A PROGRAM TO IMPROVE CHORAL CONDUCTING STUDENTS' ABILITY TO DETECT RHYTHMIC ERRORS IN CHORAL REHEARSAL

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During the spring semester of 1971, an experimental study was undertaken with a choral conducting class at North Texas State University aimed at (a) developing and evaluating an instrument to test the students' ability to detect rhythmic errors, and (b) evaluating a program of self-instruction to improve that ability. An analysis of the data collected in connection with the study was also made.

Twelve hypotheses were formulated and tested involving twenty-five students enrolled in the class. The class was divided into two groups by matching scores on an error-detection ability pre-test. Voice-parts were balanced as nearly as possible, and the two groups were determined to be significantly comparable in terms of means and standard deviations.

Two weeks were allowed for Group A to use the self-instructional program. The combined groups were then tested again, after which Group B used the program for two weeks. The third and final test was then given to the combined
groups. When not using the program, the groups had no planned activities beyond normal class participation.

The Rhythmic Error Detection Test.—A series of twenty-nine choral examples, containing 162 prepared errors, were presented on tape. Students received correct musical scores for each example on which to circle the errors presented on the tape. Prepared errors left undetected were totaled, along with notes mistakenly circled, to produce the test grade. A low total represented a good grade. Tests I and III were the same, but for Test II the items were rearranged. Using the split-half and the Spearman-Brown extension formulas, reliability index figures (on four administrations) ranged from .3987 to .7478, with an average of .6465.

The Program.—Another series of examples, on a set of seven tapes containing from fifteen to twenty-two examples each, was developed. Each example was sung two times: (A) once with a rhythmic error (or errors) in one or more voices, and (B) once with all rhythms sung correctly. Each student was given correct scores for the examples and was to listen to Part (A) and locate and mark all errors possible; then he was to compare his score with a pre-marked score.

To determine the significance of the mean gain for each group from test to test, the t test for related means was used. To test the relationship of initial error detection ability, as well as gains, with each of several variables, the Pearson product moment was used.
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CHAPTER I

INTRODUCTION

The use of recorded materials in teaching is by no means new. How they are used is limited only by the imagination of the teacher. Neither is it new to use recordings in self-instructional programs. Such programs with the purpose of developing skills in music seem logical since recordings permit identical presentations of materials and can be controlled for use by individuals. These two factors, coupled with the four characteristics of programmed instruction—small steps, active participation, immediate knowledge of results, and self-pacing\(^1\)—can presumably produce a program of self-instruction in the realm of music skills.

Choral conducting students must work to become proficient in many skills. Being able to pin-point errors when they first occur is one of them, even though little attention has been given to researching this skill until recently. This skill, like others, is not one which can be gained merely by learning about it or talking about it. It is something the student must do, and it is something he can learn to do.

better.² An effective program of self-instruction designed to teach the elimination of rhythmic errors could free the teacher to give more time and attention to other things within the course, such as beat patterns, cueing, and phrasing, which can best be presented by the teacher.

Going even further, it would reduce to some degree the number of skills the new choral conductor would find necessary to perfect after he has gone into the field. Even though age and experience may be the best teachers, many choral conducting skills can be learned in college.

Purpose of the Study

The purposes of this study were (1) to develop and evaluate a self-instructional program designed to assist choral conducting students in improving their ability to detect rhythmic errors during rehearsal, (2) to analyze the data acquired from a pre-test, a mid-test, and a post-test given in connection with the evaluation of the program, and (3) to determine the relationship of initial error detection ability, and gains in error detection ability, and each of several variables representing prior conditions which might be expected to affect an individual's error detection ability. There is no research which reflects any findings regarding such relationships. However, the researcher's experience as

a music educator and other music educators' experience suggest: that some prior conditions or experiences might influence error detection ability. It was on the basis of this evidence that some of the variables were hypothesized to show positive relationships to error detection ability and some were hypothesized to show negative relationships.

Sub-Purposes

1. To determine the range and frequency of the types of errors detected (i.e., ranging from the kinds of errors most consistently not detected to the kinds of errors most consistently detected) by conducting students.

