm

Rhythm errors have been shown to be greater in frequency than the errors in the other three phases of performance. The values given in Table 59 show that violinists and clarinetists at level A made errors in rhythm about equally often. The large percentage of errors made by the violinists in omission of rests may be the result of lack of experience with rests or of lack of training in either raising the bow or stopping its progress. This observation may also help to explain the relatively large percentage of errors made by violinists in subtraction from the value of a rest. With these exceptions, both groups appeared to encounter similar difficulties with regard to each type of rhythm error. The data, given in Tables 60, 61, and 62, show a very close agreement in percentages of errors made by the violinists and clarinetists of the other three levels of proficiency. This was true in terms of total errors and in terms of specific rhythm errors. The distribution of errors followed closely the distributions given in previous chapters for errors in rhythm. The results appear to indicate that both violinists and clarinetists have a need for similar training with regard to rhythm and that similar practice materials might be adapted for use by performers on both instruments.

Summary

The violinists and clarinetists at each of the four levels of proficiency showed remarkable agreement in the percentages of errors made in each

TABLE 59

NUMBER AND PERCENTAGE OF ERRORS IN RHYTHM MADE
BY VIOLINISTS AND CLARINETISTS OF LEVEL A

Types of Rhythm Errors	Number of Opportunities for Errors	Per Cent of Errors by Violinists	Per Cent of Errors by Clarinetists
Omit:			
Note	2555	0*	1
Rest	190	14	1
Add Rest:			
In Group	2335	0*	0
Between Groups	2335	0*	0*
Between Measures	1040	0*	1
Add to Value:			
Of Note	2555	3	2
Of Rest	190	1	3
Subtract from Value:			
Of Note	2555	6	5
Of Rest	190	7	1
Total	2745	10	8

*Less than one half of one per cent

TABLE 60

NUMBER AND PERCENTAGE OF ERRORS IN RHYTHM MADE
BY VIOLINISTS AND CLARINETISTS OF LEVEL B

Types of Rhythm Errors	Number of Opportunities for Errors	Per Cent of Errors by Violinists	Per Cent of Errors by Clarinetists
Omit:			
Note	3360	0*	1
Rest	285	2	0*
Add Rest:			
In Group	2875	0	0
Between Groups	2875	0*	0*
Between Measures	1040	0*	1
Add to Value:			
Of Note	3360	2	1
Of Rest	285	4	4
Subtract from Value:			
Of Note	3360	2	1
Of Rest	285	3	2
Total	3645	5	3

*Less than half of one per cent

TABLE 61

NUMBER AND PERCENTAGE OF ERRORS IN RHYTHM MADE
BY VIOLINISTS AND CLARINETISTS OF LEVEL C

Types of Rhythm Errors	Number of Opportunities for Errors	Per Cent of Errors by Violinists	Per Cent of Errors by Clarinetists
Omit:			
Note	5270	0*	1
Rest	905	2	1
Add Rest:			
In Group	4105	0	0*
Between Groups	4105	0*	0*
Between Measures	1040	1	2
Add to Value:			
Of Note	5270	1	1
Of Rest	905	0*	2
Subtract from Value:			
Of Note	5270	2	1
Of Rest	905	1	1
Total	6175	4	4

*Less than half of one per cent

TABLE 62

NUMBER AND PERCENTAGE OF ERRORS IN RHYTHM MADE
BY VIOLINISTS AND CLARINETISTS OF LEVEL D

Types of Rhythm Errors	Number of Opportunities for Errors	Per Cent of Errors by Violinists	Per Cent of Errors by Clarinetists
Omit:			
Note	6540	0*	0*
Rest	430	1	0*
Add Rest:			
In Group	3240	0*	0*
Between Groups	3240	0*	0*
Between Measures	1040	0*	0*
Add to Value:			
Of Note	6540	1	1
Of Rest	430	3	5
Subtract from Value:			
Of Note	6540	1	1
Of Rest	430	1	0
Total	6970	1	2

*Less than half of one per cent

of the four phases of performance. This is noteworthy in view of the fact that the violin is often considered the more difficult of the two instruments. Although variations were noted, it appeared that the major difficulties encountered by both groups of instrumentalists were the same as had been indicated previously for each of the four levels.

In the playing of accidentals, the violinists and clarinetists appeared to experience approximately equal difficulty in playing particular accidentals. Although only a few errors were made in accidentals, the greatest variation in numbers of errors was found in level A. These variations may, in part, be explained by the previous experience of the two groups of instrumentalists. At the other three levels, a very close agreement was found in the numbers of errors made by both violinists and clarinetists. Even at the highest level of proficiency, the subjects made some errors in playing accidentals, indicating the vital nature of this problem to performers at all levels of proficiency.

In the playing of key, violinists and clarinetists made approximately equal percentages of errors. The greatest variation in numbers of errors on particular notes was found in level A. Most of the variation in difficulty was found in the playing of three notes; F, C, and B. The next greatest variation in numbers of errors was found in level B. In levels C and D, there was a close agreement in the percentages made by both violinists and clarinetists. Although violinists and clarinetists use different key signatures when they play together in ensembles, it appears that both groups of instrumentalists face the same problems of key at the advanced levels. Thus, practice materials dealing with problems of key should contain similar elements for use by performers on both instruments.

