DETERMINING COMPONENTS OF EFFECTIVE INSTRUCTION IN BEGINNING AND INTERMEDIATE INSTRUMENTAL MUSIC BY THE USE OF TESTS AND THE TEACHING OF MUSIC MATERIALS

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CHAPTER I

INTRODUCTION

In academic education a thorough-going testing program has been used to indicate basic differences among students. However, in music education there has been no such comprehensive testing program to reveal the pupil's various native musical capacities or to assist the music educator in instructing each pupil according to his need. It was the lack of a comprehensive testing program, the feeling that the music program needed more emphasis on testing to determine the materials and methods to be used, that led to the selection of the problem for this investigation.

Statement of Problem

It has been felt that a comprehensive study of the values of testing in music would offer invaluable assistance to the music educator. The problem of the present study has been to determine through the study of a method of instruction based on musical aptitude tests, progressive musical concepts, and materials fitted to these concepts. This study then has been primarily an attempt to formulate a set of instructional guides for basic instrumental music. There has long been a need for the incorporation of testing, materials adapted to the needs of the student as revealed by the tests, and procedures which a teacher could use to adjust his methods to the needs and materials.

Procedures

In proceeding with the investigation, the answers to several questions seemed necessary. The four questions asked were:

1. What is the part of music in the general educational curriculum, in regard to testing, instructional materials and methods of instruction?

2. What relevant background factors of the music testing program and selection of instructional materials are needed?

3. What part could testing take in the selection of materials used in instruction?

4. What are the results that are to be placed in the hands of instructors.

To answer these questions the writer used the following procedures in conducting the investigation.

1. The part of music in the curriculum was determined through a review of literature in the areas of testing, instructional materials and teaching methods.

2. The relevant background factors were determined through experimentation in the use and construction of musical tests. A music materials questionnaire which was sent to music educators throughout this country and an experimental group of students was selected from the Bozeman Public School System.

3. Through experimental teaching and forecasting each pupil's progress, the part that testing could take in the

selection of materials was determined.

4. The results to be placed in the hands of instructors was determined through correlation of the tests used and the experimental teaching of the student groups.

Limitations of Study

1. Only a limited number of students could be taken out of classes to be used for the testing program and experimental teaching. A larger sampling of students would have increased the validity.

2. Had the tests been run during two or three school years the reliability of the tests would have been determined and a greater number of materials could have been tried. This experiment had to be limited too because of time and expense.

3. Certain materials such as the simple electric counter were used in place of a complex electric counter and the rubber band was used in place of a metal spring because they were either unobtainable or too expensive.

4. There was the feeling that had the writer more teaching experience in the field, the program would have run more smoothly.

5. Test building materials were of the best grade due to the expense involved and the difficulty of obtaining such materials.

The first step in procedures was to examine literature. A survey of the literature is in Chapter II.

CHAPTER II

REVIEW OF LITERATURE ON THE PART OF MUSIC IN THE CURRICULUM

The literature was reviewed to determine the part of music in general education. The three areas; the testing program, instructional materials and methods of instruction; were thought to be essential in relating music to the curriculum.

The Testing Program in The Curriculum

The purpose of any test, according to Risk,[1] is to derive and to ascertain: "what learning products have been attained, to determine what progress has been made toward the attainment of other learning products, to discover what skill has been gained in the use of learning products, and to discover what difficulties the learner is encountering in his learnings."[2] The tests selected for this investigation were pointed in that direction. These tests were used to find (1) if the child is ready for music and the degree of readiness, so that the music educator could forecast the success of the pupil, (2) if exercise or practice would develop the student's capacity toward learning and thus direct the student into the proper selection of musical instrument, (3) if the student had achieved. It was also felt that the type of music materials

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[1] Thomas M. Risk, Principles and Practices of Teaching in Secondary Schools, p. 365.

[2] Ibid., p. 365.

selected would play an important role.

The Importance of Instructional Music Materials and Concepts

The purpose of appropriate music materials is to aid a child's development towards maturity. This purpose has been clearly brought out by Brooks and Brown:

> Music materials must take account of the fact that children undergo a process of development which makes it desirable to have an organized sequence in music education throughout their entire school careers. The music sequence must be so constructed that in the transformation of the pupil, as he matures in the growth process occurring through the school years, each present degree of maturity grows out of the immediately preceding experience. His musical growth, therefore, becomes a continous process of development. Thus one music educator has ably and sincerely characterized the necessary materials which must be a living part of the new music education throughout the world.[3]

If sequence is so important to maturity development one must believe that the proper selection of the materials is of the utmost basic importance in a child's learning procedure. This means that each set of materials for each learning level must have the most careful evaluation before its selection. Appropriate materials were used to insure good concept development.

The formation of concepts must adhere to certain principles and, therefore, general education concept formation would not seem to be different from the formation of musical concepts. The meaning of the word, as referred to in this study is that it is a mental image. This meaning has been given by Risk:

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[3] B. Marian Brooks and Harry A. Brown, Music Education in the Elementary School, p. 303.

> The term concept is used to mean a mental impression that represents general or abstract ideas rather than particular or material things. Concepts thus may refer to either general ideas of qualities. New concepts are built in terms of old concepts, ideas, and meanings, and meanings come to be expressed in terms of ideas and concepts. Thus the three terms, for all practical purposes, may be used synonymously.[4]

The idea of concept and the characteristics of learning in concept development are basic considerations in determining the guiding music principles, which according to Risk are:

> 1. The acquisition of knowledge (understandings) is a gradual growth and is evolutionary in character.
>
> 2. In acquiring understanding, progress is from sense experience with concrete things to the more complex experiences involving abstract relationships.
>
> 3. In perceptual learning the parts are interpreted in terms of the whole; that is, the whole conditions the meaning of the parts.
>
> 4. There is an essential sequence in the development of many kinds of concepts. Fundamental concepts must be mastered first.
>
> 5. The learning processes are of like character throughout the elementary and secondary school levels, but they necessarily differ in complexity at different levels because of differences in the mental maturity of the learners.
>
> 6. Learning experiences at different grade levels should be adapted to the maturity of the learners.
>
> 7. Learning experiences should be adapted to the individuality of the learner, especially with reference to the rate of learning ability.[5]

The test results and the materials selected would have had no meaning if they had not been used. Therefore, teaching a group of students was an essential part of this study.

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[4] Risk, op. cit., pp. 171-172.

[5] Ibid., p. 173.

Value in Teaching

The educational tasks of motivating children and planning desirable learning activities point toward the teacher as the person to integrate and to use appropriate tests and materials. Lamb has pointed them out as the principal tasks of the teacher:

> The principal tasks of the teacher are (1) so to influence youngsters that they are eager to master the work at hand; and (2) to plan and conduct learning activities so that children learn what they are supposed to learn in ways that promote social adjustment. The teacher who fulfills these responsibilities provides an emotionally secure atmosphere for learning; he helps pupils instead of judging them; and he holds them to good daily work habits.[6]

The approach to teaching, of the type shown by Lamb, gives a new teacher the chance to study the tasks at hand and also gives the opportunity to try new ideas, philosophies, and materials on eager young minds. The teacher is given the opportunity to discover what teaching really entails.

The curriculum has been considered as the "whole experience" of the school created environment. Gruhn and Douglass pointed this out very clearly in the statement:

> The curriculum is coming to be thought of as consisting of the total controlled environment created under the direction of the school, for the purpose of stimulating, influencing, and contributing to the wholesome growth and development of boys and girls.[7]

It is imperative that the music teacher use the ideas of

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[6] Marion M. Lamb, Your First Year of Teaching, p. 112.

[7] William T. Gruhn and Harl R. Douglass, The Modern Junior High School, p. 61.

accepted purposes of teaching and the view of the curriculum as the pupil's total school experience. Morgan and Morgan have stressed this:

> The secret of interest in most music activities has its roots in the theory of contagion. If you are genuinely pleased, radiant, enthusiastic, and interested in music and the development of students through music, this will be caught by all with whom you come in contact. Secondary school students think they are adults, and in many respects are very mature. It is wise to give each student the idea that you regard them as individuals who are very worth while and who have at least the potentials to contribute to fruitfulness and pleasure.[8]

The part the teacher should play in this integrated program has been brought out clearly by Morgan and Morgan in the statement: "Be assured that no device, mechanical or otherwise, will replace either the studio or classroom music teacher. However, successful and effective school music teachers will need additional training and, in some areas, a different kind of training."[9]

Summary

Reports in literature have shown that in the three areas; testing, selecting materials and teaching methods; education and music have the same general principles and needs. The integration of music and education was clearly indicated.

The studies have shown that there is an accepted basic approach to music instruction and that testing in diagnosis is desirable. The factors involved in testing are presented in Chapter III.

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[8] Russel Van Dyke Morgan and Hazel Nohavec Morgan, Music Education in Action, p. 94.

[9] Ibid., p. 4.

CHAPTER III

RELEVANT BACKGROUND FACTORS OF MUSIC TESTING AND SELECTION OF INSTRUCTIONAL MATERIALS

Before the investigation could proceed, certain background factors of musical testing had to be determined. Such factors as (1) test construction and use, (2) the procurement of materials, (3) the selection of experimental groups of pupils, and (4) the selection of the basic concepts to be developed at the various levels, had to be worked out before any application of testing or teaching could be accomplished.

Use And Construction of Tests

Tests Used To Determine Musical Ear. From the already popular and functional Seashore Musical Aptitude tests, three separate tests were chosen which seemed basic to any musical testing program. These tests were for pitch, rhythm discrimination, and tonal memory. They could be given to a large group of pupils at one time. They were selected because of their value in measuring specific talents required of a musical student and because they showed areas a director must stress in aiding the pupil. The pitch test, for example, was used to determine how well the pupil could discriminate between slight differences in pitches. The rhythm test was used to see how well the pupil was able to discriminate between two differing rhythms. The tonal memory test determined how well the pupil could associate one set of tones with another by pointing out any differing tones in pairs of tonal

patterns. This was the first half of the testing program.

Testing for Basic Motor Skills. An analysis of the requisite motor skills was deemed necessary as the other half of the pre-testing program. The three areas that were selected were motility, precision, and reaction speed. Each test had to be given one at a time to each child.

These three areas were chosen because they were the most basic of motor skills and, in turn, could aid an educator in the knowledge of the pupil's coordination and muscular dexterity.

The motility test was used to determine the speed of the finger and forearm coordination. The precision test was used to determine the exactness and speed with which a child worked. The reaction speed test was used to determine how fast the reflex action was between the eye and the muscles of the arm and fingers.