2. To discover relationships existing between initial error detection ability and each of the following variables: age; sex; number of years of private voice study; number of years sung in high school and/or college choirs; number of years of private piano study; number of years of private instrumental study; number of years played in bands and/or orchestras; mathematics score on the SAT; and grade in sophomore music theory.

3. To discover relationships existing between gains in error detection ability during the self-instructional program and each of the several variables listed in Number Two (2) above.

4. To discover relationships existing between the part the conducting student sings (S, A, T or B) and the parts in which he detects or fails to detect errors.
Hypotheses

A college choral conducting class is divided into two comparable groups (Groups A and B), and the following conditions are observed:

a. A test of rhythmic error detection ability, The Rhythmic Error Detection Test, is administered to the combined groups three times, at three-week intervals;

b. Between Test I and Test II the members of Group A spend two weeks working through a self-instructional program designed to improve rhythmic error detection ability; and

c. Between Test II and Test III the members of Group B spend two weeks working through the same self-instructional program.

The following hypotheses were proposed:

1. Students in Group A will show a significant mean gain in rhythmic error detection ability from Test I to Test II.

2. Students in Group B will show no significant mean gain from Test I to Test II, this being a time during which no planned activities are engaged in by which error detection ability might be improved.

3. Students in Group B will show a significant mean gain in rhythmic error detection ability from Test II to Test III.

4. Students in Group A will show no significant mean gain from Test II to Test III, this being a time during which
no planned activities are engaged in by which error detection ability might be improved.

5. No significant difference will be found between the mean gain made by Group A between Tests I and II and the mean gain made by Group B between Tests II and III.

6. No significant correlation will be found to exist between initial error detection ability of the combined groups and any of the following variables:

   a. age  
   b. sex  
   c. number of years of private voice study  
   d. number of years sung in high school and/or college choirs

7. A significant correlation will be found to exist between initial error detection ability of the combined groups and each of the following variables:

   a. number of years of private piano study  
   b. number of years of private instrumental study  
   c. number of years played in bands and/or orchestras  
   d. math scores on SAT  
   e. grades in sophomore music theory

8. No significant correlation will be found to exist between the gains in error detection ability from Test I to Test II for members of Group A and any of the following variables:

   a. sex  
   b. number of years of private voice study  
   c. number of years sung in high school and/or college choirs

9. No significant correlation will be found to exist between the gains in error detection ability from Test II to
Test III for members of Group B and any of the following variables:

a. sex  
b. number of years of private voice study  
c. number of years sung in high school and/or college choirs

10. A significant correlation will be found to exist between the gains in error detection ability by members of Group A from Test I to Test II and each of the following variables:

a. age  
b. number of years of private piano study  
c. number of years of private instrumental study  
d. number of years played in bands and/or orchestras  
e. math scores on SAT  
f. grades in sophomore music theory

11. A significant correlation will be found to exist between the gains in error detection ability by members of Group B from Test II to Test III and each of the following variables:

a. age  
b. number of years of private piano study  
c. number of years of private instrumental study  
d. number of years played in bands and/or orchestras  
e. math scores on SAT  
f. grades in sophomore music theory

12. a. At the beginning of this experiment, the choral conducting student will tend to hear errors in the order indicated below.

(1). his or her own part  
(2). soprano  
(3). bass  
(4). the part immediately below  
(5). the part immediately above  
(6). two voices away if an inside voice
Table I presents the parts order in which it is hypothesized that each student will detect errors.

### TABLE I

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<tr>
<th>The Part the Student Sings</th>
<th>Order in Which Errors Will be Heard</th>
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b. After completing the self-instructional program the student will be able to detect errors not only in his or her own part, but equally as well in the others listed in the above parts order.

### Definition of Terms

For the purpose of this study, the following terms are defined:
Self-instruction program.--This term refers to the particular program prepared for this study to lead the student, without the aid of a tutor, through a set of specified rhythmic activities sequentially designed to improve his ability to detect rhythmic errors during rehearsal.

Program.--The term program serves as an abbreviation for the term self-instruction program.

Tapes.--Tape(s) refers to either the program tapes or the test tapes. The program tapes (seven in number) are those containing vocal examples used in the self-instructional program. The test tapes (two in number) are the tapes used in The Rhythmic Error Detection Test.

