A STUDY OF THREE FACTORS RELATED TO MUSIC READING AND OF THE RELATIONSHIP OF MUSICAL EXPERIENCE TO MUSIC READING ABILITY

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ABSTRACT

A STUDY OF THREE FACTORS RELATED TO MUSIC READING AND OF THE RELATIONSHIP OF MUSICAL EXPERIENCE TO MUSIC READING ABILITY

By

June Ann Raad

Two problem areas were investigated in this study; 1) the relationship of experience in instrumental music to sight-reading ability, and 2) the relationship between three tasks related to music reading. These three tasks are; 1) the ability to sight-read and play musically notated phrases, 2) the ability to sight-read and play typewritten musical phrases, and 3) the ability to name the notes in a musically notated phrase.

June Ann Raad

Five tests were involved in this study; 1) a test of sight-reading ability, 2) a questionnaire concerning background in instrumental music, 3) a test of sight-reading ability using musically notated phrases, 4) a test of sight-reading ability using typewritten musical phrases, and 5) a test of sight-reading ability in which the student was to name the notes in a musically notated phrase. Test 1 was projected using an overhead projector; tests 3 through 5 were made into slides and also projected. All of these tests were tape-recorded and evaluated by two independent judges.

Statistical measures employed included the Kuder-Richardson Formula 20, the Kendall Coefficient of Concordance, the Kruskal-Wallis One-Way Analysis of Variance, the Two-Way Analysis of Variance, Fixed Effects Model, and the U-test.

The major findings of this study were; 1) experience in instrumental music does not predict sight-reading ability (students with little experience read as well as those with more experience); 2) experience effects violin, clarinet, and trumpet players equally; 3) clarinet players with low experience scores sight-read better than clarinet players with high experience scores and better than both violin and trumpet players with low experience scores; 4) the three sight-reading tasks were concordant (subjects who ranked high on one of the tasks, ranked high on the other two); 5) clarinet players performed best on tasks one and two, with violin players scoring second best, and trunpet players having the lowest scores; and 6) clarinet, trumpet and violin players do not perform significantly differently on the note-naming task.

The questionnaire revealed that clarinet and trumpet players were generally older than violin players in this population, but violin players had much more experience

in playing other instruments. It was also found that most of the subjects practice 15 to 30 minutes per day, and one-half of them play an additional 15 minutes per day for their own enjoyment.

Overall, the clarinet players seemed to score best on all tests. This may be the result of a particularly good group of clarinet players within the four schools, which caused the poorer clarinetists to leave the instrumental program, or it may be due to the fact that the clarinet players were predominantly girls. It is impossible to give any statistical proof that either of these is the case, however, so more research is needed.

This study has revealed some interesting and unexpected results which certainly merit further investigation by other researchers.

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CHAPTER I

INTRODUCTION

Throughout history, music reading has been a major concern of music educators. Many attempts have been made to simplify musical notation, and many methods of teaching music reading have been employed.

Snyder lists the following steps as being important contributions in the history of music reading:[1]

> " The early scales which the ancient Greeks formulated several hundred years B.C.
> The use which Guido d'Arezzo (980-1050) made of the sol-fa syllables as a means for singers to measure the tonal relationships of the scale.
> The writing down of music and the development of the musical alphabet in the Middle Ages.
> The holding up of a large manuscript book or chart for choir members in the church to follow the neumes on a staff during the late Middle Ages and the early Renaissance.

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[1] Snyder, A.M. " Guidelines for a Music Reading Program". Music Educators Journal, Feb.-Mar. 1963, 49:4. Pp. 65-66.

The use of hand syllables to indicate to singers the steps of the scale; these were related to the sol-fa syllables and to the staff.
The use of hymnals in the churches.
The establishment of church schools in Europe for the purpose of training men and boys in the church choir to sing and to read music.
The use of music readers and song book texts in the public schools."

Music reading in America began in the churches. Because the early settlers could not read music, the hymns were a cacaphony of tunes and voices. This need for sight-singing training brought about the advent of the "Singing Schools". The first book to be printed in this country which contained instructions for music reading was "The Introduction to the Art of Singing Psalm Tunes" (1714).

Lowell Mason, a Boston singing-school teacher in the 1830's was the first to introduce singing into the public schools. In his "Manual of Instruction", he lists the following seven principles of sight-reading:[2]

"The child should sing before he learns the notes and their names. Teach sounds before signs.

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[2] Snyder, A.M., op. cit., p.66.

Lead the child to be active rather than passive in his learning - to observe, to hear, and to imitate sounds, rather than explain them to him.

Teach one thing at a time. Rhythm, melody and expression should be taught and practiced separately before we expect the child to attend to all at once.

Have each child practice and master each step of each of these divisions before passing on to the next.

Give the principles of theory after practice, and leading from it.

Analyze and practice the elements of articulate sound in order to apply them to music.

Have the names of the notes correspond to those used in instrumental music."

The middle of the nineteenth century saw another decline of interest in sight-reading, then, in the 1880's, music-reading again became a common concern. During the period from 1830 to 1880, music was taught mostly by classroom teachers who placed little emphasis on music reading.[3]

In the early twentieth century, men like Herbert, Hall, and Dewey emphasized the need for every child not only to learn to sing, but to learn to appreciate and enjoy taking part in music. Thus, again, music reading became a secondary goal of music education.

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[3] Snyder, A.M., op. cit., pp. 65-66.

The decade of the 1950's saw a revival of the interest in music reading. The following quotations reflect the thoughts of the period:

" Modern educators are learning that the ability to read is at the very foundation of the learning process".[4]

"It is paradoxical that so many persons take their ability to read words as a matter of course, and yet stand so much in awe of reading music. Even though many of them have had from six to ten years of instruction in music in the public school, they continue to think of music reading as an accomplishment restricted to the music specialist." [5]

" Has not the time arrived when music educators should make a major issue of this reading problem and attempt to arrive at an agreement as to the degree of reading skill it is desireable for high school students to have, and by what method this skill may best be achieved?" [6]

" Many young soloists have won coveted first division honors, and yet do not have the ability to recreate a simple melody correctly and musically from the composer's symbols. They must gain a concept of the time, style, rhythm, and phrasing by having it superimposed by teacher activity or by feelings of empathy while playing in an organization. They truly can be classed as music illiterates. They can not read." [7]

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[4] Frederich, F. " Intelligent Music Reading". Educational Music Magazine, Jan.-Feb. 1951. P. 31.

[5] Leonhard, Charles. " An Easier Way to Read Music". Music Journal, Mar. 1953, XI:3. P. 28.

[6] Gordon, E. "Why Johnny Can't Read Music". Music Educators Journal, Jan. 1958, 44:3. P.36.

[7] Fitchhorn, E.J. " Music Literacy(The Sight and Reading Problem)". The School Musician, Mar. 1964, 35:7. P. 45.

An article by Fitchhorn sums up the problem as follows:[8]

" The individual who cannot read and understand the printed page is stigmatized by being classified as an illiterate. He is handicapped because he can only learn by rote from direct contact from another individual who may be or quite frequently is not a competent authority... The individual possessing literacy can contact the most outstanding authorities, living or dead, and on any subject of his interest."

STATEMENT OF THE PROBLEMS

Problem One

Two methods of sight-reading which are diametrically opposed will be investigated in this study. One of these, the "traditional", teaches the child to look at a written note of music, think of its name or number, and then play that note on his instrument. Another method widely used by teachers, teaches the child to see the note, and immediately associate the written symbol with the fingering of that note.

This study will attempt to assess three abilities

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[8] Fitchhorn, E.J. op. cit., p.45.

which play an important role in evaluating the efficiency of the above two techniques: 1) the ability to perceive and play a musically notated phrase, 2) the ability to perceive and play a typewritten musical phrase, and 3) the ability to perceive and name the notes in a musically notated phrase.

The students will be asked to play three versions of the same sight-reading test. Test A will require the student to view a series of musically notated phrases, and to reproduce these phrases on his instrument. Test B will require the student to view a series of typewritten musical phrases, and to produce these phrases on his instrument. Test C will require the student to view a series of musically notated phrases, and to name the notes seen in each phrase.

The results of these three tests will be compared to see which, if any, of the skills are related.

Problem Two

The second area of investigation centers around the concept that experience in music may have an effect upon music reading ability. To evaluate this relationship, two tests will be given to each subject; Test 1 is a measure of note-reading ability in which the student will be asked to play ten traditionally notated phrases on his instrument. The second test, a questionnaire, purports to measure the amount of experience each subject has had in instrumental music. The results of these two tests will be compared to determine the effects, if any, of experience upon music reading ability.

STATEMENT OF HYPOTHESES

Hypothesis One: Experience in instrumental music is not directly related to sight-reading ability. (i.e., a more experienced student will not necessarily read better than a student with less instrumental experience)

Hypothesis Two: Experience will effect violin, clarinet, and trumpet players equally.

Hypothesis Three: There will be no difference among the six individual instrument-experience groups tested in sight-reading ability.

Hypothesis Four: Three tasks related to sight-reading are mutually variable: 1) the ability to perceive and play a musically notated phrase, 2) the ability to perceive and play a typewritten musical phrase, and 3) the ability to perceive and name the notes in a musically notated phrase.

Hypothesis Five: Violin, clarinet, and trumpet players perform equally well on the three tasks given in Hypothesis Four.

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METHODOLOGY

Since this topic will be discussed at length in Chapter III, it will be given only cursory treatment here.

Four tests will be constructed for each instrument; Test A, Test B, Test C, and Test 1. Tests A,B, and C will contain exactly the same musical material, but will be presented in different random orders. Each of these tests will consist of 24 phrases; eight phrases having three notes each, eight phrases having five notes each, and eight phrases having seven notes each. Half of these phrases will be based upon the frequency at which specific notes appear in first year instructional books for each instrument. The second half of the phrases will be based upon the frequencies obtained from second year instructional books. All three tests will be presented on slides, with the projector aimed at a music stand to approximate the usual visual field of music reading.

Tests A and C will be notated in standard musical notation: Test B will contain typed letters instead of traditional musical symbols. In Test A, the student will be asked to play the note he sees; in Test B, the student must play the notes having the letter names seen on the music stand; in Test C, the student must name the notes he sees.

Test 1, like the previous tests, will be constructed using the frequencies of notes observed in both first and second year instructional materials. This test will consist of ten phrases of various lengths, written in standard musical notation. These phrases will appear on the student's music stand, projected by an overhead projector. The student is asked to play the notes he sees.

The questionnaire will attempt to assess the student's experiences in instrumental music, both in school and outside of school.

All of the above measures will be tested for reliability; the problem of validity is taken care of in the process of constructing the tests. These tests may be assumed to have content validity since they are based upon a pre-existing model, i.e., textbooks normally used by students of this age group. The validity is further assured by the process of selection of notes; each note in each test occurs at a frequency equal to the frequency at which it appears in the instructional materials.

Tests A,B, and C will be compared in two ways. First, a Kendall Coefficient of Correlation will be computed to assess the mutual variability of the three sight-reading tasks purportedly measured by the above tests. Then, a Kruskal-Wallis One-Way Analysis of Variance will be computed to assess the similarity between instrumental groups in performing each of the three tasks.

Test 1 will be used, along with the questionnaire, to assess the effect of experience upon these students'

sight-reading ability. A Two-Way Analysis of Variance, Fixed Effects Model, will be used. Additional U-tests will be used if the Analysis of Variance determines that there is variance in students' scores.

Tests A,B,C, and Test 1 will be tape-recorded and evaluated by two judges.

All subjects will be randomly chosen to represent the total population of third year instrumental students.

LIMITATIONS OF THE STUDY

Sight-reading skill is probably related to a wide number of variables. These variables may include age, sex, socio-economic background, quality of instruction, location of school, and many more factors. Due to limited time and resources, not all of these variables can be isolated and evaluated. Therefore, the experimenter will attempt to define and measure only one variable of background; instrumental experience.

It is also impossible to construct tests for all

levels of achievement. The third year of study was selected, because it was thought that students at this level should have some experience and ability in sight-reading. Students of a younger age may not be sufficiently experienced to accurately test their music reading ability. The problem with older students lies in the selection of testing materials; it is difficult to find instructional materials that are commonly used at the high school and college levels which could serve as models for the construction of such tests.

DEFINITION OF TERMS

The terms sight-reading and music reading will refer to the ability of a student to read and play at sight any traditionally written musical note. This study will concern itself only with melodic sight-reading. Therefore, the above terms will refer only to the reading of pitches, not of rhythmice patterns and accuracy.

The terms background and experience will refer to the subject's previous and present instrumental experiences, such as; instruction on the major instrument, other instruments played, membership in musical organizations, average practice and playing time per day, amount of private instruction, age, and grade level.

The term "traditionally written note" will refer to the musical symbols used to designate a note to be played. The terms "typed letters" and "letter names" will refer to a typewritten letter name which stands for a musical pitch.

The term "series" refers to a set of instructional music books. The term "level" indicates Book 1 or 2, or the first or second part of a series.

" Frequency of presentation" refers to the number of times one specific note occurs within a given book or group of books.

"Percentages" refers to the percentage of the total number of notes in a book which fall within one grouping.

Thus, having defined the terms and processes to be followed in this study, a review of pertinent literature relating to this topic will be undertaken.

CHAPTER II

REVIEW OF THE LITERATURE

Literature which is pertinent to this study falls into several sub-groupings, which will be discussed individually in the following order:

I. Literature concerning various methods of sight-reading.

II. Literature related to the relationship between experience and sight-reading ability.

III. Literature related to the testing procedures to be used in this study.

Literature Concerning Various Methods of Sight-Reading

The bulk of this literature referring to sight-reading is a mass of differing approaches to sight-reading

efficiency and accuracy. The methods most frequently espoused are; 1) the "traditional" sol-fa system, 2) a scale-numbering system, 3) an approach based upon ear-training, and 4) an approach based upon visual eye patterns and/or finger patterns.