Appendix A contains diagrams and instructions for giving these tests which were self-designed and constructed with the aid of Mr. Creech Reynolds, Assistant Professor of Music at Montana State College.

Construction of Motor Skill Tests. Much thought was given to these tests before construction was ever attempted. Great care was taken so that they would be applicable to the motor skills, hence the selection of the motility, precision and reaction speed tests.

The motility test was patterned, in part, after that much used "Minnesota Manipulation Test" in that it was a check on dexterity. The materials used in building this test were:

1. A wooden platform twelve inches square.

2. A piece of copper plate three inches b four inches.

3. A transformer.

4. An electric counter.

5. Some heavy copper wire for a stylus.

6. Copper wire for the connections.

The copper plate was attached to the wooden platform with screws in such a way that a corner was turned upward so that the copper wire could be connected to it. The transformer was attached securely in one corner of the platform and the copper wire from it was connected with the copper plate to form one-half of the circuit. The other half of the circuit consisted of the heavy copper wire stylus attached to the electric counter and then to the transformer by means of the lighter copper connection wire. When the transformer was connected to an electric outlet, any tap of the copper stylus on the copper plate produced a closed circuit that would record the tap on the electric counter.

The maximum score for the motility test was arbitrarily set at 100 taps per 15 seconds which was reinterpretated on a maximum scale of ten so that all test results would be on a scale of ten to zero. In this way quick comparisons could be made.

The test for precision was devised with the aid of Mr. Reynolds. The materials used to construct this test were as follows:

1. A piece of wood, thirty inches long, six inches wide, and one-half inch thick, to form the base.

2. Another piece of wood, eight inches wide, four inches long, and one-half inch thick, to form the end piece.

3. A wood stand, four inches long by four inches wide and one-half inch thick, placed on end to form a fulcrum.

4. Three-eights inch wooden dowel, thirty inches long.

5. A transformer.

6. An electric counter.

7. Copper wire for stylus and for connections.

8. A metal spring.

The end piece was nailed to one end of the base so that there was an inch overlap along the side of the base. The fulcrum was nailed at the opposite end of the base four inches from the end. A hole was drilled four inches from one end, through the dowel which was attached to the fulcrum in a semi-moveable position. The copper stylii were attached to each corner of the end piece. Copper wire was attached to these and to the transformer. Another stylus was attached to the dowling tip. It was long enough to touch each of the two stylii on the end piece as the dowel was rotated from one side of the end piece to the other. The stylus on the dowel was then extended in the opposite direction, by means of the copper wire, to the electric counter. This, in turn, ran to the transformer. When connected to an electrical outlet, the dowel was swung from one end piece stylus to the other. Each time the dowel stylus made contact with an end piece stylus, the electric counter recorded it. The arbitrary

maximum score for this test was 30 contacts in a 15 second span. This score, in turn, was reinterpreted on a ten point maximum scale.

The reaction speed test was self-devised. The materials used for its construction were as follows:

1. A soft wood base thirty six inches by eight inches by one-half inch.

2. Three wood hinges.

3. Two one-fourth inch pieces of metal dowel, thirty inches long.

4. Thirty one pieces of tin sheeting material four inches wide and one inch high.

5. Three drum supports.

6. Two boards twenty-five inches long, six inches wide, and one-half inch thick.

7. Soldering material.

8. A small steel ball, one-half inch in diameter.

One-fourth inch holes were drilled through each tin sheet in the upper left and lower right hand corners and a piece of metal dowel was run through all the upper left hand holes while another piece was run through all the lower right hand holes. Each piece of tin was measured, put in its proper place, and then soldered. This was how the teeth were made and fastened into a place. A shallow straight runway was grooved in the soft wood by means of a knife and the teeth were set and secured to the soft wood by means of the drum supports. Thus the teeth would open and shut like the jaw of an animal. The other two pieces of wood were

hinged to the base or runway to form a right triangle. The runway was at a forty-five degree angle. The teeth were so spaced so that six inches remained at the upper end so that the "testees" would have ample warning of the approaching ball when it was released. The teeth were spaced in order from the top with six two-inch gaps, twelve one-inch gaps, and twelve one-half inch gaps. A brace of wood, one-half inch by one-half inch by two inches was placed beneath the teeth to open them. When the brace was released, the teeth would shut thus stopping the moving ball in one of the gaps. There were 30 gaps in the 30 inches of teeth. These gaps became progressively smaller as the ball moved faster. The arbitrary maximum score was thirty points which was also reinterpreted on a ten point maximum scale.

Uses Made of All of the Musical Tests. These six tests were given to a group of nineteen pupils from the Irving Grade School and the Emerson Junior High School. These pupils were suggested by Mr. A. L. Harstad, Instrumental Music Supervisor for the City of Bozeman, Montana, who merely gave the writer the names of the pupils who would be assembled at a scheduled time. The grade level of the students ranged from the fourth to the eighth grade. The pupils represented a variety of musical backgrounds. The pupils from the fifth grade through the eighth grade were instrumental pupils of Mr. Harstad. The pupils from the fourth grade had had no previous instrumental music instruction and were just starting on pre-band instruments.

Also taken into consideration were the recorded I. Q.'s and the reading scores because they were thought to be valuable to compare with musical achievement.

Use of Reading and I. Q. Scores of The Bozeman Public School System. Reading grades can be a significant indicator of arrival at a maturity level appropriate to beginning study in reading music. It was felt that the reading grades and the I. Q.'s should be included because they would show the basic intelligence and classroom capabilities of the child. It was also thought that through a compilation of these scores a forecast of each child's development could be made. This would aid the director in his future educational efforts with the child in the selection of appropriate materials.

The Selection of Music Materials Based on Questionnaire Results

In conjunction with the tests, a survey was made to determine the most effective and recommended materials that were being used throughout the United States, and more specifically in Montana, by Montana music educators. It was deemed of value to try to find answers to various other questions which were thought to play a part in the determination of the problem. Appendix B contains a sample questionnaire with answers representing the majority of those returning the questionnaires. The questionnaire result also aided the writer in determining the procedures which were used in the pupil groups that were instructed.

Selection of Pupils For Experimental Teaching

Mr. John D. Shively, Superintendent of The Bozeman School System, kindly agreed to allow the writer to teach nineteen students of various grades ranging from the fourth through the eighth. The nineteen students consisted of (1) an eighth grade ensemble of four clarinetists, (2) a seventh grade ensemble of four trumpeters, (3) a sixth grade class of three woodwind and percussion players, (4) a fifth grade class of three string players, and (5) five students from a fourth grade class which was just beginning pre-band instruments. The five pupils names were selected from the class by means of an alphabetical seating chart with no previous knowledge of the child except the name.

The whole fourth grade class was given instruction by the writer and the five selected were a part of the class at all times but were consciously under closer observation by the author. In the fourth grade, the first topic dealt with was the beginning instrumental musical concepts. Fourteen pupils and the fourth grade class were taught for three months.

Selected Basic Concepts for Various Levels in Musical Training

Through the writers previous knowledge and experience, it was felt that the students should learn several basic concepts before they began formal instrumental instruction. This was in keeping with the modern educational philosophies found in reference material.

There were further concepts introduced as the student developed musically.

Basic Concepts Prior to Instrumental Instruction. Certain basic musical concepts were stressed prior to putting the instrument into the child's hands. These fundamental ideas were the foundations of the student's musical advancement. They, as all other conceptual ideals, were the basis upon which the student should develop. The following concepts were picked by mutual agreement with Mr. Reynolds: (1) music fundamentals involving note name, time signature, key signature, the measure, rhythms, and reading, (2) tone production incorporating breath control, diction, dental formation, and embouchure, and (3) care of the instrument. Understanding of these concepts, having begun, would grow continuously with the pupil's progress. To become a more proficient instrumentalist several other concepts were introduced along with the student's first contact with the instrument.

Basic Concepts During Instrumental Instruction. After the instrument had been given to the child, and the above concepts introduced, the following additional concepts were stressed in the process of developing a musical student's growth. This more advanced musicology was selected from Mr. Reynold's experience and that of the writer. These concepts were: (1) production of a tone on the instrument, (2) developing technical skills and, (3) understanding of musical phrasing.

Summary

The relevant background factors found important to the music testing program were that three Seashore tests of pitch, rhythm, and tonal memory and three devised motor skill tests of motility, precision, and reaction speed along with the I. Q.'s and reading grades would fulfill the testing program requirements.

The relevant background factors found to be important in the instructional materials area were that the materials would be selected by means of a questionnaire sent to music educators all over the country.

The factors important in the experimental teaching of pupils was how they were selected and what instrumentation was involved.

The part of tests in the selection of instructional material will be discussed in Chapter IV.

CHAPTER IV

THE APPLICATION OF TESTS AND INSTRUCTIONAL MATERIALS

The purpose of this chapter was to explain how to apply the six tests, try the materials, and devise teaching methods with the various experimental groups of students.

The Use of The Testing Data

The six Seashore and Motor Skill tests were given to the experimental groups of pupils during the month of January, 1957. The individual scores on the Seashore Tests were interpreted in terms of the ten point scale and the tests of national norms. To obtain the necessary basis for test comparisons, a ten point scale was used in interpreting the single scores of the three motor skill tests. In Table 1 appear the average scores of each experimental group on the Seashore tests.

TABLE 1. SEASHORE TEST SCORES OF PITCH, RHYTHM, AND TONAL MEMORY FOR NINETEEN PUPILS OF THE TEACHING GROUPS

Tests	No. of Pupils	Grade	Average Score Seashore Test	Ranges in Scores High	Low
Pitch	5	4	5.8	10	0
	3	5	7.3	8	7
	3	6	7.0	10	0
	4	7	8.0	10	7
	4	8	6.0	10	1
Rhythm	5	4	5.8	10	0
	3	5	4.0	8	3
	3	6	5.3	8	1
	4	7	4.5	7	1
	4	8	6.0	8	4
Tonal Memory	5	4	4.8	10	0
	3	5	8.0	10	4
	3	6	5.8	10	0
	4	7	7.8	10	3
	4	8	6.8	7	6

The average scores of the experimental groups for the three motor skill tests made will be found in Table 2.