The percentages of errors in pitch made by the violinists and clarinetists were extremely small at each of the four levels, and were nearly equal for performers on both instruments. Even in level A, the percentages were small and little variation was noted in the number of errors made by the two groups of instrumentalists. It is in the process of playing the correct pitch that the problem of manipulation is directly involved, and thus it might be thought that a wide variation would appear in the performances of the two groups. However, there did not appear to be any evidence that the manipulation of the instrument had appreciable effect on errors in pitch. In fact, it appeared that both groups were relatively successful in dealing with this problem.

In rhythm errors, there was rather close agreement between the values registered by both the violinists and clarinetists at each level. One variation must be noted, however, in that the violinists were less proficient at each level than were the clarinetists with regard to the execution of rests. It is probable that this difficulty involved the manipulative problem of stopping or raising the bow. With this one exception, it appeared that practice materials containing similar elements could be used for developing proficiency in rhythm by performers on both instruments.

It appears probable that practice materials, dealing with all of the four phases of performance, could be made equally applicable for both violin and clarinet.

CHAPTER VIII

ANALYSIS OF ERRORS IN RHYTHMIC GROUP AND INTERVAL

There are several factors which might influence the errors which violinists and clarinetists made in playing the four phases of performance. Two of these factors, which have a bearing on all phases of performance throughout the test, are the rhythmic group and the interval. Since both of these are involved in each opportunity for error, it was necessary to make a separate analysis of the errors made by the performers in terms of these two factors. This chapter, then presents the results of the analysis made to determine the relationship between a particular rhythmic group or a particular size of interval and the occurrence of errors in the four phases of performance.

Analysis of Errors in Rhythmic Group

Fourteen rhythmic groups were included in the construction of the sight-reading test. By rhythmic group, reference is made to either a single note or a group of notes which may be counted as a rhythmic unit. Thus, for the purposes of this study, a whole note is counted as a group, as are four sixteenth notes. The following sections present data on errors in rhythmic groups, according to the following topics: first, a summary of the errors made by all performers; second, a comparison of the errors made by the performers at the four levels of performing ability; third, a comparison of the errors made by violinists and clarinetists; and fourth, a comparison of the errors made by the violinists and clarinetists at each

of the four levels of performing ability.

Errors in rhythmic group made by all performers.—The fourteen rhythmic groups included in this study are shown in Table 63, which also gives the percentage of errors made on each of the rhythmic groups by all performers. The performers were noticeably less proficient in playing the first five rhythmic groups; however, they were most proficient in playing rhythmic groups nine and fourteen. With the exception of the above observations, no material difference appears in the percentages of errors made on particular rhythmic groups. The first five rhythmic groups consisted of those notes which are held for the longest period of time and are ordinarily considered easier to play than are some of the other rhythmic groups. Further clarification on this apparent contradiction will be given in subsequent discussions.

Errors in rhythmic group made by performers at four levels of performing ability.—The immediately preceding discussion indicated the large percentage of errors made by all performers in playing the first five rhythmic groups. The values given in Table 64 show that this heavy weighting of these groups was the result of the performances of the members of levels A and B. The performers of level A did not play all rhythmic groups, but they made a large percentage of errors, generally, on each rhythmic group that they did play. The same observation, in a lesser degree, was true of the performance of the subjects of level B. Although the performers of levels C and D appeared relatively most proficient in playing those rhythmic groups which are held for the longest periods of time, no definite pattern was discernible in the errors which they made. It appeared that the performers

TABLE 63

NUMBER AND PERCENTAGE OF ERRORS IN RHYTHMIC
GROUP MADE BY ALL PERFORMERS

Rhythmic Group	Number of Opportunities for Errors	Number of Errors	Per Cent of Errors
1 	650	90	14
2 	350	57	16
3 	2460	278	11
4 	940	123	13
5 	7560	789	10
6 	5050	297	6
7 	6180	443	7
8 	3200	190	6
9 	5200	181	3
10 	3990	205	5
11 	1040	53	5
12 	1660	120	7
13 	160	7	4
14 	630	21	3
Total	39070	2854	7

TABLE 64

PERCENTAGE OF ERRORS IN RHYTHMIC GROUP MADE
BY SUBJECTS AT EACH OF FOUR LEVELS OF
PERFORMANCE

Rhythmic Group	Level			
	A	B	C	D
1 	15	16	0	0
2 	24	16	2	0
3 	17	7	2	2
4 	29	12	3	5
5 	21	9	9	5
6 	13	12	5	3
7 	19	8	6	2
8 	9	7	7	3
9 	0	0	5	3
10 	0	22	7	3
11 	0	0	11	4
12 	0	0	12	4
13 	0	0	0	4
14 	0	0	0	3
Total	17	9	6	3

in each level made approximately equal percentages of errors on each rhythmic group played. Thus, the particular rhythmic group did not greatly contribute to the incidence of errors at any level.