The sol-fa, or solfege, system was first inspired by the Guidean hand method of reading, where each finger stood for a syllable or tone of the scale. This system dates back to Guido d'Arezzo (1000 A.D.). In the nineteenth century, John Kerwin invented the more modern solfege system we know today as an aid in sight-singing. The latest advocate of hand symbols as an aid in music reading is Kodaly. Thus, the solfege system has been the most popular method of teaching sight-reading for many years. Many musicians still feel that this is the only acceptable way to teach music reading.

Peithman gives the following reasons for using syllables :[9]

" 1. The majority of the public schools throughout the nation use the tonic sol-fa syllables (moveable do) in their classes as indicated by Bose in Problems of Teaching Sight-Reading.

2. Groups- taught by a teacher who knows syllables and develops enthusiasm for them- will read music more rapidly than those taught by most other methods. A cappella singing improves intonation and forces one to read more carefully and accurately.

3. Once learned and practiced, syllables will always be at one's command.

4. The intervals between syllables remain static for any existing key feeling.

5. Syllables help one take dictation. They can serve music as shorthand serves the commercial world.

6. Syllables aid one to read more quickly. One will develop the ability to think in groups or phrases rather than by single notes as is done by some methods.

7. The seven sol-fa syllables may be easily used with a particular major scale and its relative minor scale.

8. If one can find do, he always knows what the key signature is if he knows his scales.

9. If one can find la, he can easily find do.

10. One has but few additional things to remember if he has learned the key signatures.

11. Syllables compel one to learn the basic foundation of all classical music, namely, keys and scales. This is a necessity if one really wishes to understand music.

12. The interval relationships once learned in any major scale can be applied to all major scales - fifteen in all.

13. All the relationships of the major scales apply to the fifteen natural minor scales.

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[9] Pleithman, H. "A Sight-Reading Aid That Works". Music Journal, Mar. 1966, XXIV:3. Pp. 88, 102-103.

14. All the relationships of the major and natural minor scales are the same for the harmonic minor except the raised seventh tone.

15. The same is true for the melodic minor scales except the raised sixth and seventh tones in the ascending melodic form.

16. Thus sixty scales are at one's finger tips if the syllables are learned for the four basic patterns C major and the three forms of a minor.

17. Chromatic alterations are easily applied if the chromatic scale syllables are learned.

18. Syllables help one to sing and hear intervals more quickly than otherwise. They develop a strong key feeling and readily point out a modulation or chromatic alteration. They help one produce more accurate pitches than most methods.

19. Syllables help much in transposition.

20. Syllables should be started in kindergarten as an extra verse to the songs that children sing. The teacher can generate enthusiasm for them and the child, who learns syllables early, will never develop an aversion to the most marvelous sight-reading aid invented by man. Syllables must be used throughout one's childhood and continued as long as he is thinking and reading music."

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Marion Flagg says:

"Names for tones are important, not as embodiments of separate pitches, but as tools by which to define and clarify relationships.....Syllable names are important historically and can be made useful tools if kept subject to relationships rather than if used to identify separate pitches; it is not "do" and "mi" sung one after the other that makes the third beautiful, but a "do-mi-ness" felt as an entity and a quality that always speaks as a third. Letter names are essential by the time key signatures begin to function."

While the sol-fa system works well for vocalists, it offers less help to the instrumentalist. This may have been one of the chief resons for the development of a scale

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10 Flagg, M. "The Written Language of Music". Music Educators Journal, Jan. 1949. Pp. 6-8.

numbering system, along with the need for such numbers in harmonic analysis.

Edgar Gordon[11] cites the major shortcoming of the solfege system as its chromatic complexities. He says that as early as 1926, musicians began to recognize the shortcomings of the solfege system, and in that year Howard Hanson suggested the use of letter names instead of solfege (in an address to the Music Supervisor's Conference). Gordon goes on to advocate the use of numbers, since these are familiar to children. In a radio program broadcast by Gordon in Wisconsin, tonal patterns were taught to children using scale numbers. His evidence indicates that the children learned rapidly and efficiently with his method.

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[11] Gordon, E. "Why Johnny Can't Read Music". Music Educators Journal, Jan. 1958, 44:3. Pp. 36-42.

Flagg adds that:[12]

" Scale numbers are the most useful tools since they embody relationships from their first use."

Leonhard[13] cites the shortcomings and advantages of both of the above methods, as well as the use of letter names. He finds all three systems workable. His major contribution to the literature rests with his theory that musical experience should proceed the learning of music reading skills.

Leonhard's writings are the prime source of information espousing the ear-training approach. He believes that the student must hear music first and develop an aural picture of the music before it is played or sung. This makes some sense for the singer, but seems impractical, on

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[12] Flagg, op. cit., p.8.

[13] Leonhard, op. cit., p.28.

a day-to-day basis, for the school-age instrumentalist.

Perhaps the largest bulk of the literature concerning reading techniques to be published in the past two decades is that which deals with visual/tactile patterning.

Berkley[14] reminds the student of the practice of always reading ahead - a much respected and frequently used technique of professional musicians.

Frederich[15] says that;

" Note patterns must be seen as stimuli inducing action rather than just as music symbols indicating tones."

He cites three factors which account for reading ability at the keyboard:[16]

" 1. A sense of position on both the staff and the keyboard, which we might call positional relationship.

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[14] Berkley, H. "The Violinist's Forum". Etude, Aug. 1949, LXVII:8, p.477.

[15] Frederich, F. "Playing by Seeing". Educational Music Magazine, Nov.-Dec. 1950. P. 38.

[16] Ibid., p.38.

2. An immediate response to the pattern 'seen' through the sense of feel.
3. A growing sense of security, that basic component of all acts of motor skill."

Thus, Frederich advocates the visual/tactile patterning idea, where little use is made of note names or numbers.

In another article[17], Frederich states that the use of extensive finger numbering and the use of note names in reading prevents immediate responses to the visual stimuli.

In yet another paper[18], Frederich states that:

"All alphabetical note names are only needed for purposes of identification and not as an aid to reading..."

In this paper, he also discusses eye span, and states that the eye does not move steadily along the musical line, but moves in a series of jumps, with each jump taking several notes into view. Thus, he says, we read in patterns.

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17 Frederich, F. "Intelligent Music Reading". Educational Music Magazine, Jan.-Feb. 1951. Pp. 31-33.

18 Frederich, F. "All Music Reading is Sight-Reading". Etude, Nov. 1951, 69:11. P. 14.

Macek[19] says that beginning players should not concentrate on "labels" of notes (names, etc.), but they "should be thinking about the correlation of note positions on the staff with the corresponding positions on the keyboard."

He also says that "the letter-naming of notes should be of secondary importance and should come about as reading develops."[20]

A study made by Rea[21] found that good readers of music read patterns of notes. He also found that the following configurations produced more difficulty in reading :

1. Extremely high or low notes.
2. An extended passage of fast notes.
3. Complicated rhythmic passages.
4. Highly chromatic passages.

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19 Macek, "Sight-Reading,a Musical Asset". Music Journal, Sept. 1957, 15:7. Pp. 64-65.

20 Ibid., p.

21 Rea, R.C. "Music Reading Films". Journal of Research in Music Education, Fall 1954, 2:2. Pp. 147-155.

5. Wide skips between notes.
6. Many sharps or flats in the key signature.

All of the above will be limited in the present study to avoid undue difficulties.

Rea also found that the eyes must move ahead of the notes being played.

Ward[22] emphasizes the advantages for a string player in reading by patterns. He says that string players learn patterns of finger positions which correspond to key signatures, and then read music in groups of notes which involve familiar finger patterns. These patterns, he says, "register in his (the player's) mind almost as rapidly as any single note would", and " as soon as pattern thinking becomes established, the student learns to read music with greater speed and accuracy."

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[22] Ward, S. "Patterned Music Reading". The Instrumentalist, Oct. 1966, 21:3. Pp. 52-53.

A 1937 study by Ortmann found evidence in support of the theory of visual span:[23]

"The data obtained in this test show that an area of one-fourth to one-third of an inch in diameter, with three items in the field, may be considered the area of clear vision for the normal eyes of pupils over thirteen years of age, who are familiar with notation.

It is obvious that in note reading we cannot read individually each note of the score any more than we can read each letter of a word in book reading, and to the extent that visual span in book reading is an important determinant of reading efficiency, so the span of vision in note reading may be equally important in the efficiency with which music is read."

Jeffries[24] notes that the first violinist in one of his orchestral groups had fingers:

"So well trained that they would automatically select exactly the right spot on the string; there was little, if any, mental conception of how the next measure would sound until he played it. The same dependence upon mechanics, automatic response and trained reflexes was found to dominate the playing of practically every one of the instrumental performers."

Thus, there are at least four ways to teach music reading. A critique published in the Council of Research in Music Education Bulletin sums up the problem in this

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[23] Ortmann, O. "Span of Vision in Note Reading". M.E.N.C. Yearbook, 1937. Pp. 88-93.

[24] Jeffries, A. "Do Instrumentalists Read Better Than Vocalists?" Music Journal, Dec. 1956, 24:10. P.26.

manner:[25]

" Now whether reading by the tonal pattern method is the best way to develop sight-reading is by no means certain; the technique of building a strong concept of pitch via solfege or the numbered-scale-interval system has enough devotees to justify doubt. Just as the teachers of English reading are still uncertain about the whole word, phonic, or complete sentence method, reading of music by tonal patterns, complete phrases, or individual pitch intervals would still seem to be an unresolved choice."

Literature Related to the Relationship between Experience and Sight-Reading Ability

Another bulk of music reading literature is devoted to the topic of "What makes a good reader?" Some of this material is empirically derived; some is researched data. This material can be divided into two major areas; 1) the experiences which aid music reading, and 2) the actual steps used in music reading.

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[25] _____"The Perception of Music Symbols in Music Reading by Normal Children and by Children Gifted Musically" (a critique) Bulletin of the Council for Research in Music Education, June 1963. P. 62.

[26] Petzold, R. "The Perception of Music Symbols in Music Reading by Normal Children and by Children Gifted Musically". Unpublished Doctoral Dissertation, University of Illinois, June 1963.

Effects of Experience upon Music Reading Ability

A study by Petzold[26] found that no significant difference in ability to sight-sing existed between subjects with one or more years of instrumental training and those with no such training. The author concludes that a high level of music reading competence depends upon providing children with activities that will enable them to understand and use the concepts underlying musical notation.

A critique of the above study reaches the following conclusion:[27]

"Children in this study demonstrated that they did not read music successfully unless they thought about the notation and about the reading process. There is no incentive or need to think unless the reading activity is interesting, challenging, and relevant to the kinds of musical acticities taking place within the school program."

A study by Jones[28] found that music reading ability

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[26] Petzold, op. cit.

[27] Bulletin of the Council for Research in Music Education, op. cit., p. 62.

[28] Jones, H.T. "The Relationship of Selected Factors and Music Reading Achievement", Unpublished Doctoral Dissertation, Michigan State University, 1968.

was slightly related to musical background, but not significantly related to perceptual time span, intelligence, or verbal reading ability.

King[29], however, found a very highly significant relationship between intelligence and music reading skills. His study included two groups of fifth and sixth grade students (N=550) who were matched according to age, grade, semesters of music instruction, sex, extracurricular music activity, and aural-visual acuity. The groups differed widely in music reading skill (Mean in group A = .266, mean in group B = 21.94). When intelligence tests were given to both groups, there was a significant difference in their I.Q. scores (group A had an average I.Q. of 100.89, group B had an average I.Q. of 107.45). The King study, being better controlled, and having more subjects than the Jones study, may have more reliable findings.

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[29] King, H. "A Study of the Relationship of Music Reading and I.Q. Scores". Journal of Research in Music Education, Spring 1954, 2:1. Pp. 35-37.

A study by Bargar[30] found that piano study, aural and notational skills, grades in music, and visual recognition skills were positively related to music reading skills.

A study by Luce yielded the following results:[31]

1. The number of hours of private instruction on the tested instrument were significantly related to the reading abilities of girls, but not related to the reading skills of boys.
2. Regular school instrumental instruction hours were not significantly related to music reading abilities.
3. The combined boys and girls school instrumental group hours were highly correlated with sight-reading.
4. The two best predictors of sight-reading ability were student leadership status and mental age. Among girls, private instruction and music goals are also somewhat predictive.

A study by Yoder[32] revealed that the quality of the

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[30] Bargar, R. "A Study of Music Reading; Groundwork for Research in the Development of Training Programs." Unpublished Doctoral Dissertation, Ohio State University, 1964.

[31] Luce, J. "Sight-Reading and Ear-Playing Abilities as Related to Instrumental Music Students". Journal of Research in Music Education, Summer 1965, 13:2.

[32] Yoder, C. "Music Reading Ability of Children in Elementary School Grades Three, Four, Five, and Six in Three Different Teaching Situations (vol. I & II)". Unpublished Doctoral Dissertation, University of Minnesota, 1969.

teaching situation is significantly related to pupils' scores on a music reading test.

Zimmerman[33] evaluated the relationships between choral sight-reading ability and musical environment, using adult subjects. He found that the following variables were significantly related to good sight-reading; formal music study, musical training and experience, early interest in and continued enjoyment of music, and the use of a systematic method of sight-reading.

In a study of score-reading ability, Pagan[34] found that good score-reading was significantly related to both the amount and type of musical training received by the subject.