Prepared Error.--Prepared error refers to any deliberate failure of the recording group to make the correct vocal response to the rhythmic requirements of the score.

Mistaken error.--Mistaken error refers to marks on the test scores where prepared errors do not occur on the tape.

Total Errors.--This term refers to a combination of the number of prepared errors left undetected and the number of mistaken errors committed, and is the score given for each test.

Rhythmic Figure.--Rhythmic figure refers to two or more notes spanning one or more beats which establish a pattern requiring rhythmic precision.
Score.--This term refers to the correct musical score on which no rhythmical errors are imposed.

Prepared Scores.--The prepared score was that score which had been altered to contain prepared errors for presentation on the tapes.

A List of Rhythmic Errors Commonly Made by Choirs in Rehearsal

1. Dotted rhythms.—The dot is either ignored (\(\text{\textbullet} \), sung \(\text{\textbullet} \)), or the figure is sung with a triplet feeling (\(\text{\textbullet} \) sung \(\text{\textbullet} \)), or in reverse order (\(\text{\textbullet} \) sung \(\text{\textbullet} \), or \(\text{\textbullet} \) sung \(\text{\textbullet} \)).

2. Even rhythms.—Often sung as a triplet (\(\text{\textbullet} \) sung \(\text{\textbullet} \)) or dotted (\(\text{\textbullet} \) sung \(\text{\textbullet} \)) if other voices have the triplet or dotted eighth and sixteenth.

3. Correct values.—Notes at ends of phrases too often not held long enough (\(\text{\textbullet} \) sung as \(\text{\textbullet} \), or \(\text{\textbullet} \), or \(\text{\textbullet} \)); \(\text{\textbullet} \) sung as \(\text{\textbullet} \), or \(\text{\textbullet} \), or \(\text{\textbullet} \), or \(\text{\textbullet} \)). When one or more parts hold while other parts move and release after a shorter note, those holding often do not hold long enough. Example:

4. Triplets.—Triplets not spread evenly across the beat (\(\text{\textbullet} \) sung as \(\text{\textbullet} \), or \(\text{\textbullet} \) as \(\text{\textbullet} \)). In 2/4 and 4/4 time, \(\text{\textbullet} \) often sung \(\text{\textbullet} \) or \(\text{\textbullet} \).
5. **Duplets.**—In compound meter, duplets are often sung too fast (\[\overline{\left(\begin{array}{c} x \\ \hline y \\
\end{array}\right)} \] sung as \[\left(\begin{array}{c} d \\ \hline e \\
\end{array}\right)\] ) or sung in a triplet style (\[\overline{\left(\begin{array}{c} x \\ \hline y \\
\end{array}\right)} \] sung as \[\left(\begin{array}{c} d \\ \hline e \\
\end{array}\right)\] ).

6. **Syncopation.**—

Short-long figures get "smoothed out" (\[\overline{\left(\begin{array}{c} d \\ \hline d \\
\end{array}\right)} \] sung \[\left(\begin{array}{c} d \\ \hline d \\
\end{array}\right)\] or \[\left(\begin{array}{c} d \\ \hline d \\
\end{array}\right)\].

Off-beat movement sung on the beat:

\[\overline{\left(\begin{array}{c} d \\ \hline d \\
\end{array}\right)} \] sung as \[\left(\begin{array}{c} d \\ \hline d \\
\end{array}\right)\]

Hemiola figures sung too fast or slow:

\[\overline{\left(\begin{array}{c} d \\ \hline d \\
\end{array}\right)} \] sung \[\left(\begin{array}{c} d \\ \hline d \\
\end{array}\right)\] or \[\left(\begin{array}{c} d \\ \hline d \\
\end{array}\right)\].

Tied notes are either held too long or not long enough: \[\overline{\left(\begin{array}{c} d \\ \hline d \\
\end{array}\right)} \] might be sung \[\left(\begin{array}{c} d \\ \hline d \\
\end{array}\right)\].