TABLE 2. MOTOR SKILL TEST SCORES FOR MOTILITY, PRECISION AND REACTION SPEED ON NINETEEN PUPILS OF TEACHING GROUPS

Tests	No. of Pupils	School Grade	Average Conversion Scores on Motor Skill Tests
Motility	5	4	5.3
	3	5	5.3
	3	6	5.5
	4	7	6.5
	4	8	6.8
Precision	5	4	4.8
	3	5	4.2
	3	6	5.7
	4	7	6.7
	4	8	7.5
Reaction Speed	5	4	7.9
	3	5	8.1
	3	6	8.4
	4	7	8.5
	4	8	8.6

In Appendix C there are charts showing the individual scores on the motor skills and Seashore tests. Each initial pertains to a pupil to whom the tests were given.

Factors, such as I. Q. and reading scores, were thought to be influencing factors in determining the components of musical ability. The I. Q. scores were also converted to a ten point scale. To make scores easier for general comparison a percent method of converting to a ten point scale was used. The score the individual pupil made was divided by the maximum score and that percent was multiplied by the maximum, ten, of the ten point

scale.

The reading letter marks were reinterpreted with a number grade in the ten point scale. For the reading grades A/ equaled 98, A equaled 95, A- equaled 92, B/ equaled 88, B equaled 85, etc. In Table 3 will be found the I. Q. and reading average scores for each instrument group.

TABLE 3. AVERAGE I. Q. AND READING SCORES FOR EXPERIMENTAL GROUPS OF NINETEEN PUPILS OF THE TEACHING GROUPS*

Tests	No. of Pupils	School Grade	Converted Average Scores
I. Q.	5	4	79
	3	5	68
	3	6	76
	4	7	92
	4	8	79
Reading	5	4	78
	3	5	75
	3	6	80
	4	7	87
	4	8	84

* I. Q. based on Otis Quick Scoring Mental Ability Test. Reading Scores based on reading marks of class teacher.

Watkins-Farnum Test. After teaching the experimental groups for five months, an achievement test was given to each group. The test used was the Watkins-Farnum Performance Scale. It was used to determine the correlation between the pre-tests and the students' final performance. The Watkins-Farnum Performance Scale used is a relatively new test based upon sight reading, tone, rhythm, pitch discrepancy, and memory. A pupil must be able to play an instrument using the motor skills and mental abilities before taking this test. The test has been used successfully to measure pupil

progress. The Watkins-Farnum test is based on a 130 maximum score but the tester has reinterpreted the test scores on a ten point maximum score scale so that the figures could be compared more readily. The group average scores on the Watkins-Farnum Performance Scale appear in Table 4.

TABLE 4. AVERAGE WATKINS-FARNUM PERFORMANCE SCALE TEST SCORES OF NINETEEN PUPILS OF THE TEACHING GROUPS

Test	No. of Pupils	School Grade	Average Test Score*
Watkins-Farnum Performance Scale	5	4	73 or C
	3	5	83 or B
	3	6	77 or C+
	4	7	84 or B
	4	8	84 or B

* Numerical score, the regular score on a ten point scale.

The Use of Proper Materials For Instrumental Instruction

Use of proper materials was brought out by the results of the questionnaire which was sent to music educators all over the country. The materials that have been used in this study were those suggested by the majority of music educators.

Many valuable new materials, at least new to the writer, were found through this survey. The materials chosen to be used were those favored most by the music educators to whom questionnaires were sent. Each experimental group of students was given a variety of materials and method books emphasizing both individual and group participation. For instance, the eighth grade group used "Easy Steps to The Band", "Band Reader", and the "Adventures in Band" in the group, plus individual work in "Rubank", "Arbans", and

"Easy Steps" for individual performance. Nearly all of the materials mentioned on the returned questionnaires were tried in the various groups, or by individuals in the groups, to determine the relative value of the materials.

These materials were used to develop the players into better musicians through the improvement of tone, pitch recognition, technique, embouchure, and by gaining a better all-around knowledge of the musical instrument and a more thorough knowledge of music in general.

Instructional Method of Teaching For Experimental Groups

The results of the testing program and the instructional materials would have been of no consequence if they had not been put to the test of actual usage. The problem of the development of musical concepts was the first consideration in the method used.

Use of The Musical Concepts. There were several procedures used in conjunction with the instructional materials. Before materials or method books were placed in a student's hands, the basic music fundamentals necessary to learning music were reviewed, except in the fourth grade where there had been no previous instrumental instruction. To them, the various basic music concepts[1] were vague or non-existent. Therefore, the whole series of musical concepts were thoroughly reveiwed. When the concept was thought to have been previously stressed enough in the general music class, an

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[1] There is a fine line drawn between concepts and skills. Key signatures are examples of a basic concept from which evolves skill measurement.

attempt at recall of basic fundamentals was made otherwise it meant starting at the beginning on several concepts such as care of the instrument, tone production, and musical fundamentals like note names, beat notes, key, and time signatures.

Concepts Used During First Class Period. The first day in all of the classes was devoted to introducing the fundamental concepts except the fourth grade class in which part of every period was devoted to beginning concepts. From the fifth grade to the eighth grade the students showed, to the teacher's satisfaction, a basic knowledge of music notation, proper care of the instrument, correct breathing, and good embouchure formation. If any of these concepts seemed to be incomplete or non-existent, they were stressed to the utmost and assignments were given for the correction of the faulty part or the complete series was repeated. Nearly all pupils however, had had a very fine orientation from Mr. Harstad so that the main concepts were built from the basic fundamentals of music, which were in the fields of tone production, technique development, and phrasing skills. As mentioned before, nearly all of the method books that were used had a great deal of text space devoted exclusively to the development of the concepts. For motivational, educational and musical interests of the student, it was necessary for the writer to introduce the right pupil to the right material. For instance, student A had a great deal of trouble acclimating himself to the standard "Rubank Method Book" for his instrument while student B had no trouble whatsoever with the same book and readily

advanced. In the case of student A, a little easier method book, "Easy Steps To The Band", was selected. As a result in time his progress was much advanced. Before the investigator finished the teaching period, it was felt that student A could readily progress to a more standard method of instruction. The Watkins-Farnum Performance Scale also tested the results of this type of experiment.

The fourth graders offered a completely different challenge, in that it was necessary to "start from scratch". The first day was devoted to review of what the students already knew. It was found that the class had quite a thorough knowledge of the note names but naturally had had little work on breathing. Key and time signatures needed review. These were quite thoroughly re-introduced and a constant check was kept during the whole experimental teaching experience. Before the instruments (song flutes) were placed in their hands, it was explained how the instruments should be treated in regard to sanitation, ownership, and care. No playing on the instrument was done during the first class period. More concepts were introduced later.

Later Class Periods of Experimental Teaching. The second class period, a tone was attempted and an association between the note, note value, rhythm, and a study of notation was started. This brought about several problems.

For example, student A, in attempting to associate the tone played with the written tone, continually became befuddled and refused

to play at all. Student B was just the opposite, readily delving for more information than had been produced. Student A, with encouragement and aid from his regular classroom teacher, rapidly overcame the difficulty and was soon one of the budding musicians while student B lost interest when the work became more advanced. Thus the cycle had been completed. No doubt another year would show other changes in attitudes in these two.

The fourth grade class used the "Easy Steps Pre-Band Instrument Method Book". Throughout this book there were examples of the basic concepts and reviews. At all times the fundamentals were continuously stressed along with the musical advancement of the student on the instrument. Before the period of experimental teaching ended, the various orchestral instruments were demonstrated to the class, so that the students could, with proper guidance, choose an instrument of their choice for further musical enjoyment and a richer life through music.

This chapter has brought out how the testing program was put into effect. The use of instructional materials was explained and the methods of teaching the experimental groups was reviewed.

The results of the teaching experience with experimental groups are presented in Chapter V.

CHAPTER V

RESULTS OF INSTRUCTION WITH EXPERIMENTAL GROUPS

The hope of an investigator is always that the results will substantiate the original beliefs. It would seem that this writer was quite fortunate in the results. The results were divided into the three major areas of (1) the testing program, (2) the selection of instructional materials based on testing, and (3) the experimental teaching experiences.

Results of The Testing Program

The results were tabulated, correlated and then a forecast for each child was made. A description of the results appears in the following sections.

Correlations and Significant Findings. In appendix D will be found the rank correlations of the pre-tests, the I. Q.'s, and the reading scores to the final Watkins-Farnum Performance Scale. The Montana State College Statistics Laboratory ran the correlations on several of the pre-tests. These were the Seashore Pitch Test, the devised motor skill motility test, the I. Q. score and the reading score. These correlations can be found in Appendix D. The results showed that there was a significant correlation between the motility test and the final test. There were also slight significant correlations between the reading score and the final test and between the Seashore Pitch test and the final test. The I. Q. seemed to have a significant relation to the final test.

Table 5 contains four pertinent correlations between the final Watkins-Farnum Performance test and a test from each section of the testing program. For instance, the Pitch test was chosen from the Seashore tests, the motility test from the motor skill tests and the I. Q. and reading scores.

TABLE 5. CORRELATIONS BETWEEN WATKINS-FARNUM TEST AND PITCH, MOTILITY, I. Q., AND READING GRADES OF NINETEEN PUPILS OF THE TEACHING GROUPS

Tests	Rho correlations
Pitch	.563
Motility	.515
I. Q.	.726
Reading	.684

The correlations would seem to show that a musician would necessarily need a high reading grade at least at beginning and intermediate levels.

The correlations also appear to show that the music student would need an above-average I. Q., a good sense of pitch, and a certain anount of physical co-ordination and skill to be able to play an instrument reasonably well. Also it seems that through these test correlations, a director of music could forecast to a reasonable degree how well a student might do in the musical field. Of course, the two items that have not been measureable, have been the amount of motivation and the persistence a student has toward music. The time the student will devote toward furthering his talent would also be a factor to be considered. On the average

it would seem that this battery of tests would give one a reasonable estimate of what the student would be able to do. As an example, one of the students who took all of the pre-tests was rated and given a forecast of his final grade. After the final test was taken and scored, it was found that the forecast for him varied only three points from his final mark. The widest discrepancy was fifteen points and the writer was of the opinion that the motivation during the teaching period did not take hold or there would have been a closer forecast in this case also.

Forecasting Achievement in Instrumental Music. The forecasts were arrived at through averaging the pre-test scores along with the I. Q. and the reading score. Table 6 shows the test grade averages for three selected students, A, B, and C; arriving at the forecast comes from this average.

TABLE 6. TEST GRADE AVERAGES AND FORECASTS FOR THREE REPRESENTATIVE STUDENTS, A, B, AND C.