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[33] Zimmerman, C.R. "Relationship of Musical Environment to Choral Sight-Reading Ability". Unpublished Doctoral Dissertation, University of Oregon, 1962.

[34] Pagan, K. "An Experiment in the Measurement of Certain Aspects of Score-Reading Ability". Unpublished Doctoral Dissertation, Indiana University, 1970.

What Skills are Needed for Successful Sight Reading?

Tucker[35] found that the ability to sight-sing was highly related to the following attributes:

1. The ability to discern the change of a single note in the second playing of a chord.
2. The ability to discern which note is alterred in which direction in the second playing of a three to ten note melodic pattern.
3. The ability to discern notational relationships visually.
4. Knowledge of certain fundamental musical signs.
5. The ability to discern how many notes there are in the single playing of a chord of two to four notes.

Since the number of years that a student participated in a school choir was not related to sight-singing ability, Tucker concludes that instrumental experience is more important than vocal experience in training for sight-singing.

Stecklein and Aliferis[36] tested the music reading abilities of college freshmen who played string, woodwind, brass, and percussion instruments, piano, and voice.

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[35] Tucker, D. "Factors Related to Musical Reading Ability of Senior High School Students Participating in Choral Groups". Unpublished Doctoral Dissertation, University of California, 1969.

[36] Stecklein, J. & Aliferis, J. "The Relationship of Instrument to Music Achievement Test Scores". Journal of Research in Music Education, Spring 1957, 5:1. Pp. 3-15.

In the melodic recognition test, the string players were significantly better than pianists, who, in turn, were significantly better than all other groups. The string group also scored highest on overall achievement scores (total of melodic, harmonic, and rhythmic tests). Piano and woodwind players were second, brass players third, and vocalists and percussionists were last.

Many music educators believe that the key to good reading lies in practice. Of this, Macek says;[37]

"It can be said that to be a good reader all one must do is to read and read and read. Basically, that is almost all there is to it, but the principal factor is the careful selection of reading material. Your sight-reading efforts should be strictly confined to music at and below the level in which you are most comfortably able to perform."

A study by Rea[38] appears to validate this belief.

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37 Macek, op. cit., p. 155.

38 Rea, R. "An Experimental Program for Improving the Sight-Reading Ability of Cornet and Clarinet Players." Unpublished Doctoral Dissertation, State University of Iowa, 1954.

He says that' "Skill in sight-reading can best be acquired by reading a large amount of music varied in all the problems encountered by the reader in actual performance."[39]

In the Petzold study previously mentioned,[40] three hundred and twenty-six songs were analyzed, and 558 different tonal configurations were identified and counted. He then selected configurations to be employed in his study from these groups. As his critic points out, this is not an entirely valid method, since textbooks are not constructed with such frequencies in mind.[41] However, this seems to be a valid way of determining a "fair" test of what students should have learned at a particular level.

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[39] Rea, op. cit., p.87.

[40] Petzold, op. cit.

[41] Bulletin of the Council for Research in Music Education, op. cit., p.62.

A study by Luce[42] also utilized frequency of use as a criteria for selection of test items; in this case, three keys were chosen for each instrument, according to their frequency of use. The actual test consisted of eight examples, each eight measures long. The entire tests were tape-recorded.

A study by Rea[43] cites the Watkins-Farnum Test as the best tool of its kind for the researcher. This test, however, does not correspond well with the material taught in elementary instruction books; therefore, its content validity for this study would be questionable. For this reason, it will not be used. It also appears that the cornet and clarinet tests are not equal in difficulty; there is also no test for violin.

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[42] Luce, op. cit.

[43] Rea, "An Experimental Program...",(op. cit.).

A dissertation written by White[44] suggests that music reading ability may be measured by the subject's ability to "hear the score". This appears to be a valid test; however, it was rejected for this study because a performance test was desired. A student's sight-reading ability in an instrumental group is not judged by what he "hears" , but by what he plays. Thus, it seems that a performance test would be a more accurate estimate of the student's practical sight-reading skill.

The Jones study previously cited utilized methods of presentation similar to those which will be employed in this study. One hundred and twenty slides of three and four note phrases were made and shown to subjects at intervals of less than a second. These tests were

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[44] White, A. "The Construction and Validation of a Group Test in Music Reading for Intermediate Grades." Unpublished Doctoral Dissertation, University of Minnesota, 1963.

administered in four different ways; 1) in the first test, the subjects were asked to write what they saw, 2) in the second test, the subjects were to listen and tell if what they heard was the same as what they saw, 3) in the third test, the students were to play what they saw (as in Test A of the present study), and 4) in the last test,the students were asked to read verbal phrases from the slides.

The Jones study, although well planned, was perhaps amiss in asking students of elementary through college age to perform similar tasks. The lack of clear cut results in this study may have resulted from the failure of the testing device to adaquately measure each age group at its own level.

A background questionnaire, the Gaston Inventory Survey of Music Background and Interest, was also given. The results on this test did not correlate with music reading skill, but here again, this may be the failure of the

questionnaire to adaquately measure the students' backgrounds. The language used on this particular questionnaire was very sophisticated, and the younger subjects may not have understood the questions being asked of them.

Jones found no relationship between music reading and any of the following; perceptual time span, intelligence, music background, or verbal reading skill. He did find a small, but statistically insignificant correlation between musical experience and music reading ability.

The Bargar study previously cited also used slides to present twenty-four note patterns consisting of scales, intervals, and chords. The exposure time was one twenty-fifth of a second. The students were asked to notate the patterns which were projected onto a screen placed in front of the testing room. The subjects were college freshmen; the recognition test involved writing a phrase after it had been shown. The author found that scores on

this test were significantly related to years of piano study, aural and notational skills, and grades received in a fundamentals of music class.

Thus, one may see that methods of writing and presenting music reading tests are still at an embryonic stage. The present researcher hopes to refine some of the above techniques in the present study.

A review of the literature pertinent to music reading shows that there are some bases for the techniques outlined for the present study.

CHAPTER III

METHODOLOGY

Construction of the Testing Devices

All five tests used in this study were newly composed by the experimenter. To insure content validity of these tests (Tests A,B,C, and 1), the following steps were taken:

1. Two series of instrumental instruction books were chosen for each instrument to be tested; violin, clarinet, and trumpet. These three specific instruments were chosen for this study because of their availability; each is the most frequently played instrument of its family. The books listed below were chosen for this

study because they are now, or recently have been, widely used in public school instrumental instruction programs. They include the following:

Violin: A Tune a Day Books I & II

By C. Paul Herforth

Publisher - Boston Music Co.

String Builder Books I & II

By Samuel Applebaum

Publisher - Belwin Inc. 1960

Clarinet and Trumpet:

Belwin Band Builder Books I & II

By W. Douglas

Publisher - Belwin Inc.

First Division Band Method Parts I & II

By Fred Weber

Publisher - Belwin Inc. 1963

2. For each of the above twelve books, an analysis was made of the frequency of presentation of each pitch (for example, the note A appeared 507 times in the String Builder Book I). Notes in repeated and da capo sections were counted as many times as they were to be played. Tied notes were counted as many times as the individual note appeared (disregarding tie signs, on the basis that the student would actually see the note two times, etc.) Parts marked "Teacher" were excluded from this count. Parts marked "Band" or "Harmony" were included in the tally. These "ground rules" were intended to make the analysis conform as closely as possible to what the student actually sees when reading these books.

3. The above frequencies were next combined at each level for each instrument; for example, the

raw scores of the Belwin Book I for trumpet were added to the raw scores obtained from the First Division Part I for trumpet. This total score was then divided by two to produce a mean frequency score for each note. In this manner, mean frequencies for each note of each instrument at each level were found. The mean frequencies for the following instruments and levels may be found in Appendix A:

Violin Level I

Violin Level II

Clarinet Level I

Clarinet Level II

Trumpet Level I

Trumpet Level II

4. The frequencies determined above were next grouped, and the percentages of the entire population of notes which fell within each group were

calculated. These groupings and percentages may be found in Appendix B. These percentages would determine the ratio of notes from each group to be used in constructing the testing devices.

5. Each of the four reading tests was assigned 120 notes (points). Sixty of these notes were drawn from level one groupings and the remaining 60 from level two groupings. The percentages of notes in these tests were equivalent to the percentages of notes and distribution of notes found in the instructional books. That is, the percentages of notes in any one of these tests which falls into a group including, for example, the notes A,G, and F on the trumpet, will correspond to the percentage of those same notes which appear in the text books.

6. Test 1 used ten phrases with the following number of notes (numbers in parenthesis indicate the number of points possible in each section of the test):

   1. An eight-tone scale; the earliest scale presented in the instructional books for each instrument (8).

   2. A nine note scale pattern - five notes ascending and four notes descending in scale-wise progression. This pattern was based upon the second scale taught in each book (9).

   3.-6. Four melodic phrases based upon the pitches of level one. There were two short (7-10 note) phrases, and two long (11-22 note) phrases(43).

   7.-10. Four melodic phrases based upon level two material, with two short and two long phrases(60).

Test 1 was made into a transparency which was projected on an overhead projector, aimed at the student's music stand.

7. Tests A,B, and C used the exact same phrases, with each test's phrases being presented in a different random order than the other two tests. These random orders of presentation may be found in Appendix D. Each test contained twenty-four phrases; eight, three-note phrases; eight, five-note phrases; and eight, seven-note phrases. Half of the phrases of each set of eight were based upon level one material, and the remaining four were based upon the frequency ratios of level two. These tests are reproduced in Appendix C. All three tests were made into slides as described below, with each slide containing one phrase. The slides were also projected upon the student's music stand.

Reproducation of Test Material

The phrases given in Appendix C were written on Sightation brand music paper, using the narrowest staves available (No. 10, 24 staves per page). The notation was done in black India ink; noteheads were made by dipping a pencil eraser, shaped as a notehead, into the ink and pressing this against the paper. All bar lines, half and whole notes, and clef signs were drawn by hand, also using black India ink. The phrases, so notated, were then made into transparencies, using an A.B.Dick Photocopier. This machine gave clearer transparencies than several other machines the experimenter tried.

The transparencies were cut into 2"x2" squares, with one phrase per square. These were then mounted in self-sealing slide mounts. These slides remained in good condition throughout the test, but their life is somewhat short due to the problem of bending and the delicacy of the film.

The slides for Test B were produced as described above, except that the note names were typed and then made into transparencies, and finally into slides.

The phrases used in Test 1 were printed as described above, then the ten phrases for each instrument were mounted together on a sheet of typing paper. This sheet was then made into the transparency which was shown to the subjects on the overhead projector.

Selection of Subjects and Evaluative Procedures

The reliability and final test samples were both drawn from four schools in the Lansing area. One school was located in the inner city, one was located in a suburban area, and the other two were rural schools. Eighty-five students from these four schools completed the questionnaire. Thirty of these students were randomly selected to participate in the reliability study (ten for each instrument to be tested). Another thirty were randomly selected to participate in the research project (ten

per instrument). Of these ten subjects, five had a high experience score, and five had a low experience score. Thus, six groups of five students each were given Tests A,B,C, and 1. These groups will henceforth be referred to as:

Violin - High Experience

Violin - Low Experience

Clarinet - High Experience

Clarinet - Low Experience

Trumpet - High Experience

Trumpet - Low Experience

All sixty students (both those involved in the reliability sample and those involved in the research project) were given the four sight reading tests. All of these tests were tape-recorded for maximum grading efficiency. Tests A, B, and C were projected onto the student's music stand using a Kodak Carousel Projector. Test 1 was projected onto the student's music stand using an overhead projector. This latter type of projector produced an image that was somewhat

difficult to see because the projector had to be placed directly behind the student, and the image projected was quite large and the projector itself gave off a great deal of light directly behind the student. In replicating this study, the experimenter would advise the use of a printed page rather than the use of this type of projector.

Each student was tested individually, and was allowed to take as much time as necessary to play each phrase. Since many students repeated notes within a phrase which they had played incorrectly the first time, it was decided to count only the first attempt at a given note as a true measure of the student's sight-reading score for that particular note.

Two judges listened to the tape recordings, and evaluated them independently of each other. When the judges' scores for an individual subtest (A,B,C, or 1) differed by three or more points, the tape was rescored

a third time. If the judges disagreed on less than three items, the items in question were scored as being correct, thus giving the subject the "benefit of the doubt".

Validity and Reliability of the Testing Devices

The manner in which the tests were derived from actual textbooks should insure content validity; i.e., that these tests measure the skills taught in instrumental music in regard to sight-reading music.

A test for reliability was also performed on each of the twelve subtests used in this study. The Kuder-Richardson Formula 20 was chosen to evaluate the reliability of these tests. Other measures of reliability were rejected because of one of the following two reasons; 1) they were biased in their selection of items to test (a split-half correlation is biased according to which items are chosen for each half), or 2) they would take too much time to perform (a test-retest technique was rejected because of the time involved, and because the subjects would be

"test-wise" on the second testing). The Kuder-Richardson Formula 20 uses all the items on the tests, and does not involve retesting. It is a measure of internal consistency.

To use this test, it is essential that all items measure the same skill. In this study, all musical examples are intended to test the ability of a subject to perceive a written symbol (either a note or a letter) and to give a verbal or musical response. The items within each subtest do assess the same skill as all other items within that subtest. It must be remembered that each of these tests (A,B,C, and 1) must be measured for reliability for each instrument. This makes a total of twelve tests to be evaluated. None of these tests are interrelated in this procedure; each is evaluated individually.

Using the formula given below, it is possible to determine the difficulty of each item(although each item must measure the same skill, the items may and do differ in difficulty).