7. **Meter shift.**—Changes in meter, which shifts accents and groupings and units of measure, are often poorly done and destroy the flow of the musical line:

\[\overline{\left(\begin{array}{c} d \\ \hline d \\
\end{array}\right)} \] might be sung \[\left(\begin{array}{c} d \\ \hline d \\
\end{array}\right)\].

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**Basic Assumptions of Study**

The basic assumptions for this study were

1. All students involved in this study would give earnest attention to all instructions and requirements in completing the program, in order that the effectiveness of the program might be accurately determined.

2. Due to similar training and experiences at this university, differences between the two groups in critical
appraisal abilities at the beginning of the program would not be great enough to affect the results of the experiment significantly.

3. Students participating in this experiment would be generally representative of choral conducting students at the same level in their college careers at other colleges and universities offering comparable opportunities for study.

Organization of Remainder of Report

In Chapter II, books and studies pertinent to this study are reviewed. Findings of truly relevant related literature were scarce since no concentrated effort in the area of error detection, specifically rhythmic error detection, has been made. Chapter III describes how The Rhythmic Error Detection Test and the self-instructional program were developed and utilized, and Chapter IV presents and analyses the data obtained in the experiment. The summary, conclusions, and recommendations in Chapter V conclude the report. Materials developed and used in the course of the study are included in the Appendices.
RELATED STUDIES AND LITERATURE

An investigation of the literature regarding choral conducting classes and choral conducting has yielded very little evidence of intensive work having been done in the area of improving choral conducting students' abilities in error detection, especially rhythmic error detection. Research of the materials related to this study indicate that they fall into three large categories: materials on conducting and the teaching of it; programmed instruction; and materials on rhythm. Much of the material falls into two or more categories, but each reference will be reported in only one of these three large divisions.

Materials on Conducting

Although many books have been written and are still being written on conducting, little or no attention is given to error detection ability or to its importance. Of the large number of books on conducting music, both instrumental and choral, twelve will be cited as possibly or definitely related to this study. Some are mentioned
to illustrate that error detection is largely omitted from the list of essential skills which conductors must possess.¹

Books on Conducting

Four books have portions devoted to what might be called error prevention. In a book by Roberton,² the whole subject is approached largely from the standpoint of the choir's need to possess or receive rhythmic guidance from the conductor, implying that the conductor must do more than just beat time. Full of helpful illustrations and suggestions, this book has nothing in it on error detection and very little on error prevention, even though it alludes to the latter. Regarding rhythmic errors, Christy says: "If the rhythmic problems in new music are solved first, the reading of the intervals often becomes easy. Inaccuracies in rhythm should therefore be corrected immediately in the beginning rehearsals."³ All skills of conducting except error detection are covered in a book by Green. She speaks of

¹Out of the numerous books on conducting that have been written in the past thirty or so years, many are useful, even valuable, even though no mention is made in any of them of the topic of this study. Four such books are: Archibald T. Davison, Choral Conducting (1940); Noble Cain, Choral Music and Its Practice (1942); Wilhelm Ehmann, Choral Conducting, translated by George D. Wiebe (1963); and Jack Boyd, Rehearsal Guide For the Choral Director (1970).


³Van A. Christy, Glee Club and Chorus (New York, 1940), p. 54.
rhythm difficulties as being potential trouble spots, especially to the school conductor, and gives many suggestions which will help any conductor in avoiding many of the rhythmic pitfalls when they appear. As she points out, by having the score well prepared before rehearsal, the conductor can in his actual conducting gestures (which she discusses) help the group through quite a few rhythmically involved or problematic situations. One of the most comprehensive books available on the subject of choral conducting and choral music education is the one by Roe. Rhythm is one of the many subjects into which he delves very thoroughly. Although they are not approached specifically as error detection devices, in more than one place Roe gives examples of rhythmic pattern errors which frequently occur, and methodical, proven ways to correct them. He stresses the need to correct all errors immediately so that incorrect memory connections will not be formed. He further suggests that "students who are taught to isolate and recognize rhythmic patterns will probably be able to handle them when they occur in song material and recognize and correct at least part of their errors." Such drill on rhythmic patterns is even more necessary when learning contemporary music, according to Roe. An instrumental conducting book,

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6 Ibid., p. 323.
by Rudolph, is pertinent to this study because of its concern with changes of rhythm and tempo and how best to accomplish such changes. This is a very thorough book on the mechanics of conducting, containing numerous musical examples for study and on which to practice conducting.