Errors in rhythmic group made by violinists and clarinetists.--Table 65 presents the percentages of errors made by violinists and clarinetists in playing each of the rhythmic groups included in the sight-reading test. The data in this table reveal that the distribution of errors was similar for both groups of instrumentalists save in playing the first five rhythmic groups. With regard to these rhythmic groups, the violinists made appreciably larger percentages of errors than did the clarinetists. This fact might be attributed to the difficulty found by less advanced violinists in manipulating the bow at a slow speed. With the exception of these five rhythmic groups, the violinists did not seem to set any clearly marked pattern of error. Although the percentages made by the clarinetists varied from three to nine, there does not appear to be any definite pattern in the errors made. With the exception of the observations noted above, neither group of instrumentalists seemed to experience special difficulty in playing any particular rhythmic group.

Errors in rhythmic group made by violinists and clarinetists at four levels of performing ability.--The percentages of errors in rhythmic group, made by violinists and clarinetists at each of the four levels of performing ability, are given in Table 66. The data in this table reveal that the pattern of distribution of errors was similar for both groups of performers at each level. The performers on both instruments at level A, in general, seemed to find considerable difficulty in playing all rhythmic groups.

TABLE 65

PERCENTAGE OF ERRORS IN RHYTHMIC GROUP
MADE BY VIOLINISTS AND CLARINETISTS

Rhythmic Group	Number of Opportunities for Errors	Per Cent of Errors by Violinists	Per Cent of Errors by Clarinetists
1 	325	22	6
2 	175	23	9
3 	1230	14	9
4 	470	15	11
5 	3780	12	9
6 	2525	6	6
7 	3090	8	7
8 	1600	5	7
9 	2600	3	4
10 	1995	4	6
11 	520	4	6
12 	830	7	7
13 	80	1	8
14 	315	4	3
Total	19535	8	7

TABLE 66

PERCENTAGE OF ERRORS IN RHYTHMIC GROUP MADE BY VIOLINISTS AND
CLARINETISTS AT EACH OF FOUR LEVELS OF PERFORMANCE

Rhythmic Group	Level							
	A		B		C		D	
	Vln.*	Clar.#	Vln.*	Clar.#	Vln.*	Clar.#	Vln.*	Clar.#
1	23	7	26	6	0	0	0	0
2	34	14	24	8	0	4	0	0
3	21	12	8	6	3	1	2	2
4	25	33	20	4	2	4	7	2
5	21	21	11	6	10	8	5	5
6	19	8	14	9	4	6	2	3
7	18	20	10	5	6	6	1	3
8	7	12	10	5	6	8	2	4
9	0	0	0	0	5	6	2	3
10	0	0	22	22	6	8	3	4
11	0	0	0	0	6	16	4	5
12	0	0	0	0	14	10	3	5
13	0	0	0	0	0	0	1	8
14	0	0	0	0	0	0	4	3
Total	19	16	12	6	6	7	3	4

* - Per Cent of Errors by Violinists

- Per Cent of Errors by Clarinetists

The violinists of level B made appreciably larger percentages of errors in playing most of the rhythmic groups than did the clarinetists; however, the pattern of distribution of errors was similar for both groups of instrumentalists.

It has previously been noted that the performers of levels C and D made markedly fewer errors in playing the first few rhythmic groups. In general, this was true for both violinists and clarinetists. In playing other rhythmic groups, the violinists appeared to find the same relative difficulties as did the clarinetists.

Analysis of Errors in Interval

Eight intervals were included in the sight-reading test used in this study. These were: prime, second, third, fourth, fifth, sixth, seventh, and octave. The following sections present data on errors in intervals, according to the following topics: first, a summary of the errors made by all performers; second, a comparison of the errors made by the performers at the four levels of performing ability; third, a comparison of the errors made by violinists and clarinetists; and fourth, a comparison of the errors made by the violinists and clarinetists at each of the four levels of performing ability.

Errors in interval made by all performers.—The percentages of errors made by all performers in playing each interval are shown in Table 67. The range of percentages of errors is rather small, four to nine, and no special pattern of distribution of errors is noted. The values given in this table seem to indicate that the size of the interval, as such, has little bearing on the errors made by the performers.

TABLE 67

NUMBER AND PERCENTAGE OF ERRORS IN INTERVAL
MADE BY ALL PERFORMERS

Interval	Number of Opportunities for Errors	Number of Errors	Per Cent of Errors
Prime	12780	712	6
Second	13980	1217	9
Third	6850	521	8
Fourth	2610	187	7
Fifth	1080	101	9
Sixth	1000	76	8
Seventh	210	18	9
Octave	560	22	4
Total	39070	2854	7

Errors in interval made by performers at four levels of performing ability.—Table 68 presents the percentages of errors in playing each interval made by performers at the four levels of performing ability. Although the percentages of errors decreased with the rise of level of performing ability, there was a close similarity in distribution of errors within each level. There did not appear to be any consistency with regard to those intervals which were most difficult or least difficult, and the variations which did occur did not seem sufficiently large to warrant any conclusions concerning the difficulty of playing any particular size of interval.

Errors in interval made by violinists and clarinetists.—The percentages of errors made by violinists and clarinetists in playing each interval are given in Table 69. Although the clarinetists made slightly less errors than did the violinists, there was a close similarity in the proportionate number of errors made by both groups of instrumentalists in playing each interval. Slight variations were noted; however, it did not appear that any particular sizes of intervals were markedly more difficult for either of the two groups of performers.