Downie[45] gives the following formula for the Kuder-Richardson Formula 20 test of reliability:

$$r_{tt} = \frac{k}{k-1}\left(1 - \frac{\Sigma pq}{s^2}\right)$$

where: k = the number of items on the test

p = the difficulty of each item (percentage of subjects who answered it correctly)

q = 1 - p

pq = p(1-p)

Results of the Reliability Tests

The reliability scores were evaluated using the Kuder-Richardson Formula 20, qielding the results given in Table 1 on the following page.

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[45] Downie, M.M. & Heath, R.W. Basic Statistical Methods. (3rd ed.) New York; Harper & Row, 1970. P.246.

Table 1: Results of the Reliability Tests

Instrument	Test	Reliability
Violin	A	.97
	B	.87
	C	.91
	1	.88
Clarinet	A	.53
	B	.81
	C	.92
	1	.78
Trumpet	A	.75
	B	.96
	C	.91
	1	.88

These figures probably represent the lower end of the scale of reliability for these tests. According to

Downie[46], the reliability of a test increases with the number of subjects tested. Since the sample for these tests is relatively small, the reliability scores are probably underestimating the actual reliability of these tests.

Using the criteria that any reliability score above .70 denotes a reliable test (i.e., 70% of the differences among subjects'scores are due to the variable being tested, and 30% of such differences are due to test error), eleven of the above tests may be said to be reliable. Some are very reliable, having scores in the .90 range. Only one test, Clarinet Test A, appears to be unreliable (about half of the differences in scores is due to test error). The reason for this unreliability is probably due to the narrow range of scores on this test. These scores were; 115,116, 117, 118, 118, 118, 119, 119, 120, 120. The

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[46] Downie, op. cit., p. 246.

mean is 118, which is extremely high considering that the highest possible score is 120. It appears that there was not a sufficient range of scores to make this a true test of the reliability of this particular subtest. The same test given in two alternative forms (Tests B and C), were found to be highly reliable; therefore, this test will be used in this study.

Evaluation of Test Data

Test 1 will be used, along with the questionnaire, to evaluate the effect of experience upon music-reading ability. The test design to be used is the Two-Way Analysis of Variance, Fixed Effects Model. The questionnaire will be used to divide the subjects into six groups, as shown below. The scores from test 1 will function as the dependent variable. This data will be put into a chart like the one in Figure 1.

Figure 1: The ANOVA Design

Instrument	High Experience	Low Experience
Violin	1. 2. 3. 4. 5.	1. 2. 3. 4. 5.
Clarinet	1. 2. 3. 4. 5.	1. 2. 3. 4. 5.
Trumpet	1. 2. 3. 4. 5.	1. 2. 3. 4. 5.

Several criteria must be met in order to use this statistical method. First, it must be assumed that the population tested herein is a sample of a regularly distributed population. Statistically, we may assume that the mean of any sample population approaches the mean of the normal population if the sample size is large, i.e., thirty or above. This study will, therefore, include

thirty subjects to fulfill this statistical assumption. The sample used here may also be assumed to represent the population of third year violin, clarinet, and trumpet players, since it was randomly drawn from several schools, incorporating several grade levels and ages, and several methods of instruction.

It must also be assumed that the error variance must have the same value for all treatment populations (the three types of instruments, and the high and low experience groups). This assumption may be made when all groups have the same number of subjects. In this study, all such groups will have five members. It is also important to note that these two variables are completely crossed and balanced.

The conditions necessary for utilizing the Two-Way Analysis of Variance, Fixed Effects Model, are

described by Hays[47], and met in the following manner:

1. The errors are normally distributed with expectation of zero for each treatment-combination population. This assumption is based on the use of large populations in each cell; in this case, 5.
2. The errors have exactly the same variance for each treatment-combination population. Here, this is satisfied by having equal numbers of subjects in each cell, 5.
3. The errors are independent; both within each treatment-combination and across treatment-combinations. This is satisfied by the statement that the observations made about high and low experience groups were made independently of each other (no subject appeared in both groups),

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[47] Hays, W.L. Statistics. New York: Holt, Rinehart, & Winston, 1963. P. 396.

and the observations made about each instrumental group were independent (no person performed on more than one instrument).

The Analysis of Variance will yield results pertinent to Hypotheses One, Two, and Three:

Hypothesis One: Experience in instrumental music is not directly related to sight-reading ability.

Hypothesis Two: Experience will effect violin, clarinet, and trumpet players equally.

Hypothesis Three: There will be no difference among the six individual instrument-experience groups tested in sight-reading ability.

If any variance is found within these variables, individual U-tests will be performed to find just where this variance occurs.

Hypotheses Four and Five will be tested using two nonparametric tests, the Kendall Coefficient of Concordance, and the Kruskal-Wallis One-Way Analysis of Variance. These tests were chosen, instead of parametric tests, because of their relative strength. The Kendall test will be used to compare students's scores on the three tasks related to sight-reading. If parametric tests had been used for this purpose, three separate tests would have been necessary. If the experimenter were to choose a 0.05 level of confidence for each of these tests, the summed error for all three would be .15. By using one nonparametric test, the level of error will be 0.05. Thus, the Kendall test is stronger than the three t-tests would be. The same rationale lies behind the use of the Kruskal-Wallis technique.

The Kendall Coefficient of Concordance will be used to test Hypothesis Four: Three tasks related to sight-reading

are mutually variable; 1) the ability to perceive and play a musically notated phrase, 2) the ability to perceive and play a typewritten musical phrase, and 3) the ability to perceive and name the notes in a musically notated phrase.

The formula to be used in this test, as given in Siegel is:[48]

$$W = \frac{s}{1/12\ k^2\ (N^3 - N)}$$

where; s = sum of squares of the observed deviations from the mean of R_j.

k = the number of sets of rankings

N = the number of individuals ranked

Since ties in ranks will occur in this study, the following abridged formula will be used whenever ties occur:

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[48] Siegel, S. Non-Parametric Statistics. New York: McGraw-Hill, 1956. Pp. 229-238.

$$W = \frac{S}{1/12\ k^2\ (N^3 - N) - k\sum T}$$

Where: $T = \frac{(t^3 - t)}{12}$

t = the number of observations tied for a given rank.

Once W is found, the significance of this score is found by the following formula which converts the W score into a Chi-square score which has a tabled probability value:

$X^2 = k\ (N-1)\ W$ with N-1 degrees of freedom

A significant X^2 value indicates that the tests being compared are highly concordant. This does not mean that the scores are reliable or accurate, but that they are related to one another. In this study, a significant X^2 value would mean that students' scores on Tests A,B,and C are significantly interrelated.

The Kruskal-Wallis One-Way Analysis of Variance will be used to test Hypothesis Five; Violin, clarinet, and

trumpet players perform equally well on the three tasks given in Hypothesis Four.

This statistical test attempts to determine whether the variations in scores among the different instruments are due to chance factors, or if the three instrumental groups tested represent three distinct populations. The formula, as given by Siegel, is:[49]

$$H = \frac{12}{N(N+1)} \sum_{j=1}^{k} \frac{R_j^2}{n_j} - 3(N+1)$$

Where; k = the number of samples

n_j = the number of cases in each sample

N = the number of cases in all samples combined

Rj = the number of ranks in each column

$\sum_{j=1}^{k}$ = directs one to sum over all k columns

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[49] Siegel, S. Non-Parametric Statistics. New York: McGraw-Hill, 1956. Pp. 184-193.

To correct for ties, the H factor must be divided by the following factor:

$$\frac{1-\sum T}{N^3-N}$$ Where; $T = t^3-t$

t = the number of observations tied for a particular rank.

N = the number of observations in all k samples combined.

The resulting H factor is again looked up in a Chi-square table with k-1 degrees of freedom.

A statistically significant score (.05 or less), leads one to reject the null hypothesis, and to state that the samples actually represent k significantly different populations. In this study, a significant H value would indicate that there is a significant difference between players of the three instruments on the particular skill being tested.

The final evaluative technique to be used was empirical in nature, rather than statistical. The responses on the questionnaire were tabulated for each question and each instrumental group to give some idea of how the three groups compare in experience, and to give some indication of the "typical" experience of third year instrumental students.

CHAPTER IV

RESULTS

A Two-Way Analysis of Variance, Fixed Effects Model, was used to test Hypotheses One, Two, and Three. Table 2 shows the organization of these test data:

Table 2: Raw Data for the ANOVA Test

Instrument	High Experience	Low Experience
Violin		
Mean	110.2	106.6
Clarinet		
Mean	107.0	115.6

Table 2 (cont'd)

Instrument	High Experience	Low Experience
Trumpet		
Mean	112.6	109.2

Figure 2, on page 69, gives the format to be used in presenting the data from the Analysis of Variance technique, as well as the formulas for each sum of square, and the method fro deriving the Mean Square and the F-ratio.[50]

Table 3, on page 71, gives the actual data found by using the ANOVA technique, and the significance level of the F ratios thus found.

Hypothesis One states that: "Experience in instrumental music is not directly related to sight-reading ability". To assess this statement, it is necessary to observe the

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[50] Hays, op. cit., p.402.

Figure 2: Format for the ANOVA Table

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-Ratio
Rows	$\frac{\sum_k (\sum_{ji} Y_{ijk})^2}{Cn} - \frac{(\sum_{jki} Y_{ijk})^2}{N}$	R-1	$\frac{SS_{rows}}{R-1}$	$\frac{MS_{rows}}{MS_{error}}$
Columns	$\frac{\sum_j (\sum_{ki} Y_{ijk})^2}{Rn} - \frac{(\sum_{jki} Y_{ijk})^2}{N}$	C-1	$\frac{SS_{columns}}{C-1}$	$\frac{MS_{columns}}{MS_{error}}$
Interaction	$\frac{\sum_{jk} (\sum_{i} Y_{ijk})^2}{n} - \frac{\sum_{k} (\sum_{ji} Y_{ijk})^2}{Cn} - \frac{\sum_{j} (\sum_{ki} Y_{ijk})^2}{Rn} + \frac{(\sum_{jki} Y_{ijk})^2}{N}$	(R-1)(C-1)	$\frac{SS_{interaction}}{(R-1)(C-1)}$	$\frac{MS_{interaction}}{MS_{error}}$

Figure 2 (cont'd)

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-Ratio
Error	$\sum_{jki}\sum_{ijk}\sum Y^2 - \frac{\sum_{jk}\sum_{i}(\sum_{ijk} Y)^2}{n}$	RC(n-1)	$\frac{SS_{error}}{RC(n-1)}$	_____
Total	$\sum_{jki}\sum_{ijk}\sum Y^2 - \frac{(\sum_{jki}\sum_{ijk}\sum Y)^2}{N}$	RCn-1	_____	_____

Table 3: Results of the Analysis of Variance

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-Ratio
Rows	49.4	2	24.7	0.685 (not significant)
Columns	2.1	1	2.1	0.058 (not significant)
Inter-action	244.1	2	122.05	3.4 (significant at .05)
Error	865.2	24	36.05	

F ratio between columns. This F ratio is 0.058, which is not significant. There is no difference between students with high and low experience scores; both groups scored equally well on the sight-reading test.

To assess Hypothesis Two ("Experience will effect violin, clarinet, and trumpet players equally"), it is necessary to look at the F ratio between rows, which is 0.685. This value is also not significant. Thus, players of the three different instruments do not differ in sight-reading ability as measured by Test 1.

The test for interaction effects (which tests Hypothesis Three; "There will be no difference among the six individual instrument-experience groups tested in sight-reading ability"), proved to be significant at the 0.05 level. This made it necessary to perform additional U-tests between the following sets of data, which yielded the results stated in Table 4:

Table 4: Results of the Mann-Whitney U Tests

Instrumental Groups Compared	Significance Level	
Violin High: Violin Low	.274.	Not significant.
Violin High: Trumpet High	.421.	Not significant.
Violin High: Trumpet Low	.421.	Not significant.
Violin High: Clarinet High	.310.	Not significant.
Violin High: Clarinet Low	.133.	Not significant.
Violin Low: Trumpet High	.093.	Not significant.
Violin Low: Trumpet Low	.274.	Not significant.
Violin Low: CClarinet High	.540.	Not significant.
Violin Low: Clarinet Low	.022.	Significant.
Trumpet High: Trumpet Low	.274.	Not significant.
Trumpet High: Clarinet High	.274.	Not significant.
Trumpet High: Clarinet Low	.111.	Not significant.
Trumpet Low: Clarinet High	.540.	Not significant.
Trumpet Low: Clarinet Low	.028.	Significant.
Clarinet High: Clarinet Low	.062.	Significant.

The U tests show that there are two clearly significant differences in scores; between clarinet players with low experience and violin players with low experience, and between clarinet players with low experience and trumpet players with low experience. There is a third relationship which is very close to the significance level decided upon by the researcher; this is the relationship between the clarinet-high group and the clarinet-low group. Note that in all three cases, it was the clarinet-low group which received the highest scores.

The Kendall Coefficient of Concordance Test was used to test Hypothesis Four; "Three tasks related to sight-reading are mutually variable; 1) the ability to perceive and play a musically notated phrase, 2) the ability to perceive and play a typewritten musical phrase, and 3) the ability to perceive and name the note in a musically

notated phrase." Table 5 illustrates the means for each instrumental group, and Table 6 gives the results of the statistical procedures.