*Conducting Choral Music*, by Robert L. Garretson, is a very practical book, offering solutions to many of the problems that the conductor will probably meet during the first few years of conducting and teaching experience. Specific practices and techniques are presented to give the reader all assistance possible, but because few teaching situations are alike, the things stressed are basic principles which would be helpful in increasing the conductor's insight and in providing a general approach for meeting and solving the many problems which constantly arise.

Much attention is given to the many facets of conducting, such as planning and organization, conducting techniques, tone and diction, style and interpretation, rehearsal techniques, programs and concerts, and even budgets and purchasing equipment. Even so, with a declared concern for providing practical experiences for the conductor in his professional training, no mention is made of the importance of learning to detect errors. Still, the book is very good for use in

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college and university courses in choral methods, choral conducting and materials, and secondary school music. A very good basic listing of choral pieces for most voice combinations is given in the Appendix, which should prove to be valuable to anyone setting up a department or beginning a program.

Gehrkens, in the introduction of his early-twentieth-century book, stresses the importance of aspiring conductors studying harmony, counterpoint, form, composition, and orchestration, as well as extra attention being given to harmonic ear training. He also urges a thorough knowledge of music history so that the various periods and their styles and forms may be well known and understood.

Following the introduction, he discusses such topics as personal traits necessary in conducting, baton technique, interpretations in conducting, and the many kinds of conductors (orchestral, choral). He mentions the conductor's role as a voice trainer, and the art of program making; gives some pertinent tips on the relationship of the conductor and the accompanist; and makes some suggestions on how to gain in efficiency in the rehearsal. His one reference to error detection is a warning to the conductor not to sing with the choir, because he will not be able to "detect errors and make intelligent criticisms" if he does.  

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10 Ibid., p. 161.
A very useful book is a collection of articles written by some of the leading choral directors in the country and edited by Neidig and Jennings. Each article is complete in itself, although the editors have carefully selected and arranged them so that in reading them one does not get a feeling of lack of continuity. Subjects range from personal and professional development and public relations to voice classes, all ensembles, contests and festivals, facilities and equipment, and rehearsal techniques. Over all, each topic is treated generally, but some rather thoroughly, as detailed how-to approaches are taken. The book is a valuable one and all choral conducting students stand to benefit by studying it. Included are fine listings of materials and repertoire, which should prove to be helpful to any conducting student. Again, none of the articles discuss how to detect errors or improve error detection ability.

Research Reports

In his 1963 study, Matthews alludes to the need for skills development, but is primarily concerned with the mechanics of conducting. Harrison feels that the total curriculum for the future conductor must be strengthened.


emphasizing competencies in voice, piano, laboratory experiences, and choral literature and materials. Other studies similar to the two mentioned have also been done.

In 1965, Carlsen briefly reviewed several then-current experiments in music education dealing with an aural aspect of programmed music instruction, and suggested several relevant implications. They are as follows:

1. Research in music can contribute to the development of a theory of teaching.
2. Program efficiency must always be established, but this can be done by means other than pitting the program against a live teacher.
3. The development of programs and appropriate hardware will widen the horizons of assistance which programmed music instruction can provide the teacher. As a result, the teacher should be able to increase the depth and quality of his instruction.
4. The need to understand the many problems of programming techniques will probably bring about the use of computer based program systems. These could and certainly should involve instruction in the aural aspects of music.
5. The need for basic research in aural perception is acute and should be given prime consideration.