Student A		Student B		Student C	
Tests	Scores	Tests	Scores	Tests	Scores
Pitch	10.0	Pitch	9.0	Pitch	1.0
Rhythm	6.0	Rhythm	8.0	Rhythm	6.0
Tonal Memory	10.0	Tonal Memory	10.0	Tonal Memory	5.0
Motility	5.3	Motility	8.1	Motility	4.9
Precision	5.9	Precision	8.4	Precision	5.1
Reaction Speed	8.5	Reaction Speed	8.5	Reaction Speed	7.3
Reading Grade	7.5	Reading Grade	9.5	Reading Grade	7.0
I. Q.	6.8	I. Q.	9.5	I. Q.	7.5
Averages	7.373		8.72		5.42

1. The factors used in forecasting were averaged instead of weighted.

2. Student A's average of 7.37 converted to a hundred point scale makes 74 which is a C- mark.

3. Student B's average of 8.72 converted to a hundred point scale makes 87 which is a B+ mark.

4. Student C's average of 5.42 converted to a hundred point scale makes 54 which is a F mark.

On the final test, student A received a numerical mark of 88 which is a B+. Student A represents the widest variation from the forecast grade.

Student B's forecast could represent the above average student's forecast. On his final test he achieved a 92 which put him in the A- category yet he was only five points off the forecast.

A slower student's forecast looked something like student C's forecast. On the final Watkins-Farnum Performance Scale he received a 46 which was still a rather low F but there was only an eight point difference between the forecast and the results.

It seems to be logical to conclude from these results that by use of this system, a relatively accurate forecast could be made. Through this means, the director of music could plan the student's advancement to fit more closely to the student's abilities.

Use of Results From Correlations and Forecasts. Using these tests as a guide, the director would be able to select the right material for the right student. A thorough knowledge of the various methods and materials is needed, however, to have this occur. It was found that these materials played a very important part in each student's advancement in gaining or reaching their full musical potential. Together, the testing program and the instructional materials were of much more value than they would ever be separately. This could be explained by stating that through the testing program a student's forecast would allow the music director to choose the

material which would best insure the student's progress and would allow him to progress as fast as his ability warranted. The material which would allow the student to proceed at his own ability level would produce better results.

The Importance of Materials To Student's Advancement

According to Lamb, "American teachers should keep up-to-date in their knowledge of instructional materials."[1] It is also the writer's opinion that materials will continue to play a very important part in a music student's advancement. Therefore, it would seem that all music teachers should become acquainted with the multitude of materials that are available to them. The discovery of the importance of materials in this study would seem to bear this out.

It was found through experimentation that certain methods in the use of materials were more appropriate. "Alfred's Basic Method Books", which besides having slower texts, were easily readable, had interesting sketches, and presented a very commendable approach for a slower student. It would appear that the type of student should determine the type of material. For instance, a slower student will more readily advance with material that is adapted to his own level. The format of "Easy Steps" seemed to be very fine for both the average and below-average student while the "Rubank Books" were aimed directly at the average student. The above-average

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[1] Marion M. Lamb, Your First Year of Teaching, p. 197.

student seemed to advance more rapidly in the "Walter Beeler Books" while the "Boosey-Hawkes Series" really presented to the superior beginning student a book that would keep him occupied. For the advanced students, the various methods and materials for the particular instrument were found to be very useable. For instance, the "Arbans Book" for trumpet was found to be more than adequate to fill an intermediate grade student's progress satisfactorily. The book itself is quite impressive as far as thickness is concerned and explains rudiments concisely, yet clearly. Each page is printed distinctly which makes it easy to read. The exercises, solos, duets, and trios are on a progressive learning basis. Several of them are on the college level of playing ability. For overall use and reliability, it is a highly desirable for trumpet study and has been used as such for many years.

Each individual instrument had its own best method book for the advanced student. For instance, the choice clarinet book was the "Klose'-Boermann Method Book". The saxophone standard was the "DeVille Saxophone Studies", while the customary flute book for the advanced student was the "Flute Studies" by George Soussmann. All of these, and the advanced books for the other instruments, seemed to be based on the theory that an advanced student would need challenging materials to insure progress. All of the more advanced books certainly adhere to this theory.

Effective Presentations in Classroom Work

During the experimental teaching it was found that some class methods worked well while others did not. These were analyzed and it was found that the positive approach to the children seemed to provide the biggest dividends. In the fourth grade class the presentation of the tonette tone presented a problem. It was found that using an affirmative response[1] produced a desired effect while a negative response seemed to make the children more reticent. For instance, one child could not seem to produce a tone, but instead of the teacher saying "no, no" the whole procedure was reviewed and it was pointed out that blowing up a balloon and blowing the tonette were much the same. This analogy seemed to be effective not only in the lower grades but the upper grades as well.

Some of the materials, as has been already revealed, were not suited to the specific groups. For instance, it was found that the fourth grade class as a whole could not advance with a method book in which the material was presented too slowly or too fast. This seemed to show that it would have been much more effective to work with the individual student than to work with a larger class.

It was also found that in the lower grades the materials had to be reviewed and emphasized much more than in the higher grades. A slower pace had to be maintained to insure that everyone understood what was being done. In the upper grades, much more

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[1] Affirmative response refers to a positive action in regard to a student's understanding. Encouraging a child would be an example of affirmative response.

was done in the advanced concepts. The basic concepts were covered only in review.

The students seemed to understand or gain the various concepts as they were presented, and readily adapted them to their own advancement. In the fourth grade the note names were introduced, and the students, after what was considered a reasonable period of time, were using and understanding them as well as some of the upper grade students. The other fundamentals were also introduced and by the end of the teaching experience it was felt that the students knew as much as could be expected of them. Tone production seemed to be easily understood and developed along with the instrument care. Producing the tone seemed to present the biggest barrier to concept development, but it was thought that the proper approach is of the utmost importance to the student's advancement. Technical skills were probably the most practiced and in return these seemed to have the greatest development.

Motor Skill Significance. This was emphasized by the results of the motor skill tests which showed that the technical skills were quite dependent upon the former. For example, a student who did well on the motor skill tests usually readily comprehended the technical skills. However, the student with the lower motor skill test score usually had to work that much harder to achieve the musical goal. Again, the two factors, persistence and motivation, would have to be taken into consideration.

It seemed that as the concepts were introduced, they were

rapidly comprehended and put to their proper use in the music world and language. "As teachers we are interested in learning experiences and in the observation of learning reactions."[2] as pointed out by Risk.

It would seem from the results that have been indicated that the three major areas considered in this investigation must be integrated to aid in a student's progress. These areas are (1) a comprehensive testing program from which a forecast can be made, (2) a series of instructional materials suited to the student, and (3) some form of appropriate devised method for instructing the child.

A detailed summary of the findings appear in Chapter VI.

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[2] Thomas M. Risk, Principles and Practices of Teaching in Secondary Schools, p. 52.

CHAPTER VI

SUMMARY AND CONCLUSIONS

Summary

It was found in the review of literature that testing in music is as important as in other subject areas but there has been very little in music. It was found that adjusting materials to learning levels in music is important for desirable pupil progress just as in other educational areas. It was also found that the instructor is the vital factor in integrating the tests with the materials to assure pupil progress.

There was only one musical aptitude test that seemed generally accepted. The test was the Seashore Musical Aptitude Test from which it was found that the three areas of pitch, rhythm, and tonal memory are a satisfactory basis from which to determine musical aptitude. There were no tests to measure musical motility, precision, or reaction speed. The tests that were self-devised to measure these three areas were successful, judging from the results when compared to the Seashore results. They illustrated that there could be satisfactory locally constructed tests by music instructors.

The selection of appropriate materials, as revealed by a questionnaire sent to music educators, was a satisfactory basis from which to choose instructional materials for appropriate ability levels. It was found that certain musical concepts were essential to basic instrumental instruction, such as note names, key and time

signatures, care of the instrument, and tone production.

The instruction period with the various instrumental groups was devoted to the significant use of the testing data, the use of proper instructional materials for instrumental instruction, and instructional methods of teaching for experimental groups. This brought out care in the accuracy of compiling test scores to insure that the results would be valid. The instruction brought out that care should be extremely essential in introducing materials to the pupils. It also brought out that care by the teacher should be taken in any teaching method so that the child will be at his own ability level to insure his progress and needs.

Nineteen pupils from five different grades with approximately four pupils in each group were taught for a period of three months. The fourth grade class was taught as a whole but five of the pupils in the group of nineteen were in the fourth grade group. It was found that the fourth grade had to have a review of basic music fundamentals first. It was found also that by adjusting materials to ability levels the nineteen pupils progress was more satisfactory. In correlating the final test on achievement with the preliminary pre-tests it was found there were strong positive correlations (.52-.72). The strong relationship between pre-tests and the final achievement, as measured by the Watkins-Farnum Performance Scale, indicates clearly the tendency of pupil strengths shown on the pre-tests to persist in final achievement. Therefore, weaknesses shown on pre-tests could be signals to an instructor to adjust materials to those weaknesses

if achievement is to be improved. The pre-tests were used to forecast final achievement. The final achievement test correlations bore out the forecast of musical ability. The general approach of the methods used to build on basic music fundamentals allowed the pupil to move at his own rate to his own potential and observation by the instructor seemed to bear this out.

Conclusions

The results of this study would seem to indicate that the drawing of certain conclusions is justified. They are as follows:

1. Emphasis on concept development is just as important in music as in other educational subject areas.

2. Even though there are no satisfactory motor skill tests available, the music instructor can devise his own with proper thought and care in construction.

3. Pre-tests provide a means for forecasting achievement and thereby indicating points for adjusting instructional materials.

4. Music instructors could look to I. Q.'s and reading scores for a type of prediction of musical ability.

5. The general conclusion is that testing is extremely important in music for diagnosis by the music instructor for locating pupil difficulties and for selecting instructional materials.

There were certain limitations of time, expense, and number of pupils available but had the investigator been able to carry on a more extensive and refined study, and the same findings had existed as occurred in this study, the conclusions drawn could be made

without any reservations and extended to the general areas of pre-testing, selection of materials, and a method of adjusting materials to musical abilities indicated by testing.