Errors in interval made by violinists and clarinetists at four levels of performing ability.—Table 70 presents data comparing the performances of the violinists and clarinetists, at each of the four levels of performing ability, with regard to errors made in intervals of various sizes. The performers at level A made more errors in interval than did those at the other levels, both in general and on most of the specific intervals. An exception to the above statement is noted in the performance of the clarinetists and violinists on sevenths and octaves. The wide variation shown in this one

TABLE 68

PERCENTAGE OF ERRORS IN INTERVAL MADE
BY SUBJECTS AT EACH OF FOUR
LEVELS OF PERFORMANCE

Interval	Level			
	A	B	C	D
Prime	13	7	5	3
Second	18	10	8	4
Third	19	11	6	2
Fourth	20	6	7	3
Fifth	17	10	6	7
Sixth	17	8	9	4
Seventh	20	3	8	10
Octave	10	6	4	3
Total	17	9	6	3

TABLE 69

PERCENTAGE OF ERRORS IN INTERVAL MADE
BY VIOLINISTS AND CLARINETISTS

Interval	Number of Opportunities for Errors	Per Cent of Errors by Violinists	Per Cent of Errors by Clarinetists
Prime	6390	6	5
Second	6990	9	8
Third	3425	7	8
Fourth	1305	8	7
Fifth	540	11	8
Sixth	500	7	8
Seventh	105	9	9
Octave	280	5	3
Total	19535	8	7

TABLE 70

PERCENTAGE OF ERRORS IN RHYTHMIC GROUP MADE BY VIOLINISTS AND
CLARINETISTS AT EACH OF FOUR LEVELS OF PERFORMANCE

Interval	Level							
	A		B		C		D	
	Vln.*	Clar.#	Vln.*	Clar.#	Vln.*	Clar.#	Vln.*	Clar.#
Prime	13	14	10	4	6	4	3	3
Second	21	16	13	7	8	8	3	4
Third	21	18	13	9	5	7	1	3
Fourth	20	21	11	2	7	7	2	3
Fifth	23	11	14	7	6	6	5	7
Sixth	29	26	12	3	6	11	3	5
Seventh	33	7	7	0	2	14	10	10
Octave	20	0	12	0	4	4	3	3
Total	19	16	12	6	6	7	3	4

* - Per Cent of Errors by Violinists

- Per Cent of Errors by Clarinetists

instance may possibly be accounted for through the small number of opportunities for errors in these two intervals. The violinists of level B consistently made a greater number of errors in playing each specific interval than did the clarinetists; however, the distribution of errors was similar for both groups. Some slight variation in number of errors was noted, particularly in octaves; however, there were only a small number of opportunities for errors in that particular interval. The two groups of performers at level C appeared to make similar distributions of errors in intervals, although some slight variation is evident in the playing of sixths and sevenths. In level D, the violinists and clarinetists made approximately equal distributions of errors in playing intervals. The two groups of performers appeared equally proficient in playing sevenths and octaves, the two intervals on which the most variation in number of errors was shown in the previous levels. There was some indication that the less advanced violinists tended to make relatively more errors in playing the larger intervals. With the exception of this observation, the data did not show any marked pattern of distribution of errors.

Summary

No particular rhythmic group appeared to present marked difficulty for either groups of instrumentalists at any of the four levels of performing ability. Although slight variations were noted in percentages of errors, there was no definite pattern of distribution of errors. The performers, in general, were least proficient in playing the first five rhythmic groups which are held for the longest period of time; however, this fact was the direct result of the large percentage of errors made by the members of

levels A and B in playing these groups. Furthermore, the violinists of these two levels made larger percentages of errors than did the clarinetists in playing the first five rhythmic groups. With the exception of the above observations, little variation was noted in the percentages of errors made in playing a particular note or group of notes. The performers of level A experienced considerable difficulty with all the rhythmic groups which they played. Although members of the other three levels made progressively smaller percentages of errors, yet, at each level, it appeared that the performers experienced approximately equal difficulty with all rhythmic groups.

In spite of small variations in the percentages of errors made on the eight intervals, it did not seem that the size of the interval had much bearing on the percentages of errors made by all performers. The percentages of errors made in each level varied, as did the range of percentages; however, there was no consistency with regard to those intervals which were difficult or easy to play. These variations were not great enough to warrant a conclusion that the size of the interval was significantly related to the percentages of errors made by the players at any level of performing ability. The percentages and ranges of percentages of errors made by the violinists and clarinetists were approximately the same. Furthermore, a consideration of the percentages of errors made by the violinists and clarinetists at each of the four levels indicated that the intervals which appeared difficult to one group of instrumentalists at one level seemed easy to one group at another level. The size of the interval bore little relation to the percentages of errors made by either violinists or clarinetists at each of the levels of

performing ability.

Neither the specific rhythmic group nor the size of the interval appeared to have a direct relationship to the number of errors made by the performers of the study.

CHAPTER IX

SUMMARY AND CONCLUSIONS

The Problem

In general terms, the purpose of this study was to make an exploratory investigation of the errors made by performers on orchestral instruments in sight reading music. More narrowly, the purpose was to determine the errors made by violinists and clarinetists, of four levels of performing ability, on a specially prepared sight-reading test.

The specific objectives of the study may be stated as follows:

1. To analyze and compare the errors made in four phases of performance; namely, the playing of accidentals, key, pitch, and rhythm.
2. To analyze and compare the errors made in playing each specific category of the four phases of performance.
3. To analyze and compare the errors made by performers at four levels of performing ability.
4. To analyze and compare the errors made by violinists and clarinetists.
5. To analyze and compare the errors made in rhythmic groups and intervals.