Table 5: Group Mean Scores on Tests A,B,C

Instrument	Test	Mean
Violin	A	108.7
	B	101.5
	C	107.9
Clarinet	A	107.1
	B	84.6
	C	101.9
Trumpet	A	117.1
	B	114.3
	C	112.1

Table 6: Results of the Kendall Coefficient of Concordance

Source of Data	X^2 Value	Significant?
Violin Tests A,B,C	19.17	Yes, at .03
Clarinet Tests A,B,C	15.93	Probably, value lies between .05 abd .10
Trumpet Tests A,B,C	16.47	Yes, very slightly above .05

Tests A,B,and C for each instrument appear to measure abilities that are highly concordant. The violin test of concordance was clearly significant; the trumpet test was extremely close to significance at the 0.05 level, and the clarinet test may well be concordant as well. The unreliability of Clarinet Test A may have had some effect on this test of concordance.

It is important to remember that these results show that students who rank high on one of the subtests will also rank high on the other two subtests; this does not mean that the numerical scores on this three tests are the same- a student may perform better on one test than on the others,

and yet receive the highest ranking on each of the three subtest.

The results of the Kruskal-Wallis One Way Analysis of Variance tests Hypothesis Five: "Violin, clarinet, and trumpet players perform equally well on the three tasks given in Hypothesis Four". Table 7 depicts the mean scores of the three tests for each instrumental group, and Table 8 gives the results of the statistical analysis.

Table 7: Mean Scores of Each Instrumental Group

Test	Instrument	Mean Score
A	Violin	108.7
	Clarinet	117.1
	Trumpet	107.1
B	Violin	101.5
	Clarinet	114.3
	Trumpet	84.6

Table 7 (cont'd)

Test	Instrument	Mean Score
C	Violin	107.9
	Clarinet	112.1
	Trumpet	101.9

Table 8: Results of the Kruskal-Wallis Test

Source of Data	X^2 Value	Significant?
Test A	11.6	Yes, between .01 and .001
Test B	13.4	Yes, near .001
Test C	1.6	No, value lies between .3 and .5

The above data imply that the three instrumental samples do represent three distinct populations for Tests A and B. However, the differences due to chance alone among the scores of the three samples on Test C are between 30 and 50%; thus it is impossible to say that this sample represents three distinct populations in terms of note-naming

abilities.

Eighty-five students answered the questionnaire. Their answers were tabulated, and this information is contained in Appendix F.

CHAPTER V

CONCLUSIONS

Effects of Experience upon Sight-Reading Ability

The results of the Analysis of Variance test, given in Chapter IV, indicate that experience (as defined and measured by the questionnaire) has no effect upon the sight-reading performance of third year violin, clarinet, and trumpet players. There was no significant difference in sight-reading ability among instrumental groups; i.e., violin, clarinet, and trumpet players performed equally well on Test 1. The results of this research do not imply that the time spent in instrumental music instruction does not make students good sight-readers. The results imply, instead, that additional time spent in these activities does not seem to be directly related to the improvement of sight-reading skills. It must be remembered

that all of the students tested performed well on Test 1, and there was little difference in their backgrounds. The experimenter had hoped to test a more diverse group, but the students selected for this study were more homogeneous than had been expected.

There was, however, a significant interaction effect. This necessitated further U tests to find where the variations occurred. This procedure found two significant relationships and one other relationship which was very close to the 0.05 level of significance. Table 9 summarizes these findings.

Table 9: Significant Relationships between Groups

Groups Compared	Significance Level
Violin Low: Clarinet Low	.022
Trumpet Low: Clarinet Low	.028
Clarinet High: Clarinet Low	.062

In all three cases, the players in the Clarinet Low group scored better than their competitors. These results imply that clarinet players with a low level of experience sight-read significantly better than either violin or trumpet players with low experience. The results also imply that clarinet players with a low level of experience sight-read better than clarinet players with more experience. The cause of this phenomenon is not apparent from the data involved in this study. However, some empirical observations made by the experimenter may shed some light on this surprising result. First of all, the band directors whose students were involved in this study commented that this year they had an exceptional number of fine clarinet players in their groups. This abundance of good clarinetists may have caused the poorer clarinet players in each school to drop out of the instrumental music program. Since neither the trumpet nor the violin sections were so well-endowed, the poorer players of those instruments may have

remained in the groups. A second possibility involves the structure of the instruments themselves. It may be that the clarinet, having a spatial arrangement of keys which is similar to the scale in that the player removes fingers going up the scale and adds them progressively coming down the scale, is more easily related to the spatial arrangement of the notes on a page, and that sight-reading on the clarinet is therefore easier than it is on other instruments. Certainly, the violin player has more difficulty in relating the staff to his instrument, and the valve patterns on the trumpet are far removed from the spatial arrangement of the notes. A third possibility is that the results are somewhat due to sex differences. The clarinet players were predominately girls, whereas the trumpet players were mostly boys, and the violin players were mixed.

For whatever reason this difference occurred, it

remains a puzzling phenomenon, and one that certainly merits further investigation.

Figure 3 reiterates the hypotheses tested by the Analysis of Variance technique, and the conclusions which may be drawn from the test results.

Interrelationship of Three Tasks Related to Sight-Reading

The researcher has attempted to identify the relationships which exist among three tasks related to sight-reading:

1. The ability to perceive and play a musically notated phrase.
2. The ability to perceive and play a typewritten musical phrase.
3. The ability to perceive and name the notes in a musically notated phrase.

To assess these relationships, the Kendall Coefficient of Concordance was used. The results of this test imply that the three tasks were significantly related for both

Figure 3: Conclusions Drawn about Hypotheses One, Two, and Three

Hypothesis:	Accepted/Rejected	Conclusions:
I. Experience in instrumental music is not directly related to sight-reading ability.	Accepted	Experience in instrumental music does not appear to play an important role in predicting a student's sight-reading ability.
II. Experience will effect violin, clarinet, and trumpet players equally.	Accepted	Experience does seem to effect players of these three instruments equally.

Figure 3 (cont'd)

Hypothesis:	Accepted/Rejected	Conclusions:
III. There will be no difference among the six individual instrument-experience groups tested in sight-reading ability.	Rejected	There are significant differences between the following groups; Clarinet Low: Clarinet High Clarinet Low: Trumpet Low Clarinet Low: Violin Low

violin and trumpet players (.03 and .05 respectively), and probably related for clarinet players. Since the students' ranks on these three tasks were concordant, it would appear that the skills, themselves, are concordant. It must be remembered, that these results only imply that the students' ranks on the three tasks were related, which is to say, a student who had the top score on Test A, probably ranked very near the top on Tests B and C. This does not mean that the numerical scores on these three tests were the same. So it is theoretically possible that all or some of the students did much better on one particular test than they did on the other two.

The researcher was also interested in the relationship among instrumental players on each of the three subtests (Tests A,B,C); i.e., do players in each of the three instrumental groups perform equally well on Test A, on Test B, on Test C?

To identify and measure the relationship among instrumentalists on each of the tests, the Kruskal-Wallis One-Way Analysis of Variance test was used. The results of this statistical analysis imply that the three instrumental groups represent three distinct populations for both Test A and Test B. This indicates that there are differences among players of the three instruments on tasks one and two which are not due to chance alone, but to population differences. On all three of these tests, clarinet players scored highest, with violin players scoring second highest, and trumpet players receiving the lowest scores. On the first two tasks, this represents a population difference, but the differences among these three groups on the third task (Test C) were largely due to chance (30 to 50% of the difference may be attributed to the chance factor, with the remaining 50 to 70% of the variance being the result of actual population d fferences).

Thus, the three groups did not perform significantly differently on Test C; i.e., all three groups make approximately the same number of errors in naming notes within musically notated phrases.

Figure 4 shows the two hypotheses related to the three sight-reading tasks stated above, and the conclusions which may be drawn from the test results of the Kendall Coefficient of Correlation test and the Kruskal-Wallis One-Way Analysis of Variance test.

Evaluation of Questionnaire Responses

An examination of student responses to the questionnaire reveals the relationships within and among groups that are given in Table 10 on pages 91-92.

There are only three major areas in which these three groups of instrumentalists differ:

1. Age; violinists were approximately one year younger than clarinet and trumpet players, were one grade behind them in school, and had started playing the violin one year earlier than the

Figure 4: Conclusions Drawn about Hypotheses Four and Five

Hypothesis:	Accepted/Rejected	Conclusions
IV. Three tasks related to sight-reading are mutually variable.	Accepted	Students' rankings on these three tasks are concordant; a student who ranks high on one of them, will rank high on the others.
V. Violin, clarinet, and trumpet players perform equally well on the three tasks given in Hypothesis IV.	Accepted for the note-naming task, rejected for the other two tasks.	Clarinet players do best on all 3 tasks, violins are second, and trumpets are last. These differences are due to population differences for tasks one and two; in task 3, it was largely due to chance.

Table 10: Questionnaire Results

1. Clarinet and trumpet players were older and were generally about one grade ahea of violin players.
   21/25 violin players were in 7th grade.
   29/31 clarinet players were in 8th grade.
   24/29 trumpet players were in 8th grade.

   18/25 violin players were under 14.
   0/31 clarinet players were under 14.
   4/29 trumpet players were under 14.

2. Violin players were involved in instrumental music in grades 5,6, and 7. Clarinet and trumpet players were involved in grades 6,7, and 8.

3. Most subjects had no private lessons on their instrument (62/85). Total years of private lessons totalled:

   13 for all violinists
   8 for all clarinetists
   9 for all trumpeters.

4. Slightly more than half of the subjects played no other instruments, 46/85.

   19/25 violinists played one or more instruments.
   9/31 clarinetists played one or more other instruments.
   11/29 trumpeters played one or more other instruments.

5. Total years of playing these other instruments were:

   64 for violin.
   28 for clarinet
   21 for trumpet

6. Clarinet and trumpet players had more experience in summer band programs and music camps than did violinists:

   10 violin players had such experience
   23 clarinet players had such experience
   17 trumpet players had such experience

7. Most of the subjects practiced 15 to 3o minutes per day,61/85. 10 trumpet students spent more time than this, as compared to 3 clarinets and 7 violinists who spent more than 30 minutes per day practicing.

8. About ¼ of the subjects never play for their own enjoyment, 20/85. More than half play 15 minutes per day for their own enjoyment, 46/85.

9. Only 9 of the subjects were involved in any kind of extracurricular musical group (less than 10%).

clarinet and trumpet players had begun playing their instruments.

2. Experience with other instruments; violin players have much more experience with other

instruments, followed by clarinet, and then trumpet players.

3. Summer music programs; clarinet and trumpet players have much more experience in these programs, probably because there are more such programs available for winds than there are for strings.

The instrumentalists, in general, practice 15-30 minutes per day, and about ½ of them spend another 15 minutes per day playing for their own pleasure. It is interesting to note that one-fourth of these students say that they never play for their own pleasure. This is certainly a poor indication of the attitude they have towards their music. It would seem that these students do not enjoy playing their instruments. This leads one to question their motives for joining an instrumental music program. Several factors make play a part here.

First, being in a band or orchestra may be looked upon as a social activity or a status activity. These students are at an age where being part of a group and having status with their peers is very important. This may help to explain why these students are involved in instrumental music. Most of the students tested were also looking forward to high school band - the marching band - which is also a status group. Much of their activity in the junior high school band is geared to preparing them for high school band, and this seems to be a great motivating force at this age.

The experimenter was also surprised to find that less than 10% of these students were involved in extracurricular music activities. In a day when popular music is directed at teenagers, and when being part of such a group is a great status symbol, it is amazing to find that students are not forming their own rock and roll groups. Yet, not one of the students was involved in such a group. The students who were involved in extracurricular music

activities were members of such groups as community bands and orchestras.

Limitations of This Study

It is necessary to note several empirical observations which may have a direct bearing on the results of this study.

The first of these observations is that students who participated in this study were, for the most part, very good readers, and were capable of doing the kind of reading which might be expected of them at this age level. The researcher was surprised at the overall ability of these students not only to read the printed page, but to function well on the task which required the student to read typewritten phrases, and on the note-naming task. Of the sixty students tested, only two or three were totally unable to read the notes which were typewritten, or unable to name the notes. This indicates that instrumental music

teachers, at least in the Lansing area, are doing an outstanding job of teaching music reading.

A second observation, which has been made previously, is that the clarinet students tested were particularly proficient for their age and grade level. This may have made some results appear in this test which will not appear in a duplication of this study.

The third observation which must be made is that the violin students were at a somewhat unfair disadvantage. It was necessary to set some evaluative criteria for judging the correctness of a musical response. The criteria used was that the note played not be more than one semitone from the correct pitch. This meant that a "C" had to sound more like a "C" than a "C#" to be judged correct. Since violin players have a more difficult time playing on pitch, this criteria may have lowered their scores in this study.

Another evaluative judgement may have influenced the scores of trumpet players. Since only the student's first musical response was counted, trumpet players were penalized for blowing the wrong overtone even if the fingering was correct. Both this, and the criteria of pitch were necessary to make some distinction between notes correctly perceived and incorrectly played and those notes that were incorrectly perceived and played as perceived.

The researcher has attempted to set fair criteria for judging the performance of these students, but a truly objective appraisal of their performance is almost impossible. Thus one must accept the results as being a measure of sight-reading ability which is as accurate as is possible given the fallibility of the human performer and the human judge.

It is important to note, also, that the material used in this study was probably too simple for the students

tested. In replicating this study, it would be more advantageous to use students at the second year level, so that a wider range of scores might be obtained.

Summary

In closing, it is well to reiterate the findings of this study and to comment on the direction which further research might take.

It was found that experience in school instrumental music, private instruction, other instruments played, and amount of time spent in playing the instrument did not discriminate between good and poor sight-readers. All read at a similar level.