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APPENDIX A

INSTRUCTIONS AND DIAGRAMS OF MOTOR SKILL TESTS

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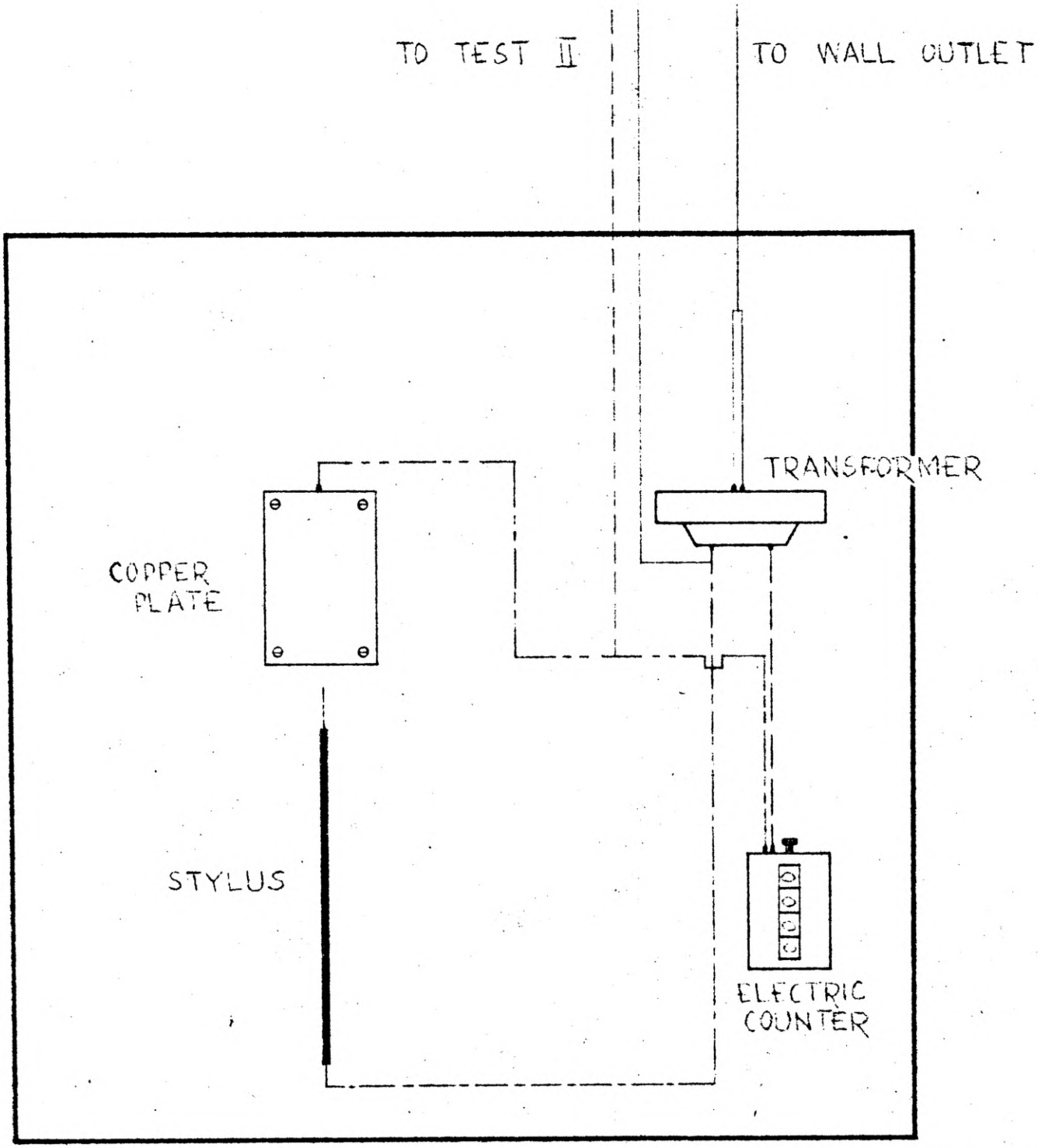


TEST I : MOTILITY

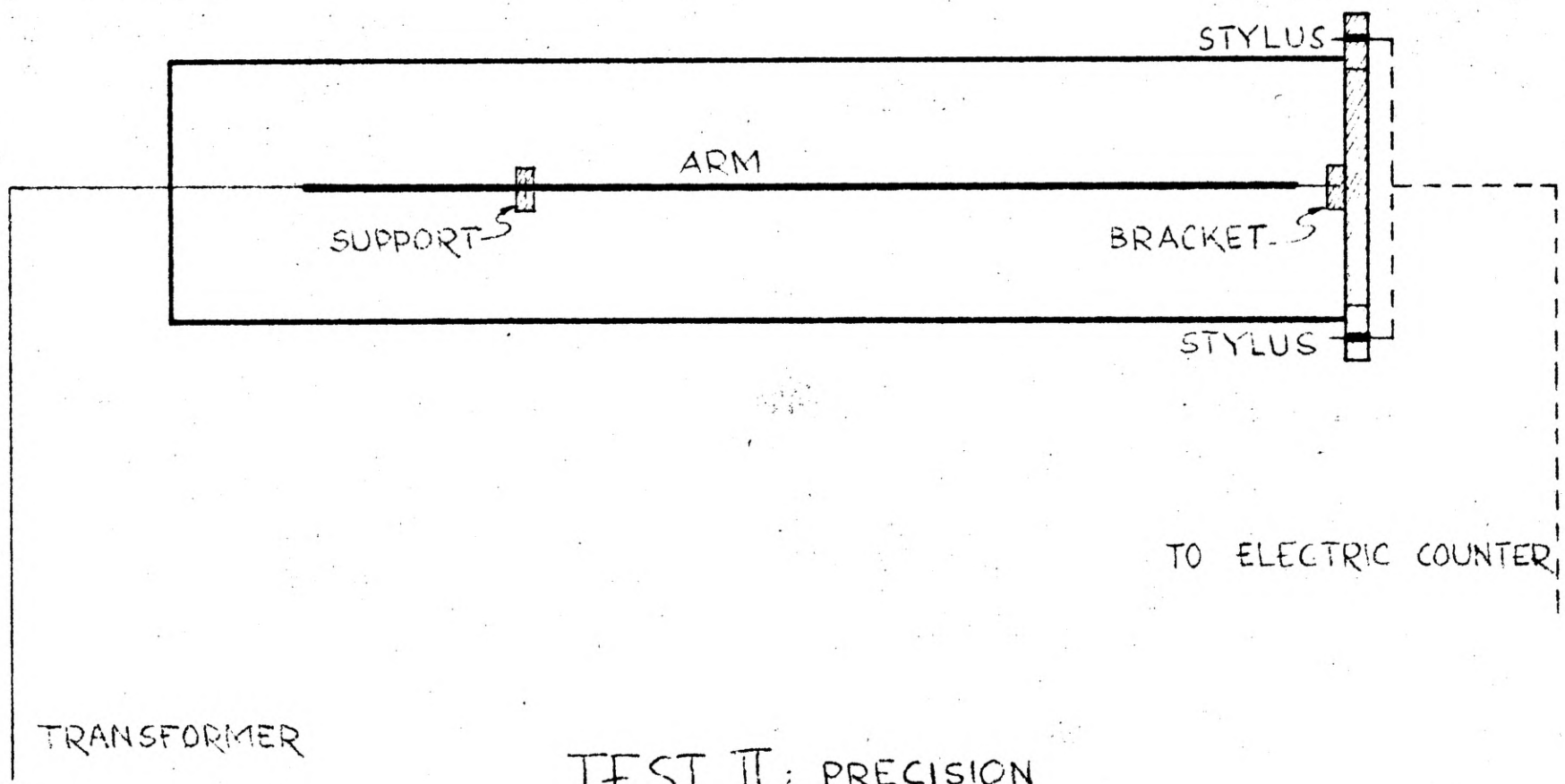
MOTILITY TEST INSTRUCTIONS

1. Test on level surface as desk or some similar base.

2. Explain how test is run by giving example to class as a whole.

> "This is a test of how fast you can tap. Hold your heavy wire like a pencil. The command "Ready" will be your warning. When you hear the command "Go", tap as fast as you are able to on the copper plate until the command "Stop". Stop immediately, and lay the wire down. Each test will last ten seconds. You will be given a trial test first, then three tests to earn your score."