Significance of this investigation.---This study has significance primarily for the field of music education, in that it deals with the diagnosis of reading errors, on the basis of which remedial teaching may be planned, and instructional material may be organized. Further, it has significance for the field of psychology because of its bearing on the learning process in music, through measurement of growth in sight-reading ability,

measurement of performance in music, and discovery of individual differences among instrumental performers.

Derivation of the study.---This study was suggested in part by the experience of the writer, and in part by earlier investigations in music and reading. It has often been evident that students encountered difficulties in sight reading in music, but tests were not available for locating the particular musical elements causing the difficulty. A careful analysis of oral reading performance is an essential step in the diagnosis of reading difficulties in literature. Similarly, a careful analysis of instrumental music reading performance should aid in diagnosis of reading difficulties in the field of music. It could easily be possible that instruction might ignore the most vital factors in the remedial program if accurate diagnosis had not previously been carried out. These facts indicated the need for the development of a method of diagnosis of difficulties in the sight reading of instrumental music.

Limitations of the study.---It was necessary to impose certain limitations on the scope of this investigation. These limitations were concerned with the selection of the subjects of the study, the number of instruments to be used, and the musical factors to be considered.

The subjects of the investigation consisted of forty performers chosen from elementary school pupils, high school pupils, college students, and professional musicians. These performers were divided into four groups of ten performers in each: level A, consisting of those performers whose playing ability would be grade one or two; level B, consisting of those performers whose playing ability would be grade three or four; level C,

consisting of those performers whose playing ability would be grade five or six; and level D, consisting of those performers whose playing ability would lie within the range above grade six. The grade level was defined by the playing ability which would normally be expected of a student after a specified number of years of training and was indicated by the teacher of each subject.

The instruments under consideration were limited to two of those, in the symphony orchestra, which are most commonly used in the public schools. The violin was selected as the representative of the string section of the orchestra, and the clarinet as the representative of the woodwind section. Two instruments were included in order to provide a check on those items of difficulty which might be peculiar to one of the two instruments. Thus, at each level, half the performers were violinists, and half were clarinetists.

The musical elements presented to the performers in the sight-reading test included pitch, key, accidentals, time, rests, rhythm, and interval. The key signatures were limited to the major keys, since the majority of the music performed by public school instrumental music students is written in the major mode. The pitches included in the test covered only the normal playing range of each instrument. The accidentals used included sharp, flat, and natural. The time signatures were limited to the four most common signatures: 4/4, 3/4, 2/4, and 6/8. Whole, half, quarter, eighth, and sixteenth notes and rests were used in the study, since notes and rests of a denomination smaller than sixteenths would occur infrequently in music written for school pupils. The sizes of the intervals used in the test varied from primes to octaves.

Related Literature and Research

The literature related to the problem of sight reading in instrumental music deals with three types: sight reading in music, measurement in music, and diagnosis of reading difficulties.

Sight reading in music.—The value of sight reading in music has been verified by many leading music educators. These educators have indicated the following outcomes for those who are proficient in sight reading: enriches musical life; makes possible significant instrumental performance; opens up a world of enjoyment; provides a stimulating feeling of mastery; and strengthens the love for music. Not only have these educators indicated the value of sight reading in music, but they have also indicated the need for further research in this field. They have, in addition, pointed out the dearth of diagnostic tests in the area of sight reading in instrumental music.

Measurement in music.—Measurement in music, in this study, includes achievement testing, performance testing in vocal music, and performance testing in instrumental music. Achievement testing has been carried out mainly through a pencil and paper type of technique. Most achievement tests have concerned themselves with knowledge about music rather than with performance in music. In some cases, objective methods of scoring have been used, while in others, subjective methods have been used. A small number of tests have been used in the field of vocal performance testing. In these tests, the analysis of errors was not carried out in detail for all phases of performance, nor was a diagnosis of errors made for subjects at various levels of performing ability. Although objective scoring was used in some

cases, little use was made of a method of recording of the performance which would allow for repeated perusal of the data for errors. Although classification of errors was used in some of these tests, none of these classifications appeared to be adequate for the present study. There is a definite lack of testing material in the field of performance in instrumental music. Most of the studies in this field have used the piano or the organ as the performing medium. Pertinent to this study, these investigations have indicated methods of computation of item difficulty for music included in the test, methods of classification of errors, methods of scoring, and methods of analysis of test data. However, none of these tests included all of the following vital elements: construction of test from true-to-life music; provision for various levels of performing ability of the subjects; detailed analysis of errors, and comparison of performing mediums.

Diagnosis of reading difficulties.--A comparison of reading difficulties in the reading of literature and in the reading of music indicates the value of research in the music field similar to that already carried out in the field of reading. The usefulness of oral reading tests in reading diagnosis points to the probable value of similar tests in the field of performance in instrumental music.