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14 One such study was done by Robert Ward Getchell in 1957 at the State University of Iowa, resulting in recommendations for a one-semester beginning conducting course. The title is "An Investigation of, and Recommendations for, the Beginning Conducting Class in the College Curriculum." An abstract of this unpublished doctoral dissertation is published in Dissertation Abstracts, Vol. 17, 3038.
6. There is both basic and action research taking place in aural perception. It is important that the action researcher move ahead with what he does know, but at the same time, encourage basic research, observe the findings, and effectively modify his own findings as a result.\textsuperscript{15}

The Carlsen review came toward the end of a decade (1957-1967) in which great interest in programmed instruction had been shown. In a bibliography by Rogers and Almond, entries extending from the beginning of 1957 through November of 1967 indicated the increased attention given to programmed instruction during that time. Although most of the entries are in the area of music theory, other areas are psychology of music, instrumental methods, music history, music literature, and composition.\textsuperscript{16}

Programmed Materials in Music

The next fifteen citations in this section will have to do with programmed instruction in music that has been or is being done. Much has been written and is being written about utilizing programmed instruction in teaching many basic music skills. In his 1959 study of aural training, Spohn not only reported that his self-presentation method improved a student's ability to identify melodic and


harmonic intervals, but listed twelve advantages or by-products available when a self-instructional program is utilized.\textsuperscript{17} Carlsen, one of the leading music education researchers and author of a program of self-instruction in melodic perception, points out that complex concepts can be grasped almost as easily as simple concepts when taught by programmed instruction.\textsuperscript{18} In fact, the results of the experiment which led to the development of Carlsen's melodic perception program clearly indicate the value of programmed tape recorded material in teaching melodic dictation. Up to this time no study had conclusively supported the feasibility of using programmed instruction in such a manner.\textsuperscript{19}

In 1954, Hansen devised a test to investigate the score reading ability of both undergraduate music students and graduate music students. This test utilized the choral medium in its construction, containing thirty musical

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excerpts, lasting thirty-six minutes, containing 118 errors in performance. Testees heard each passage twice, and were to indicate by checking in boxes provided under the score the notes or chords in which the tape did not agree with the printed score. The test was given one time to two hundred-sixty students in eight colleges and universities, with the following general conclusions: (1) one or two years of music theory made a difference in performance on the test, but more than two years did not seem to matter; (2) grades in ear training correlated highly with test scores; (3) the better a student plays and reads at the piano, the better his achievement on the test; (4) age, sex, voice part sung in choir, voice or instrumental study (except piano) made very little difference on test results.20

Rizzolo, in 1969, designed a study to test the ability of the music student to improve his recognition of intonation errors by use of a prerecorded tape. The taped examples permitted the student to compare aurally errors of intonation on intervals, triads, and the chord of the dominant seventh with in-tune prototypes.21


The purpose was to ascertain the difference in the ability of two groups of music students to improve their sensitivity to errors of intonation and to improve their ability to recognize the direction of intonation errors in triads and chords in the performing ensemble. The study was limited to the development of sensitivity to the intonation of the major third, the minor third, the fifth, and the minor seventh, and the combination of these intervals as they form the major triad, the minor triad, and the chord of the dominant seventh. A control group was exposed to the traditional method of teaching intonation, and the experimental group was exposed to an experimental method utilizing seventeen tapes containing sharp and flat intervals.

The study revealed no significant differences between the experimental and control groups in their abilities to recognize errors of intonation in any of the intervals or chords mentioned, or to identify the direction of intonation errors—-that is, flat or sharp.

Many investigators have reported favorably regarding tape recorded drills to increase aural acuity. One of the earliest was Cookson in 1949.\textsuperscript{22} Other leaders reporting positive results from programmed drill materials were

\textsuperscript{22}Frank B. Cookson, Recordings and Self-Tutoring (Cleveland, 1949).
Clough\textsuperscript{23} and Poland,\textsuperscript{24} the latter in collaboration with previously mentioned Spohn. In 196?, Tarratus, using tapes developed by Spohn at The Ohio State University, conducted an experiment at Northwestern State College of Louisiana to see how students in a different locale would compare with those who originally took the tests and instruction. His findings compared favorably with the Ohio findings, and the results were statistically significant even with small groups.\textsuperscript{25}

Costanza, in a study of melodic and harmonic score reading skills, reported that these skills can be effectively taught by programmed instruction, that the learnings are transferable from one musical situation to another, and that such skills can be measured.\textsuperscript{26} Hewlett sought to determine

\begin{itemize}
\end{itemize}
if tape recorded material could be used for ear training practice as effectively as the traditional methods. He did this by experimentally comparing programmed ear training exercises requiring a written response (the student notating what he heard) with programmed exercises requiring a played response (the student playing at the keyboard what he heard on the tape). No significant differences were found between the two methods for over-all dictation, sight singing improvement, and rhythmic dictation. However, in the group required to play their responses, those with previous keyboard experience showed significant superiority in error detection type of dictation, implying that the played response method may be of value in training conductors, since detection of errors of all kinds is of utmost importance to the conductor.  