3. Allow each child to have a trial run without benefit of time.



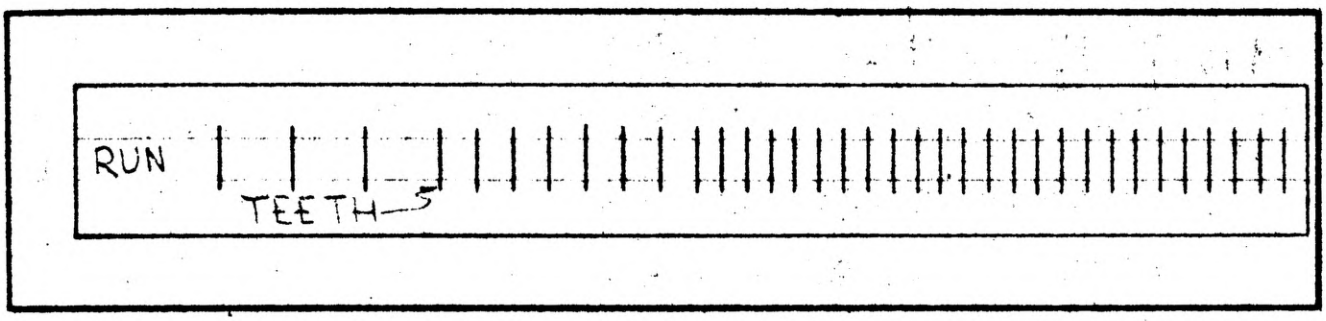
TEST II: PRECISION

PRECISION TEST INSTRUCTIONS

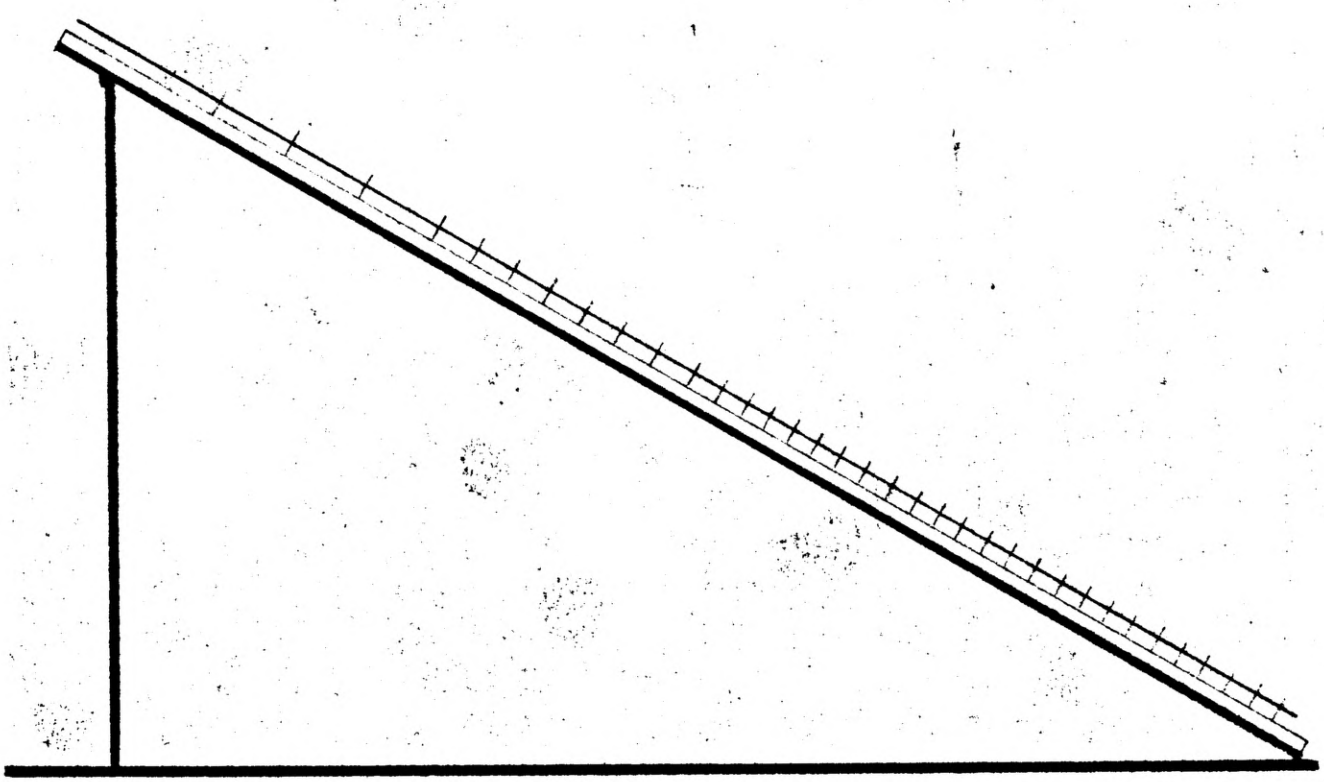
1. Explain how test is run to whole class.

   "This is a test of how fast you can move the stick from one side to the other, each time touching the end of the stick to the point on each side. Hold the end of the stick and let it lie on the brace in the middle until you hear the command, "Go". On the command of "Stop" halt immediately and lay the stick back in the original position in the middle of the brace. Each test will last thirty seconds. Only when the tester hears the click upon contact will a time be scored. You will be given a trial test first, then three tests to earn your score."

2. Always allow the child one practice test without the benefit of timing.



TEST III : REACTION SPEED



REACTION SPEED TEST INSTRUCTIONS

1. Explain how test is run to whole class.

   " This is a test of how fast you react to a seen object. Hold the support by two fingers and when the ball is released pull out the support. See the ball before you remove the support. There will be no command except "Watch". After that be ready at any time. The object is to stop the ball as soon as possible. Speed is necessary. You will be given a trial test first then three tests to earn your score."

2. Always allow the child one practice test without the benefit of timing.

APPENDIX B

QUESTIONNAIRE SENT TO SELECTED MUSIC EDUCATORS

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Questionnaire with answers representing the majority of music educators questioned 51

QUESTIONNAIRE SENT TO SELECTED MUSIC EDUCATORS

(Answers Represent The Majority of Music Educators Questioned)

1. In what grade does the instrumental program begin?

   Answer: Fifth grade

2. Does the school supply any instruments? If yes, what instruments?

   Answer: Yes, usually the larger instruments.

3. Is there any selectivity in the organization?

   Answer: Yes

4. How often does the organization meet?

   Answer: Ranged from once to five times a week, however two times a week was most common.

5. How long are class periods?

   Answer: Forty-five minutes

6. When does the organization meet?

   Answer: During the school day.

7. How much time is spent with individual instruction?

   Answer: None

8. Would you please list the methods you have found to be the most useable in the heterogeneous classes in beginning and intermediate band.

   Answer: Brass: Easy Steps to The Band, Belwin Class Method

   Woodwind: Easy Steps to The Band, Belwin Class Method

   Percussion: Easy Steps to The Band, Belwin Class Method

   All instruments combined: Easy Steps to The Band, Belwin Band Builder, The Band Reader, Adventures in the Band

9. Would you please list the methods and materials you have found to be the most valuable in the homegeneous class for beginning and intermediate band.

   Answer: Trumpet or cornet: Belwin, Rubank, Arbans

   Baritone: Rubank, Arbans

   Trombone: Rubank, Arbans

   Tuba: Rubank, Easy Steps

   French Horn: Rubank, Hauser

   Clarinet: Rubank, Belwin, Easy Steps, Klose'-Baermann

   Saxophone: Rubank, Easy Steps, DeVille

   Flutes: Rubank, Easy Steps, Rex Elton Fair

   Oboe: Rubank, Easy Steps

   Bassoon: Rubank, Easy Steps, Weisenborn

   Percussion: Rubank, Haskell Harr

10. What form of rhythmic counting system do you use for beginning students?

    Answer: Use of foot tapping, counting out loud, clap hands.