Procedure

The method of investigation used in this study was a modified form of the normative survey technique. Criteria were first set up for the preparation of the seventeen exercises of the sight-reading test, which included a preliminary exercise designed to verify the assignment of the subjects to

levels. The background material used in the construction of the test exercises was based on an analysis of six selected books of violin studies. These studies ranged in difficulty from easy material for beginning students to difficult material which would provide a challenge even for professionals. A detailed analysis of the selected studies was made with regard to the following items: key signatures, time signatures, rhythmic patterns of the measures, accidentals, intervals, and rhythmic groups. On the basis of this analysis, the test exercises were constructed and then subjected to a trial presentation, using subjects not included in the final testing program of the study. As a result of this presentation, the final test was developed, the method of scoring established, the method of tabulation formulated, and the directions for administration determined.

The sight reading test was then administered to each subject individually and a wire recording was made of his performance. The recordings were played back as many times as was necessary to permit a thorough and detailed study of the test data.

Method of scoring.—The final scoring consisted of marking the errors on a thin sheet of paper placed over each test exercise. The use of the extra thin sheet made it possible to use the same copy of the test exercises for all performers. The thin sheet of paper was so placed on the page as to permit it to be replaced over the test exercises at any later time for further re-checking.

A code system was evolved for use in marking the errors. This code may be illustrated by ANS 2, 6. This, decoded, would read: added note, same, interval of a second, error occurring in rhythmic group six.

Method of tabulation.--The description of each error was transferred from the scoring sheets to a tabulation sheet for each subject which gave subtotals for each exercise played and also gave the total number of errors of each type made by the performer. Information concerning the rhythmic group and the interval was tabulated on another type of tabulation sheet for each performer. The totals of each individual tabulation sheet were then recorded in tables showing relationships between the factors under consideration in the study.

Analysis of Errors in Four Phases of Performance

In proportion to the number of opportunities for errors, the performers found most difficulty in playing accidentals. However, in most music, it is generally true that few accidentals are played in comparison to the number of opportunities for errors in playing rhythm, key, and pitch. Of the three phases of performance, rhythm was the one in which by far the largest percentage of errors was registered. In fact, more than half of all the errors made during the tests were errors in rhythm. Next in importance was the playing of key, which accounted for more than one fourth of all errors. Approximately one sixth of all errors was made in the playing of pitch.

In the playing of specific accidentals, the performers found little difficulty with naturals, save for one note, B natural. The amount of difficulty in playing other accidentals seemed to vary directly with the order in which that sharp or flat is added to the key signature. Thus, more difficulty was found in playing D sharp, the fourth sharp to be added, than in playing C sharp, the second sharp to be added in key signatures.

In playing specific notes of the key, the performers encountered little difficulty with naturals, save for notes F natural and B natural. As was true in accidentals, the difficulty in playing the sharps and flats appeared to increase directly with the order in which the sharps or flats are added to the key signature.

In proportion to opportunity for errors, the performers found least difficulty in pitch. In fact, the number of errors made in all categories of errors in pitch was less than one half of one per cent of the number played. The majority of errors in pitch consisted in the playing of either a higher or a lower note than was written in the score. The number in playing of either higher or lower notes was approximately the same. Addition of notes consisted mainly of repeating of a note in the score rather than adding a note at either a higher or a lower level.

The majority of the errors in rhythm were made by holding a note too long or releasing a note too soon. Of the several types of rhythm errors, the performers made the largest percentage of errors in extending rests too long. Rests were more often inserted incorrectly between measures than between or within rhythmic groups.

Analysis of Errors at Four Levels of Performing Ability

The four phases of performance seemed to present approximately the same relative difficulty to the performers at each of the four levels of performing ability. In each instance, the subjects found most difficulty in playing accidentals and rhythm, and least difficulty in pitch and key. Even though the test exercises became more difficult with the rise of level,

the percentages of errors decreased from level A to level D, with the most rapid decrease occurring between levels A and B.

There was no indication that the incidence of errors in the playing of accidentals, at all levels, could be attributed to the playing of one or more particular accidentals. While subjects of level A found considerable difficulty with each accidental which they played, the subjects of level D were comparatively very proficient in playing all accidentals which they encountered. The most rapid progress in ability to play accidentals was noted from level A to level B. The performers of level C erred on only four out of the twelve different accidentals which they played and were generally proficient in playing naturals.

The performers at each of the four levels of performing ability appeared to have the same relative difficulties in key. In general, they were most proficient in playing naturals, and seemed to find that the difficulty of playing sharps and flats increased directly with the order in which the sharps or flats were introduced in key signatures.

Although the number of errors was relatively small in every instance, it appeared that the performers experienced similar difficulties in pitch at each of the four levels of performing ability. Even in level A, one per cent or less of errors was registered on each particular type of pitch errors. At the three higher levels of performance, the percentages of errors were generally less than half of one per cent in all areas of pitch. The errors in pitch which were most commonly made by subjects of all four levels were: substituting a higher or a lower note and repeating a note which was written in the score.

The members of each level of performing ability appeared to find proportionately the same difficulty with regard to the various areas of rhythm. The majority of the errors in rhythm consisted of holding a note too long or releasing a note too soon. In terms of opportunities for errors, the subjects of each level appeared to encounter more difficulty with rests than with notes.