It was also found that violin, clarinet, and trumpet players read equally well, with the one exception that clarinet players with low experience tended to sight-read better than trumpet or violin players with low experience and better than other clarinet players who had more experience.

Students who performed well on any one of the following tasks related to sight-reading did well on the other two (and students who did poorly on one, did poorly on the other two):

1. The ability to perceive and play a musically notated phrase.

2. The ability to perceive and play a typewritten musical phrase.

3. The ability to perceive and name the notes in a musically notated phrase.

On all three of the above tasks, clarinet players performed best, with violin players being second best, and trumpet players being the worst. On tasks one and two, this represented a true population difference. The differences on task three were largely due to chance factors.

Thus it would appear that third year clarinet players do an overall better job of sight-reading than do violin and trumpet players of the same age. This may be the

result of having an abundance of clarinet players, the poorest of whom drop out by the third year. Or it may be attributable to the fact that the majority of clarinet players were girls, whereas the violin players included both boys and girls, and the trumpet players were mostly boys.

It is evident that this study is only a beginning look into the complicated and confusing issue of music reading. It tells only a small portion of the story and more research into the other facets of music reading is needed. It is hoped that the methods and results of this study may be of assistance to those who wish to further investigate these phenomena.

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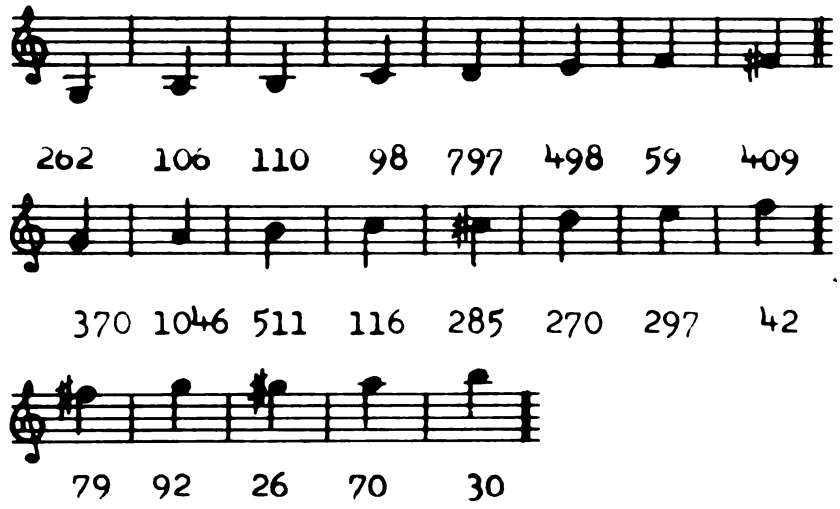
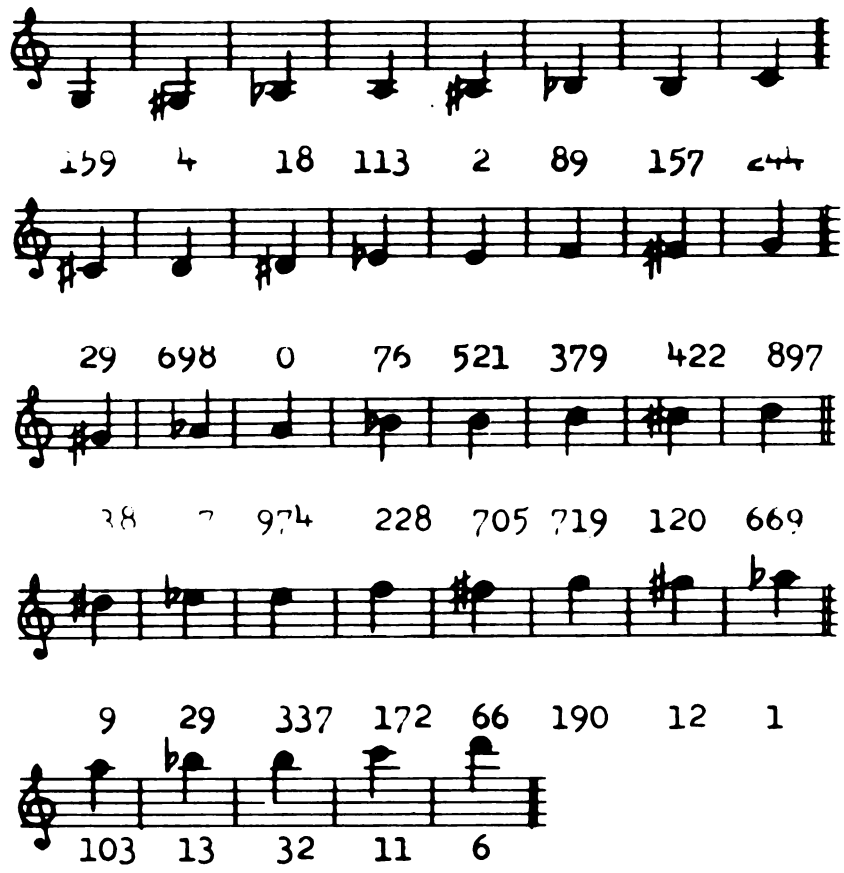
APPENDIX A

APPENDIX A - MEAN FREQUENCY OF NOTES

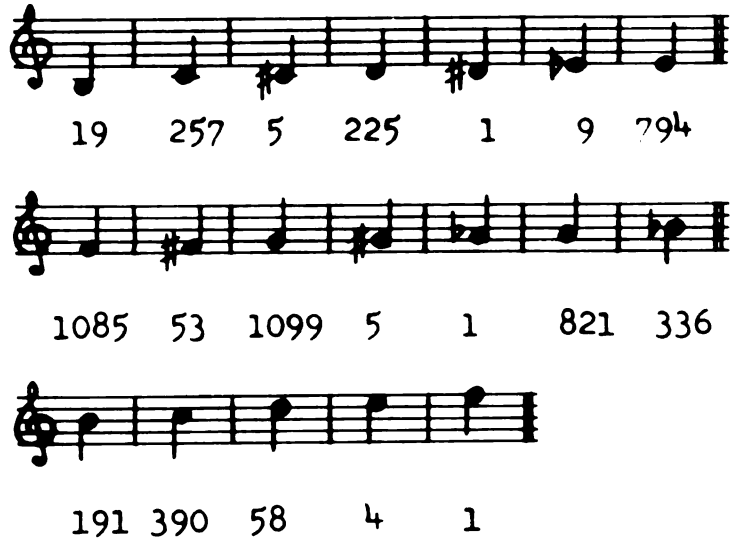
Violin: Level I



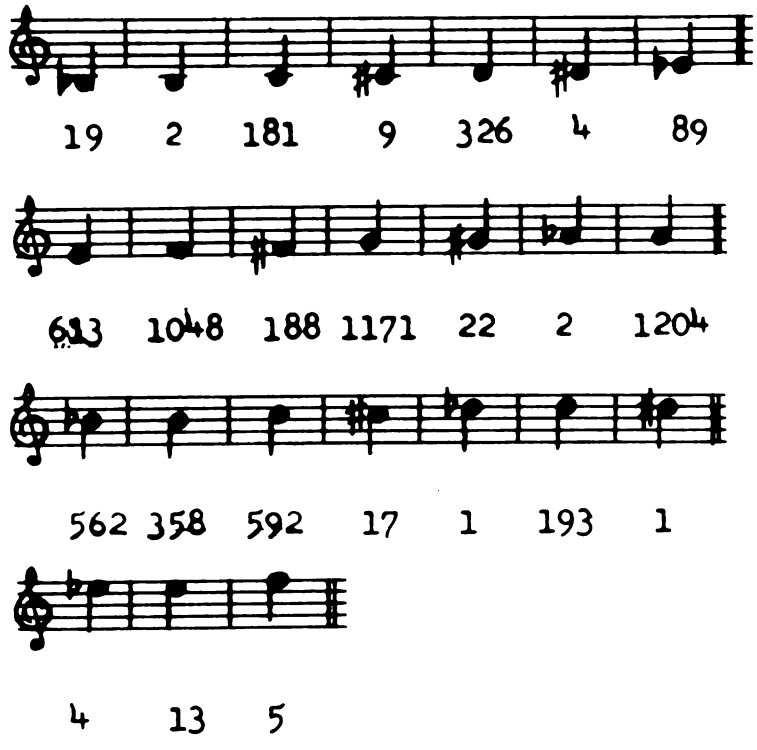
Violin: Level II



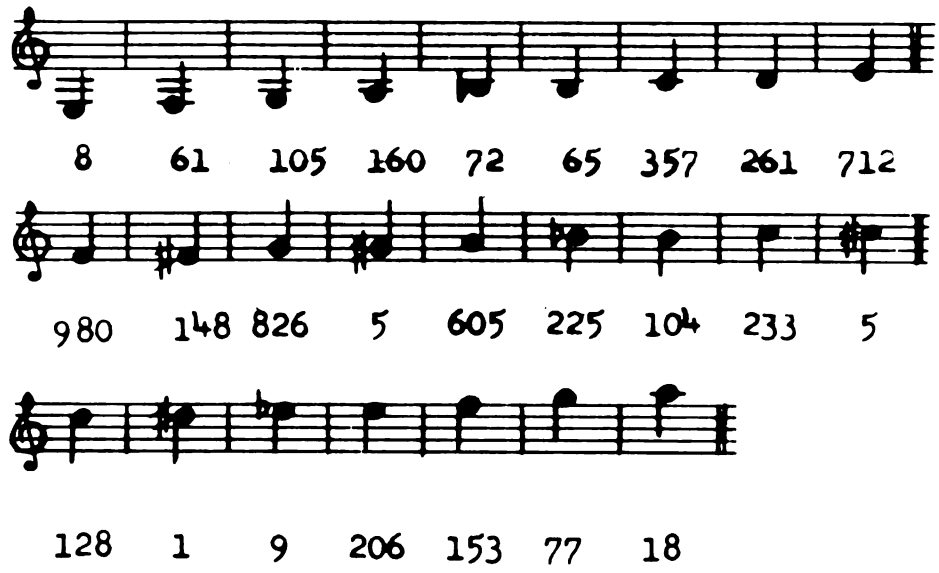
Trumpet:Level I



Trumpet: Level II



Clarinet: Level I



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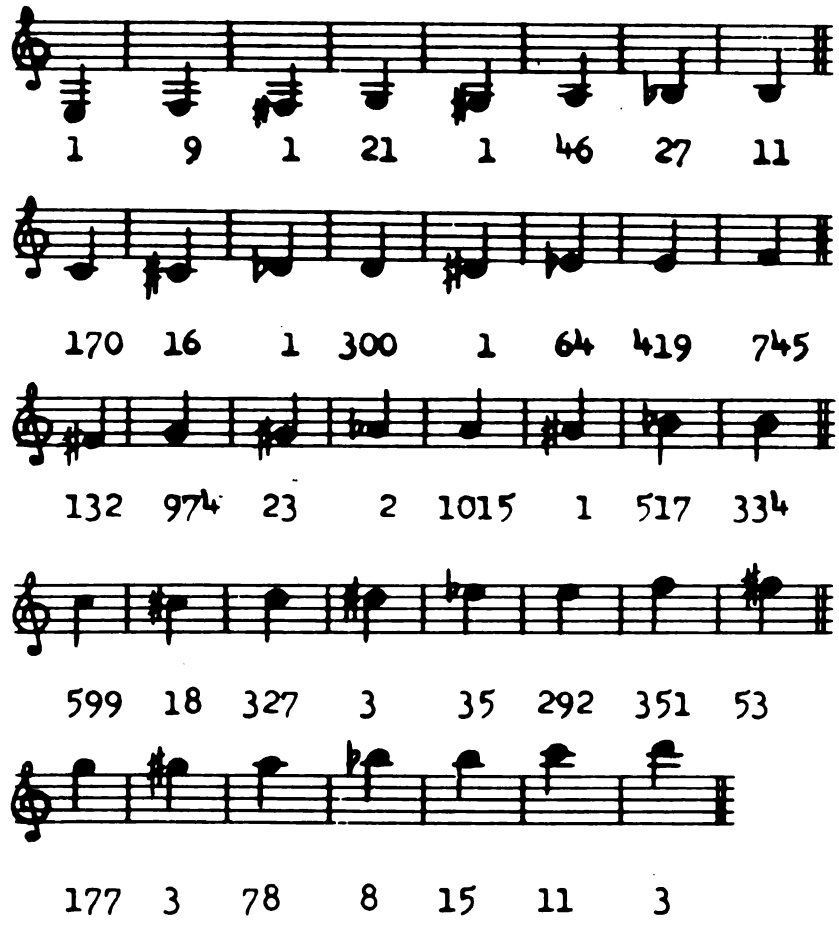
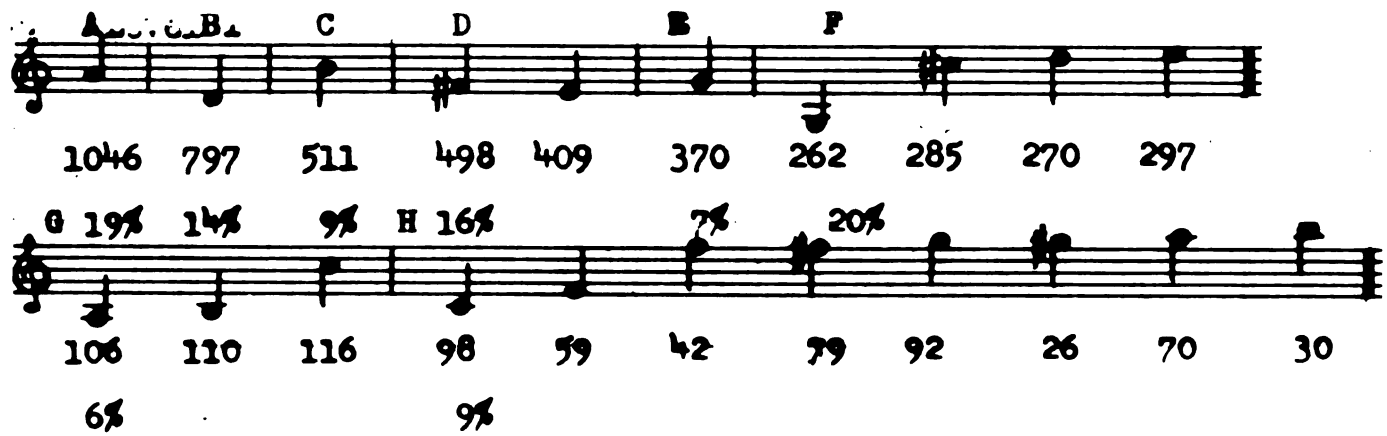