APPENDIX C

CHARTS OF TEST SCORES ON SIX PRE-TESTS FOR INDIVIDUALS BY EXPERIMENTAL GROUP

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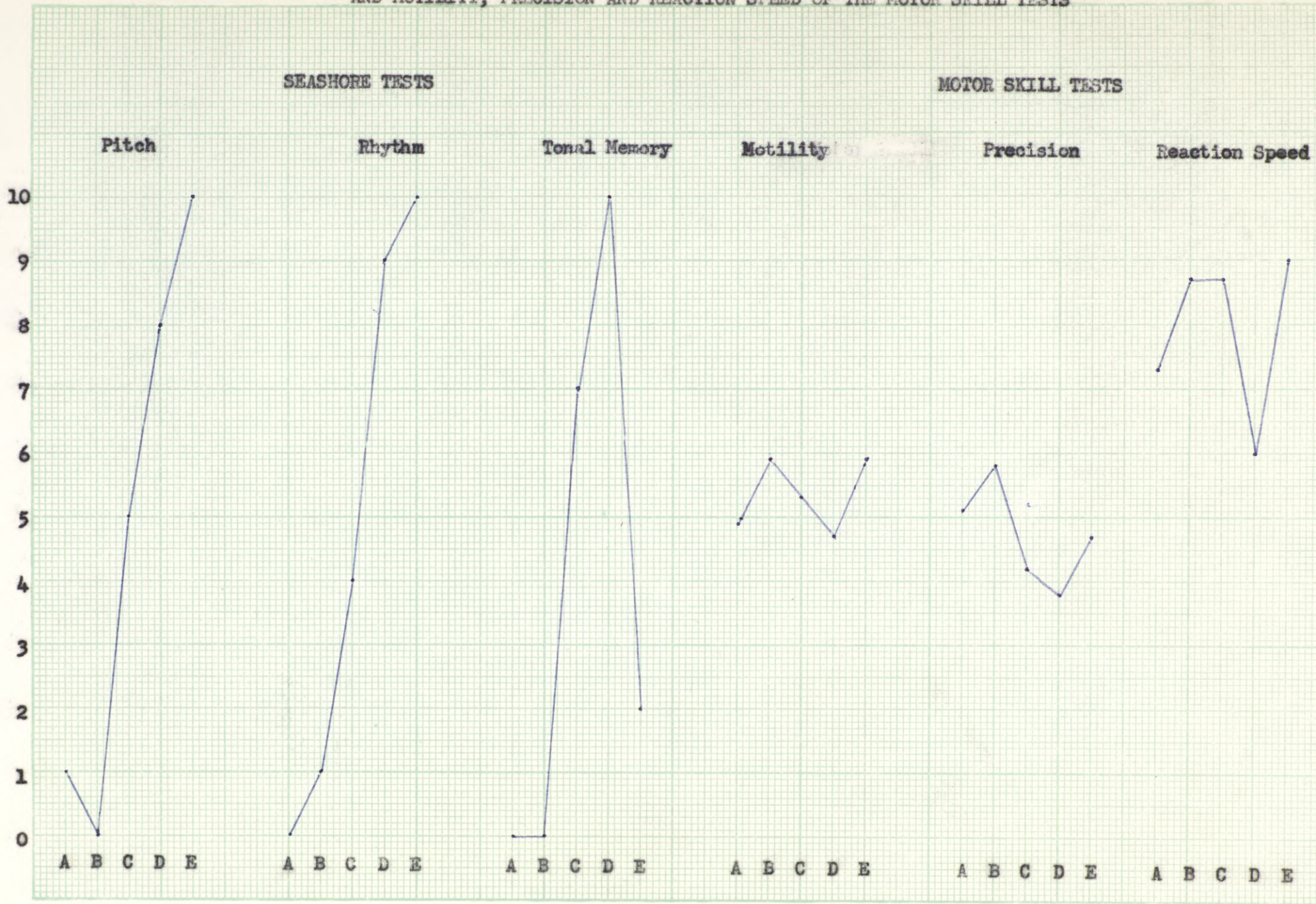
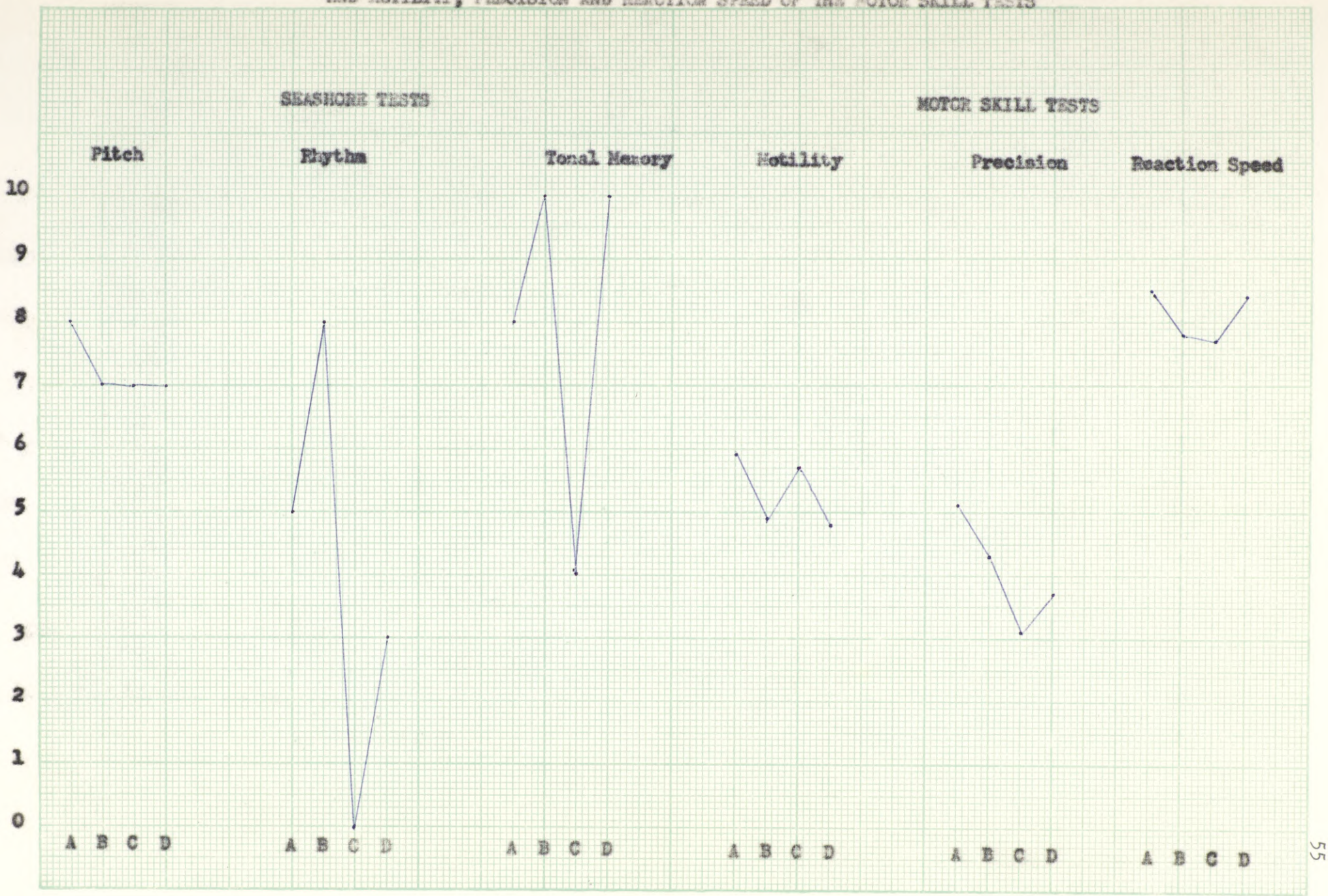
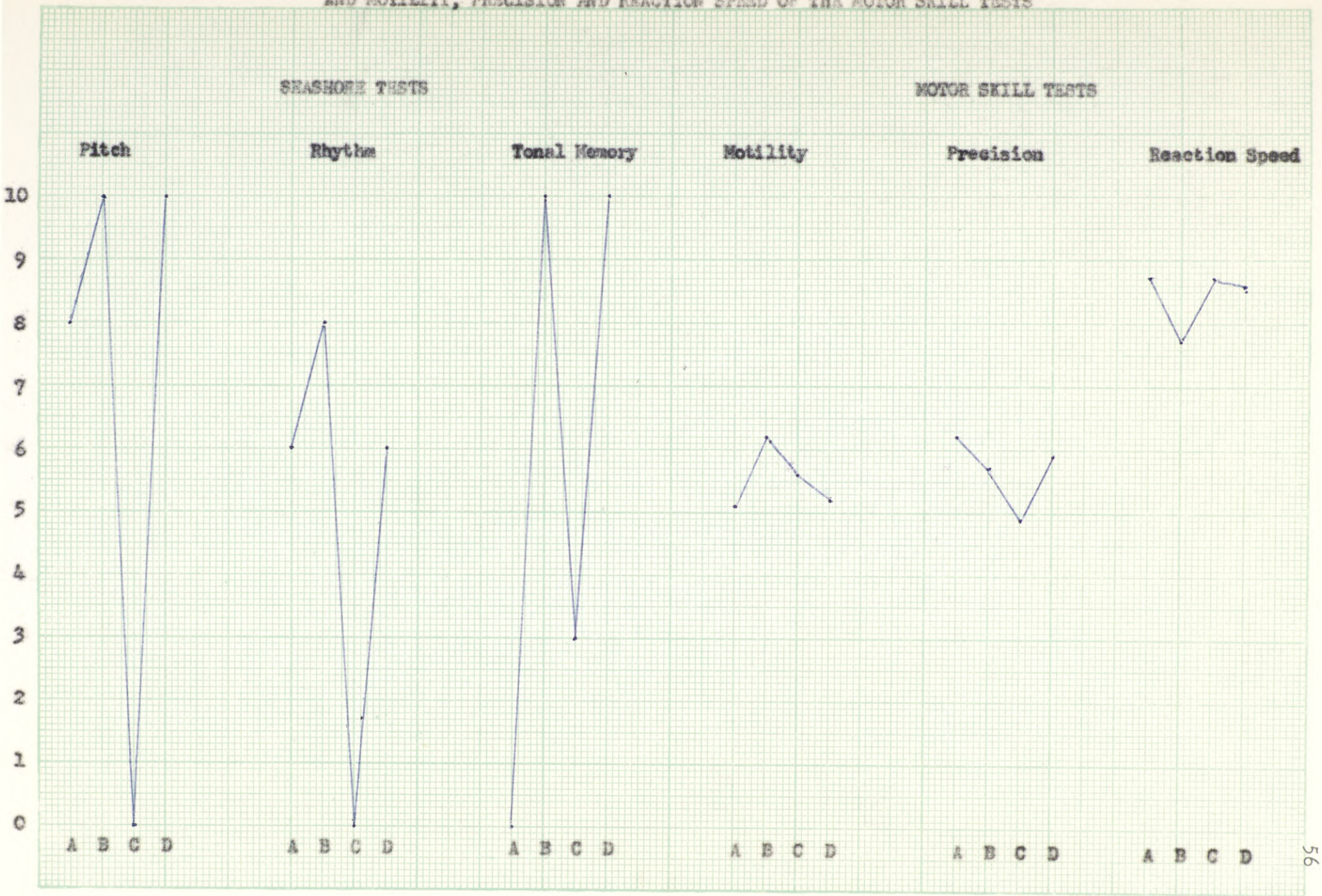
INDIVIDUAL SCORES OF FOURTH GRADE PUPILS ON PITCH, RHYTHM, AND TONAL MEMORY OF THE SEASHORE TESTS AND MOTILITY, PRECISION AND REACTION SPEED OF THE MOTOR SKILL TESTS



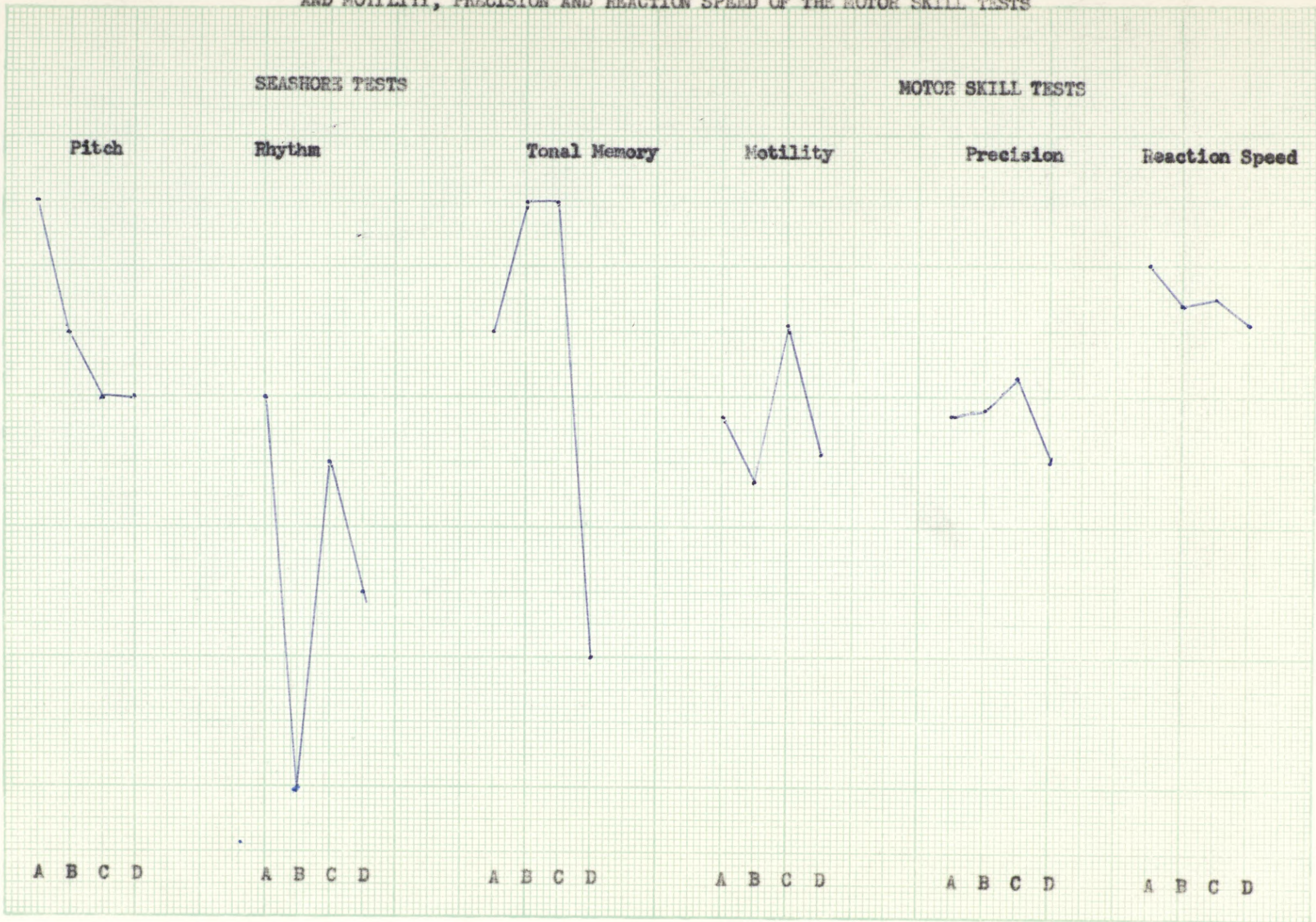
INDIVIDUAL SCORES OF FIFTH GRADE PUPILS ON PITCH, RHYTHM, AND TONAL MEMORY OF THE SEASHORE TESTS AND MOTILITY, PRECISION AND REACTION SPEED OF THE MOTOR SKILL TESTS