Analysis of Errors by Violinists and Clarinetists

The violinists and clarinetists appeared to experience approximately the same difficulties in sight reading in music. They exhibited a very close agreement in percentages of total errors and in percentages of errors in each of the four phases of performance. The clarinetists were slightly more proficient than the violinists but the difference was small. A close parallel existed in the observations made concerning key and accidentals. In both cases, the two groups of performers were most proficient in playing naturals and least proficient in playing the sharps and flats which are least commonly used. It appeared that little difference existed between the difficulty encountered by the violinists and clarinetists in pitch since both groups of subjects made less than one half of one per cent of errors in all save one of the categories of errors in pitch. In general, both groups of instrumentalists found approximately equal difficulty in rhythm; however, the violinists appeared to have more difficulty with rests than did the clarinetists.

Analysis of Errors by Violinists and Clarinetists at Four Levels of Performing Ability

The violinists and clarinetists, at each of the four levels of pro-

ficiency showed remarkable agreement in the percentages of errors made in each of the four phases of performance. Although variations were noted, it appeared that the major difficulties encountered by both groups of instrumentalists were the same as had been indicated previously for each of the four levels. In the playing of accidentals, the violinists and clarinetists appeared to experience approximately equal difficulty in playing particular accidentals. The greatest variation in number of errors in accidentals was found in level A. At the three higher levels of performance, a very close agreement was found in the number of these errors made by violinists and clarinetists. In the playing of key, violinists and clarinetists made approximately the same percentage of errors. The greatest variation in numbers of errors on particular notes was found in level A. Most of the variation in difficulty was found in the playing of three notes: F, C, and B. The next greatest variation was found in level B. In levels C and D, there was a close agreement in the percentages of errors made by both violinists and clarinetists. The percentages of errors in pitch made by the violinists were extremely small at each of the four levels, and were nearly equal for performers on both instruments. There did not appear to be any evidence that the choice of instrument had any significant relationship to errors in pitch. In rhythm errors, there was rather close agreement between the percentages of errors registered by both the violinists and clarinetists at each level. An exception to this general statement is that the violinists were less proficient at each level than were the clarinetists with regard to the execution of rests.

Analysis of Errors in Rhythmic Group and Interval

No particular rhythmic group appeared to present marked difficulty to either group of instrumentalists at any of the four levels of performing ability. The performers, in general, were least proficient in playing the five rhythmic groups which are played for the longest period of time; however, this may be explained by the large percentages of errors made by the members of levels A and B in playing these groups. The violinists of these two levels made larger percentages of errors than did the clarinetists in playing these five rhythmic groups. With the exception of the above observations, little variation was noted in the percentages of errors made in playing any particular rhythmic groups.

The size of the interval seemed to bear little relation to the percentages of errors made by both groups of instrumentalists at each of the levels of performing ability. The percentages of errors made in each level varied, as did the ranges of percentages; however, there was no consistency with regard to those intervals which were difficult or easy to play. The distribution of errors in intervals made by the violinists and clarinetists was approximately the same.

Conclusions

The results of this study seem to indicate the following conclusions with regard to the questions raised in the statement of the problem:

1. The playing of rhythm, as evidenced by the large number of errors reported in this study, is the major source of difficulty in the sight reading of music for violin and clarinet.

2. Accidentals, though played less frequently than the other phases of performance, present considerable difficulty when they are met in music, particularly in the first few years of instrumental study for violinists and clarinetists.

3. In the playing of key, the amount of difficulty appears to increase directly with the order in which the sharps and flats are introduced in the key signature. Practice materials, written in keys using a large number of sharps and flats, might profitably be given more emphasis in the instrumental music program.

4. Violinists and clarinetists acquire proficiency in playing the correct pitch at an earlier stage of training than they achieve mastery of rhythm, accidentals, and key.

5. The relative difficulty found in playing accidentals, key, pitch, and rhythm is the same at each of the four levels of performing ability.

6. In playing the four phases of performance, violinists differ from clarinetists only slightly in their pattern of errors. Thus, many of the problems in sight reading in music may be dealt with in classes containing performers on two or probably more different instruments.

7. The particular rhythmic group has little relationship to the number of errors made by the performers in playing the four phases of performance.

8. The size of the interval has little relationship to the number of errors made by the performers in playing the four phases of performance.

9. No data of the study appear to contradict the assumption that

ability in sight reading in music is dependent on a general insight with regard to each of the four phases of performance. In fact, the observations which were made concerning the level of performance, the choice of instrument, the rhythmic group, and the interval seem to bear out this assumption.

Problems for Further Study

The following problems have been suggested by the analysis of the data of this study:

1. A study of the effectiveness of several contrasting methods of teaching of rhythm.
2. A study of the effectiveness of an intensive program of instruction on the problem of playing of accidentals, using materials designed to provide more opportunity for the playing of accidentals than is commonly provided.
3. A study of progress in sight-reading ability arising from the use of instructional material utilizing least commonly used keys.
4. A series of case studies of individual students with reference to their performance in reading music, using the findings of this study as a basis for comparison.
5. A study of the effectiveness of heterogeneous grouping for generalized instruction in the techniques of sight reading.
6. A study of the causes of errors made by instrumentalists in the sight reading of music.