APPENDIX B

APPENDIX B _ GROUPINGS AND PERCENTAGES OF NOTES

Violin: Level I



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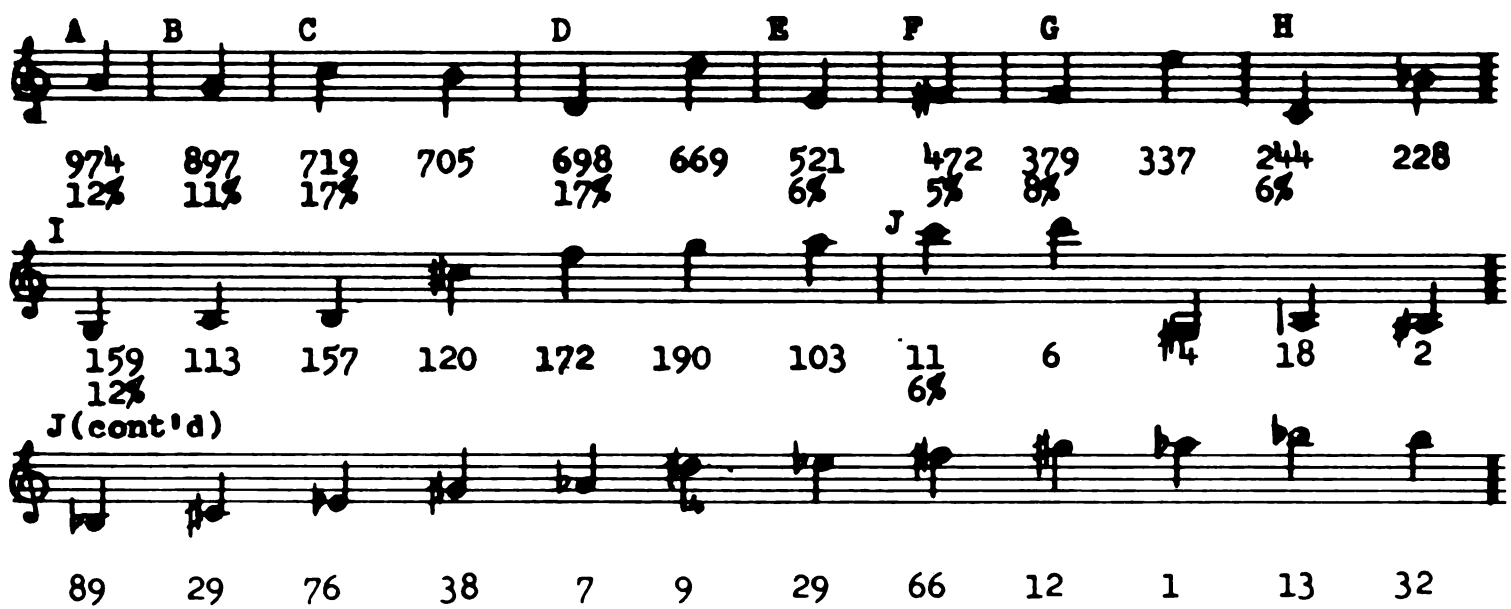
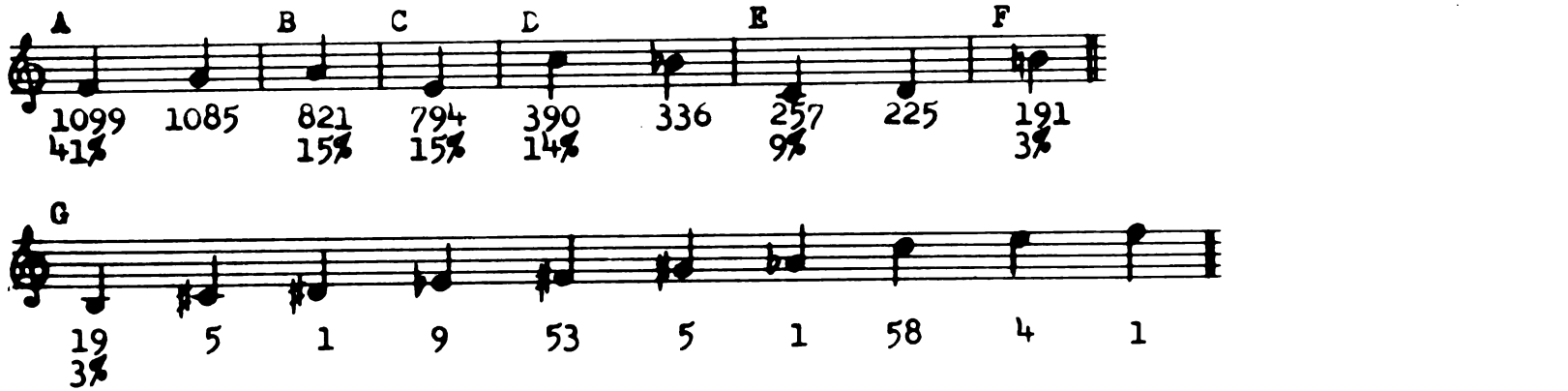
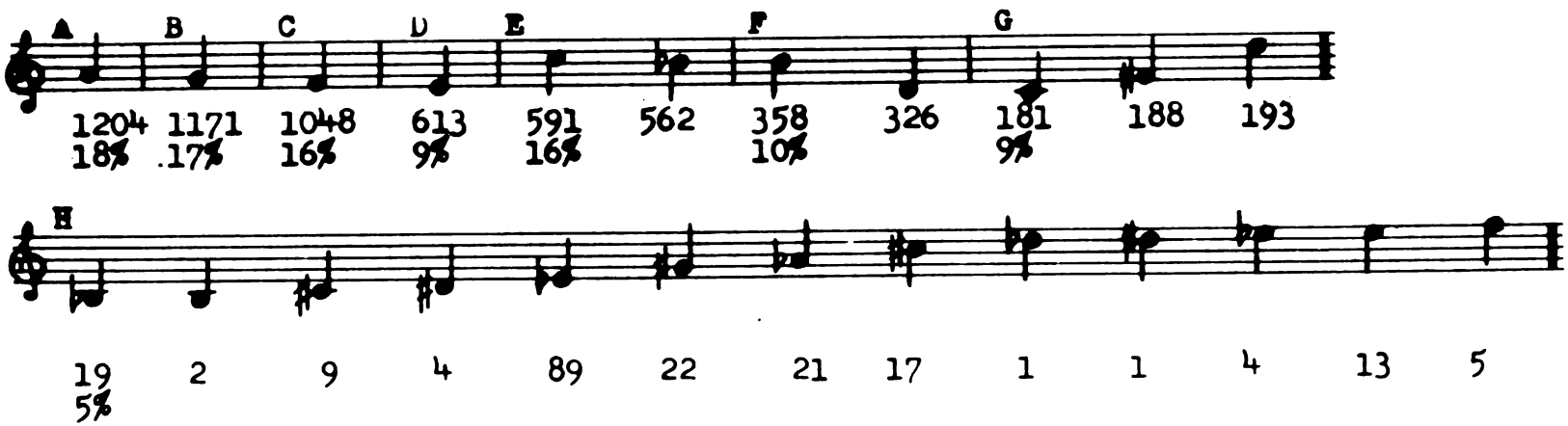


Trumpet:Level I



Trumpet: Level II



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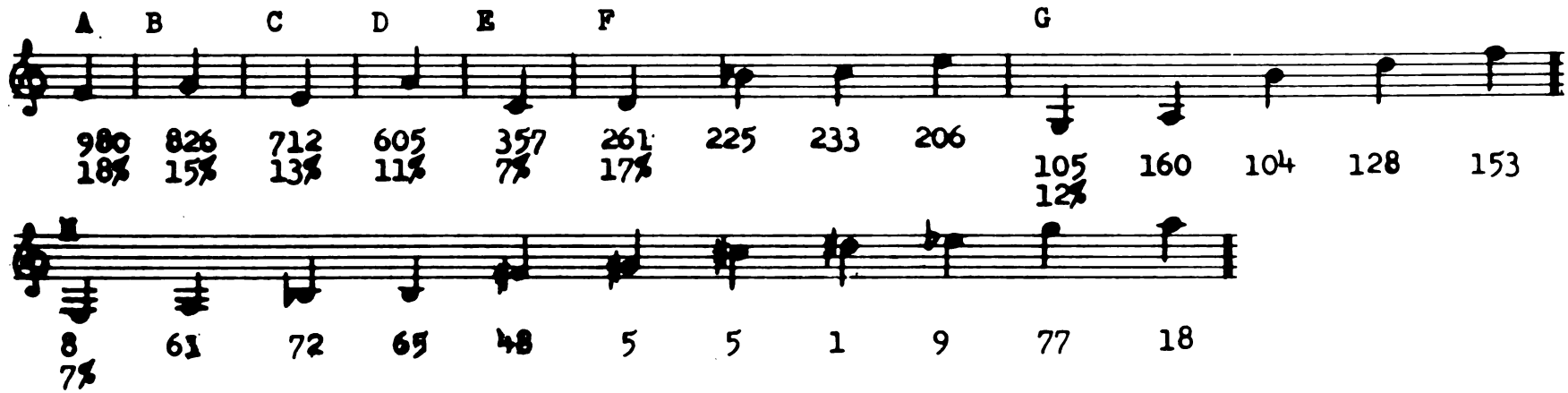

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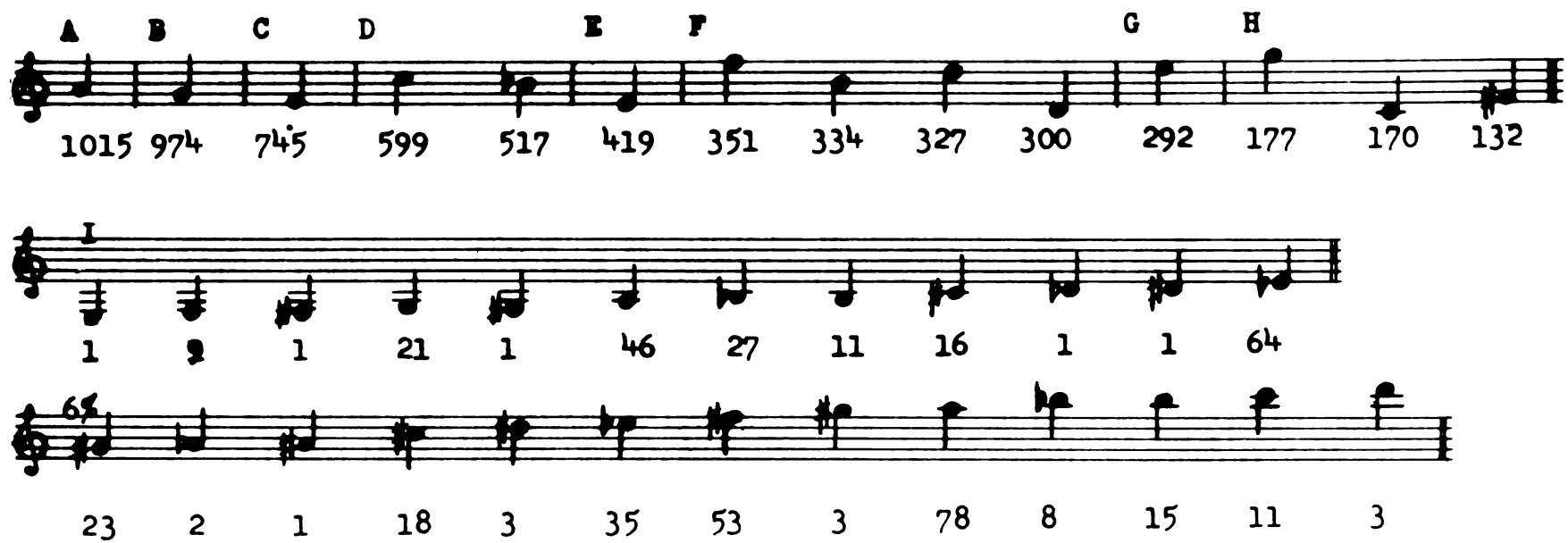

APPENDIX C

APPENDIX C - TESTING DEVICES

Violin Test 1

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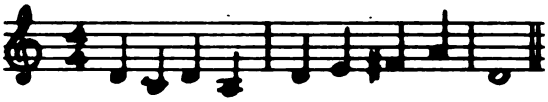
6. 

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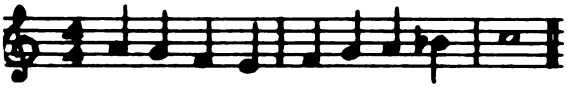
8. 