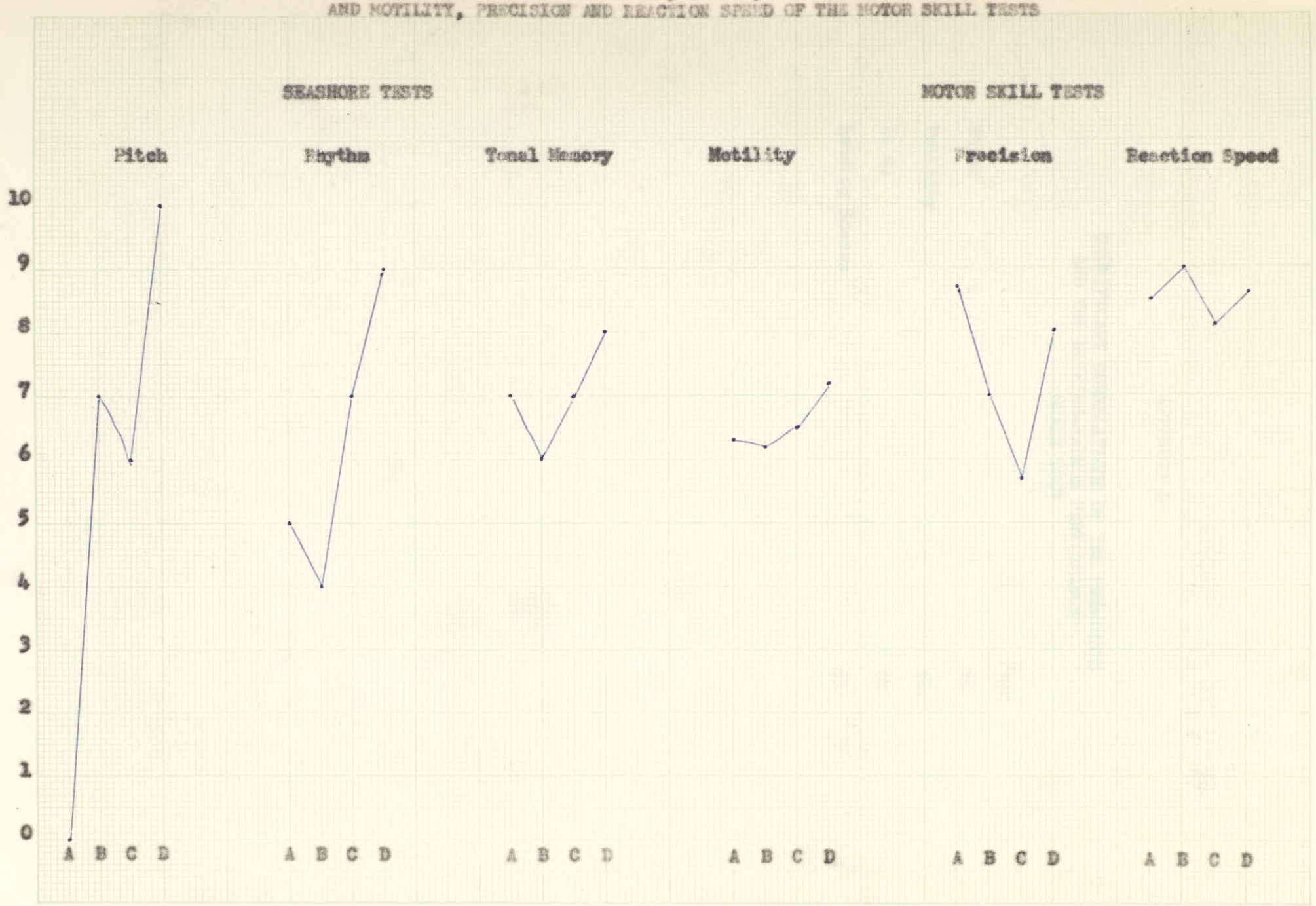
INDIVIDUAL SCORES OF SIXTH GRADE PUPILS ON PITCH, RHYTHM, AND TONAL MEMORY OF THE SEASHORE TESTS AND MOTILITY, PRECISION AND REACTION SPEED OF THE MOTOR SKILL TESTS



INDIVIDUAL SCORES OF SEVENTH GRADE PUPILS ON PITCH, RHYTHM, AND TONAL MEMORY OF THE SEASHORE TESTS AND MOTILITY, PRECISION AND REACTION SPEED OF THE MOTOR SKILL TESTS



INDIVIDUAL SCORES OF EIGHTH GRADE PUPILS ON PITCH, RHYTHM, AND TONAL MEMORY OF THE SEASHORE TESTS AND MOTILITY, PRECISION AND REACTION SPEED OF THE MOTOR SKILL TESTS



APPENDIX D

SIGNIFICANT CORRELATIONS OF THE PRE-TESTS AND THE WATKINS-FARNUM PERFORMANCE SCALE TEST

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PITCH

	Test X	Rank	Test Y_2	Rank	d	d^2
1.	82	8	70	11	3	9
2.	85	5	60	14	9	81
3.	88	3	100	3	0	0
4.	78	13.5	0	18	4.5	20.25
5.	80	10.5	70	11	1.5	2.25
6.	93	2	70	11	9	81
7.	83	7	80	7	0	0
8.	87	4	100	3	1	1
9.	68	18	0	18	0	0
10.	84	6	100	3	3	9
11.	78	13.5	100	3	10.5	110.25
12.	81	9	70	11	2	4
13.	79	12	70	11	1	1
14.	76	16	80	7	9	81
15.	77	15	8	7	8	64
16.	95	1	100	3	2	4
17.	72	17	0	18	1	1
18.	80	10.5	50	15	4.5	20.25
19.	52	19	10	16	3	9
						498.00

$$\text{Rho} = 1 - \frac{6 \times 498}{6840}$$

$$\text{Rho} = 1 - \frac{2988}{6840}$$

$$\text{Rho} = 1 - .4368$$

$$\text{Rho} = .5632$$

MOTILITY

	Test X	Rank	Test Y_3	Rank	d	d^2
1.	82	8	40	18	10	100
2.	85	5	54	11	6	36
3.	88	3	90	3.5	.5	.25
4.	78	13.5	49	13	.5	.25
5.	80	10.5	48	14	3.5	12.25
6.	93	2	90	3.5	1.5	2.25
7.	83	7	90	3.5	3.5	12.35
8.	87	4	60	10	6	36
9.	68	18	61	9	9	81
10.	84	6	90	3.5	2.5	6.25
11.	78	13.5	46	15	1.5	2.25
12.	81	9	83	7	2	4
13.	79	12	43	16	4	16
14.	76	16	90	3.5	12.5	156.25
15.	77	15	40	18	3	9
16.	95	1	90	3.5	2.5	6.25
17.	72	17	40	18	1	1
18.	80	10.5	64	8	2.5	6.25
19.	52	19	52	12	7	49
						536.5

$$Rho = 1 - \frac{6 \times 536.5}{6840}$$

$$Rho = 1 - \frac{33190}{6840}$$

$$Rho = 1 - .4852$$

$$Rho = .5148$$

I. Q.

	Test X	Rank	Test Y_1	Rank	d	d^2
1.	82	8	82	8	0	0
2.	85	5	76	11	6	36
3.	88	3	85	5	2	4
4.	78	13.5	73	13	.5	.25
5.	80	10.5	75	12.5	2	4
6.	93	2	97	1	1	1
7.	83	7	83	7	0	0
8.	87	4	93	2	2	4
9.	68	18	80	10	8	64
10.	84	6	84	6	0	0
11.	78	13.5	68	16	2.5	6.25
12.	81	9	72	14	5	25
13.	79	12	66	17	5	25
14.	76	16	69	15	1	1
15.	77	15	81	9	6	36
16.	95	1	87	4	3	9
17.	72	17	58	18	1	1
18.	80	10.5	89	3	7.5	56.25
19.	52	19	75	12.5	6.5	42.25
						314.00

$$\text{Rho} = 1 - \frac{6 \times 314}{6840}$$

$$\text{Rho} = 1 - \frac{1880}{6840}$$

$$\text{Rho} = 1 - .2748$$

$$\text{Rho} = .7252$$

READING SCORES

	Test X	Rank	Test Y_4	Rank	d	d^2
1.	82	8	85	6	2	4
2.	85	5	85	6	1	1
3.	88	3	82	8	5	25
4.	78	13.5	80	9	4.5	20.25
5.	80	10.5	88	3	7.5	56.25
6.	93	2	92	1	1	1
7.	83	7	78	12	5	25
8.	87	4	88	3	1	1
9.	68	18	75	12	6	36
10.	84	6	85	6	0	0
11.	78	13.5	75	16.5	3	9
12.	81	9	75	16.5	7.5	56.25
13.	79	12	78	12	0	0
14.	76	16	78	12	4	16
15.	77	15	75	16.5	1.5	2.25
16.	95	1	88	3	2	4
17.	72	17	78	12	5	25
18.	80	10.5	72	19	8.5	72.25
19.	52	19	75	16.5	2.5	6.25
						360.5

$$\text{Rho} = 1 - \frac{6 \times 360.5}{6840}$$

$$\text{Rho} = 1 - \frac{2163.0}{6840}$$

$$\text{Rho} = 1 - .3162$$

$$\text{Rho} = .6838$$

READING SCORES

	Test X	Rank	Test Y_4	Rank	d	d^2
1.	82	8	85	6	2	4
2.	85	5	85	6	1	1
3.	88	3	82	8	5	25
4.	78	13.5	80	9	4.5	20.25
5.	80	10.5	88	3	7.5	56.25
6.	93	2	92	1	1	1
7.	83	7	78	12	5	25
8.	87	4	88	3	1	1
9.	68	18	75	12	6	36
10.	84	6	85	6	0	0
11.	78	13.5	75	16.5	3	9
12.	81	9	75	16.5	7.5	56.25
13.	79	12	78	12	0	0
14.	76	16	78	12	4	16
15.	77	15	75	16.5	1.5	2.25
16.	95	1	88	3	2	4
17.	72	17	78	12	5	25
18.	80	10.5	72	19	8.5	72.25
19.	52	19	75	16.5	2.5	6.25
						360.5

$$\text{Rho} = 1 - \frac{6 \times 360.5}{6840}$$

$$\text{Rho} = 1 - \frac{2163.0}{6840}$$

$$\text{Rho} = 1 - .3162$$

$$\text{Rho} = .6838$$