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APPENDIX

Preliminary Exercise of the Sight-Reading Test

Exercises 1-16 of the Sight-Reading Test

PRELIMINARY EXERCISE



EXERCISE NO. 1



EXERCISE NO. 2



EXERCISE NO. 3



EXERCISE NO. 4



EXERCISE NO. 5



EXERCISE NO. 6



EXERCISE NO. 7



EXERCISE NO. 8



EXERCISE NO. 9



EXERCISE NO. 10



EXERCISE NO. 11



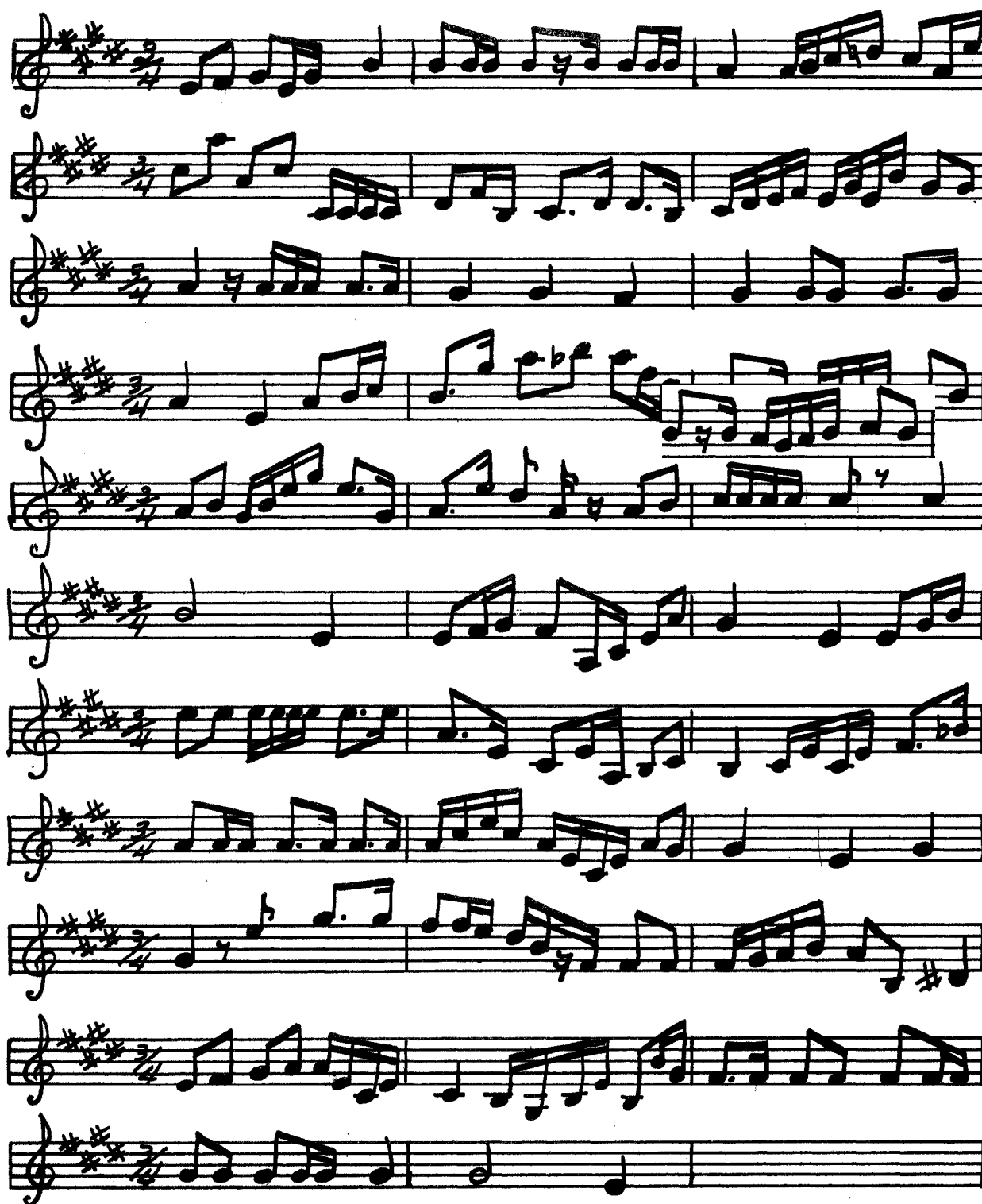
EXERCISE NO. 12



EXERCISE NO. 13



EXERCISE NO. 14



EXERCISE NO. 15

The musical score for Exercise No. 15 consists of ten staves of music. The key signature is G major (one sharp, F#) and the time signature is 2/4. The notation includes various rhythmic patterns, primarily eighth and sixteenth notes, with several triplet markings (indicated by a '3' over the notes). The first staff begins with a treble clef, a key signature of one sharp (F#), and a time signature of 2/4. The music progresses through the staves with increasing complexity in rhythm and melodic movement, ending with a final staff that concludes the exercise.

EXERCISE NO. 16

The musical score for Exercise No. 16 consists of ten staves of music, all in 3/4 time and one sharp (F#) key signature. The notation includes various rhythmic patterns, including eighth and sixteenth notes, and rests. Trills are indicated by a 'tr' symbol above notes in measures 1, 3, 5, 7, 9, and 11. Slurs are used to group eighth and sixteenth notes in measures 2, 4, 6, 8, 10, and 12. Triplet markings (a '3' over a group of notes) are present in measures 2, 4, 6, 8, 10, and 12. The exercise concludes with a final measure on the tenth staff containing a whole note and a quarter rest.