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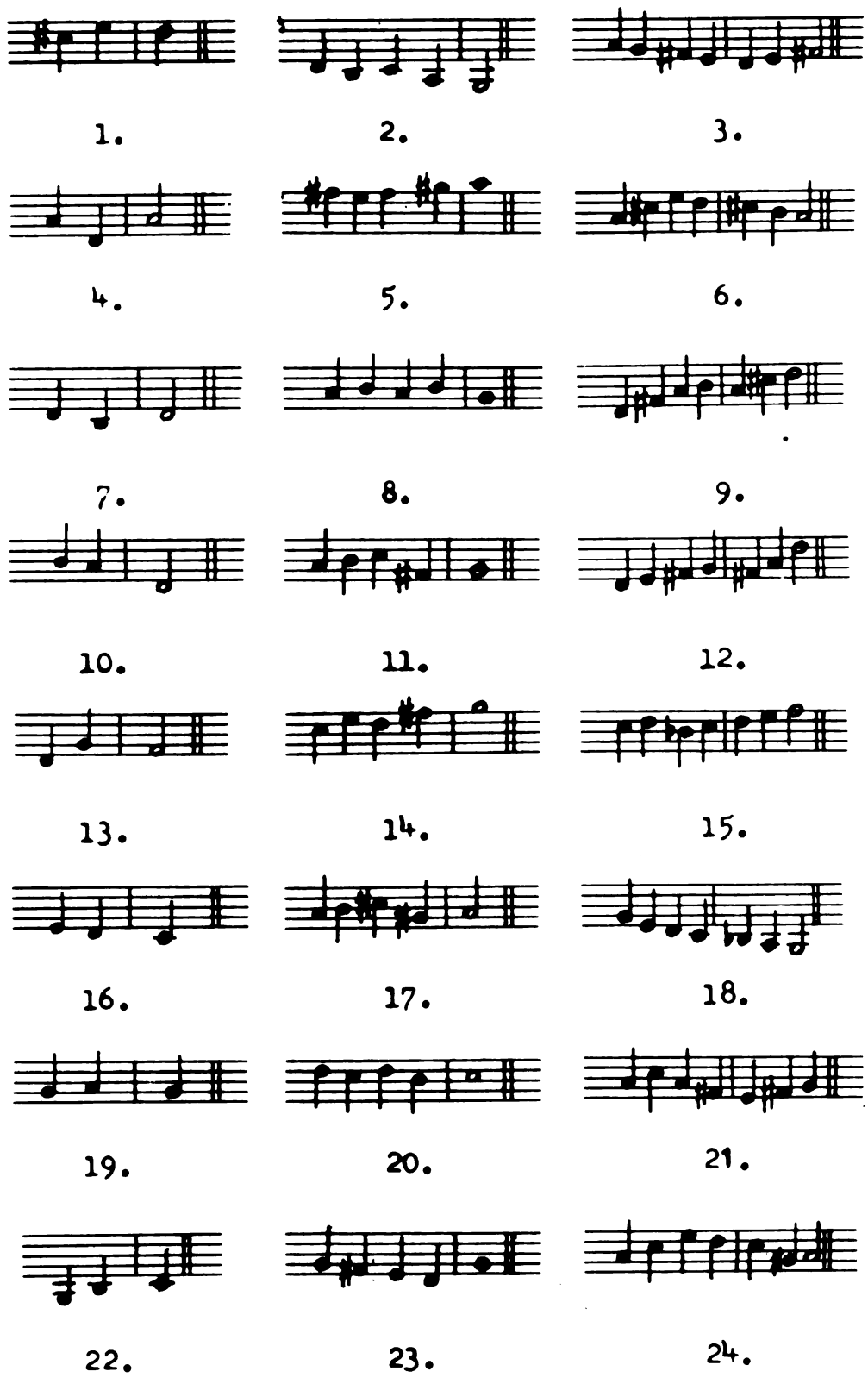
Violin Tests A,B,C



Trumpet Test 1

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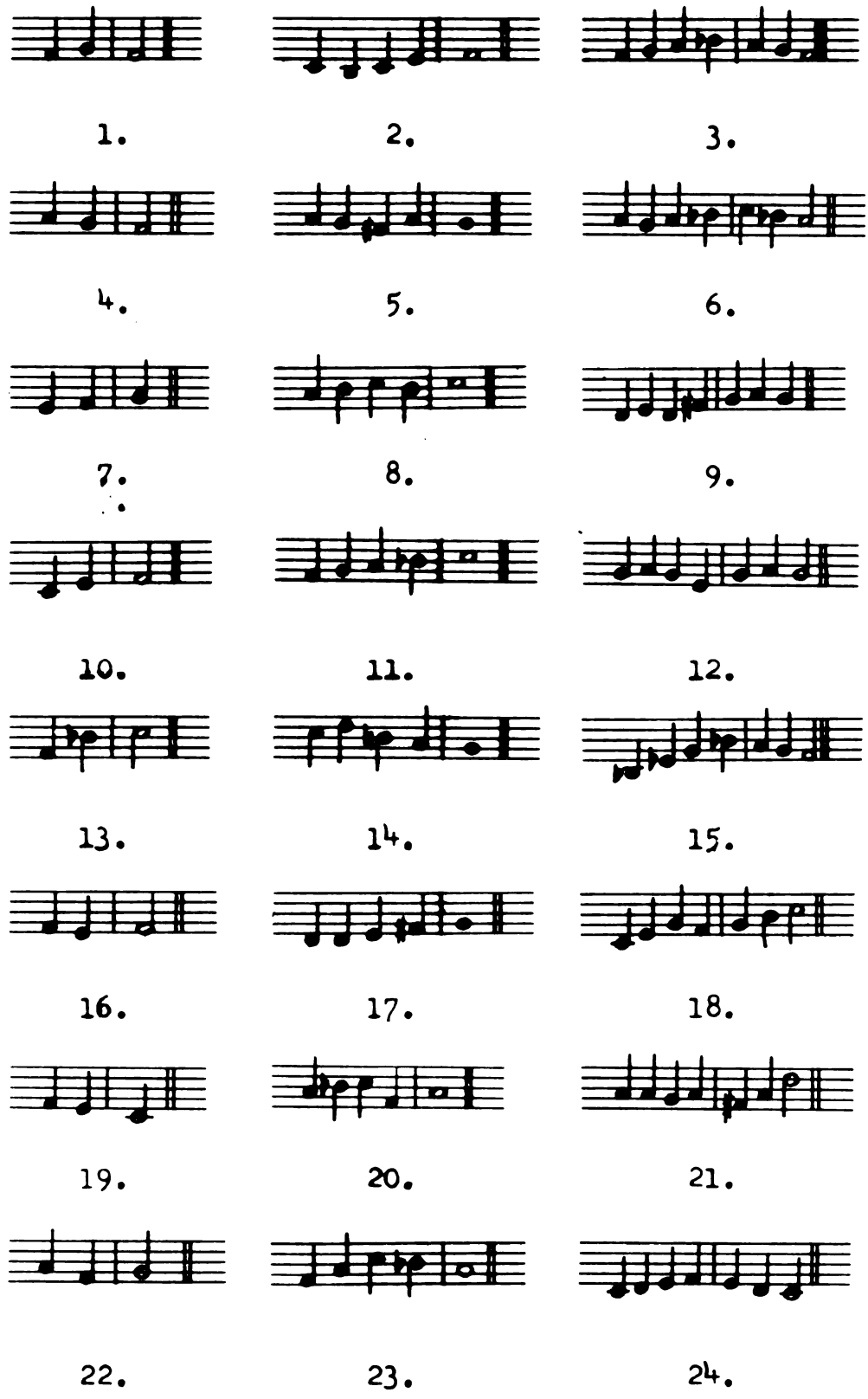
Trumpet Tests A,B,C



Clarinet Test 1

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Clarinet Tests A,B,C

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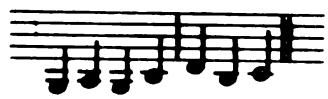

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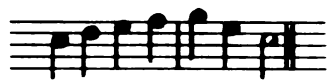

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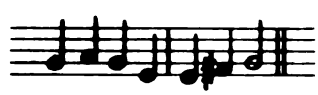

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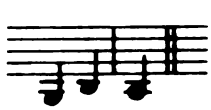

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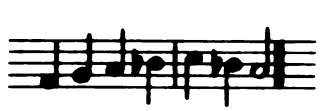

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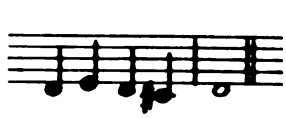

23.

24.

APPENDIX D

APPENDIX D

ORDER OF PRESENTATION - ALL INSTRUMENTS

Test A	Test B	Test C
1. 7	1. 9	1. 24
2. 6	2. 13	2. 23
3. 15	3. 24	3. 8
4. 20	4. 1	4. 15
5. 8	5. 14	5. 12
6. 16	6. 18	6. 1
7. 5	7. 4	7. 2
8. 11	8. 10	8. 10
9. 4	9. 2	9. 21
10. 1	10. 21	10. 6
11. 22	11. 16	11. 19
12. 17	12. 20	12. 7

Test A	Test B	Test C
13. 24	13. 7	13. 11
14. 10	14. 17	14. 22
15. 12	15. 12	15. 20
16. 13	16. 22	16. 3
17. 9	17. 3	17. 9
18. 14	18. 19	18. 4
19. 21	19. 15	19. 17
20. 19	20. 5	20. 18
21. 18	21. 23	21. 5
22. 2	22. 6	22. 14
23. 23	23. 11	23. 16
24. 3	24. 8	24. 13

APPENDIX E

APPENDIX E

QUESTIONNAIRE

1. Name_____

2. School_____

3. Instrument_____

4. School Grade 5th (2), 6th(4), 7th(6), 8th(8), 9th(10)

5. Date of Birth 12(2), 12½(3), 13(4), 13½(5), 14(6), etc.

6. In which of the following grades were you a member of the school band, orchestra, or instrumental music class? (2 points per year)

4th grade_____ 7th grade_____

5th grade_____ 8th grade_____

6th grade_____ 9th grade_____

7. In which of the following grades did you take private lessons on this instrument? (2 points per year, one per summer)

4th grade_____ Summer after 4th grade_____

5th grade_____ Summer after 5th grade_____

6th grade_____ Summer after 6th grade_____

7th grade_____ Summer after 7th grade_____

8th grade_____Summer after 8th grade_____

9th grade_____

8. List the other instruments you play: (2 points per instrument, 2 per year of lessons)

Instrument: Years Played:

_____

_____

_____

_____

9. How many times have you gone to a summer music camp or played in a summer band ?

Never (0) Once (2)

Twice (4) Three or More times (6)

10. How many minutes per day do you usually spend practicing your music lessons (total for all instruments played) ?

None (0) 45 Min. (6)

15 Min (2) 1 Hour (8)

30 Min (4) More than 1 Hr (10)

11. How many minutes per day do you spend playing for your own pleasure (count all the time you spend playing all instruments except practice time) ?

None (0) 45 Min (6)

15 Min (2) 1 Hour (8)

30 Min (4) More than 1 Hr (10)

12. Have you ever belonged to any instrumental groups outside of school ? If so, please check the type of group to which you belong(ed): (2 points for each)

Dance or Rock Band_____

Community Band_____

Community Orchestra_____

Other_____

APPENDIX F

APPENDIX F

QUESTIONNAIRE RESPONSES

Question:	Violin	Trumpet	Clarinet	Total
4. Grade				
7th	21	2	0	23
8th	1	24	29	54
9th	3	2	3	8
5. Age				
12-12½	4	2	0	6
13-13½	14	2	0	16
14-14½	3	14	22	39
15-15½	3	10	9	22
16	1	1	0	2
6. Instrumental Music				
4th	0	2	2	4
5th	23	10	9	42

Question:	Violin	Trumpet	Clarinet	Total
6.(cont'd)				
6th	22	29	31	82
7th	25	26	31	82
8th	4	26	31	61
9th	3	3	2	8
7. Private Lessons				
None	16	23	23	62
1 Sum.	3	2	1	6
2 Sum.	0	0	1	1
1 Yr.	2	1	5	8
1 Yr.,1 Sum.	1	1	1	3
2 Yrs.	1	1	0	2
2 Yrs.,1 Sum.	0	0	0	0
2 Yrs., 2 Sum,	1	0	0	1
3 Yrs.	1	0	0	0
3 Yrs. 1 Sum.	0	1	0	1

Question:	Violin	Trumpet	Clarinet	Total
8. Other Instruments				
None	6	18	22	62
One	15	7	4	26
Two	0	2	3	5
Three	3	1	2	6
Four	1	0	0	1
Five	0	1	0	1
9. Years/Other Instruments				
None	11	23	25	59
One	2	0	1	3
Two	1	2	1	4
Three	3	2	2	7
Four	3	1	0	4
Five or More	5	1	2	8

Question:	Violin	Trumpet		Clarinet	Total
9. Summer Music					
Never	23	12		8	43
Once	2	11		11	24
Twice	0	4		8	12
Three, More	0	2		4	6
10. Practice Time					
None	3	0		1	4
15 Min.	7	10		12	29
30 Min.	8	9		15	32
45 Min.	5	1		1	7
1 Hr.	2	7		0	9
More	0	2		2	4
11. Playing Time					
None	7	8		5	20
15 Min.	12	15	19	19	46
30 Min.	2	4		5	11
45 Min.	0	1		0	1
1 Hr.	1	0		1	2

Question:	Violin	Trumpet	Clarinet	Total
11. Playing (cont'd)				
More	3	1	1	5
12. Outside Groups				
	3	4	2	9