Sidnell has experimented with the testing of self-instructional drills to improve score reading skills that help instrumental teachers in detecting and identifying errors during rehearsals. He developed material of a self-instructional nature utilizing both programmed (experimental) and nonprogrammed (control) formats. Results of his experiment comparing the two sets of material showed that

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both the experimental and control groups improved significantly in score reading ability (which Sidnell defines as being able to detect and identify pitch and rhythm errors in instrumental performance), but the programmed format produced the greater improvement, thus implying that programmed drills can help prospective conductor/teachers improve their error detection skills, which are sorely needed by all conductors. A similar study for choral conductors by Walters is in progress, but is not available for inspection or review.

Ashford investigated the use of programmed instruction in fundamental concepts in music theory. Many factors in the study support programming as a method and point up the usefulness of such an approach. Other investigations regarding the use of programmed learning in music include Mandle's study on music reading, Schmalsteig's work with

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vowel forms and production,\textsuperscript{32} and Nelson's study on
students' perception of form.\textsuperscript{33}

\textit{Programmed Materials on Rhythm}

The remaining five entries in this chapter have to do
specifically with rhythm and programmed instruction. Many
of the foregoing books, articles, and studies touch on or
include rhythm in them, to be sure, but except for one, all
five articles or studies to follow deal with rhythm almost
exclusively. In an article examining the pedagogical and
psychological implications of automated music training,
Ihrke rather informally discusses the possible advantages,
as well as the possible problems, in utilizing programmed
instruction in music training. After separating the total
range of musical elements into two categories, those being
(1) musical facts, or nontonal information about music, and
(2) tones and their combinations, he turns to those elements
which may be termed proficiency and skill elements of musical
materials, two of them being rhythm and pitch. Although
rhythm is a very complicated factor in music, it has elements
within it which are clearcut and readily programmed. He

\textsuperscript{32}Emily Bortdorf Schmalsteig, "The Development and
Evaluation of Programmed Instruction in Singing Correctly
Produced, Uniform Vowels," \textit{Journal of Research in Music
Education}, \textbf{XVIII}, 3 (Fall, 1970), 293.

\textsuperscript{33}Carl B. Nelson, "The Effectiveness of the Use of
Adjunct Programmed Analyses of Musical Works on Students'
Perception of Form," \textit{Council for Research in Music Education,
Bulletin}, No. 9 (1967), 29-44.
than makes several suggestions as to how and why rhythm may be programmed effectively, but urges that great care be taken to insure a total musical experience for every student. Six years later, Ihrke conducted an experimental study to test the validity and effectiveness of automated rhythm training techniques. The device used consisted of four components—the training manual, electric keyboard, tape recorder, and an electronic rhythm monitor. The monitor compared signals from the tape model and from the student keyboard response, providing immediate feedback in terms of "early" and "late" error lights. The program of 235 items was linear. Student response was made concurrently with the hearing of background music which provided a musical setting for the rhythmic response.

Experimental subjects were randomly selected from a class of elementary classroom teacher trainees to see whether basic rhythmic proficiencies can be provided by this means. They were tested against results obtained by traditional methods in the classroom by use of a pre-test and a post-test, which provided data for statistical treatment. Results indicated that the program was highly effective; the null hypothesis was rejected at the 0.001 level.

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McArthur also found that rhythmic concepts and skills, when studied as an entity in themselves, can be better learned through programmed instruction rather than by conventional methods. Further, his findings indicate that they can be better learned when presented by a machine than by a teacher.36

Shrader, in his study of rhythmic sight reading based on principles of programmed learning, not only found that his program did improve the students' ability to sight-read rhythm, but that the method of training (programmed) was enjoyable and provided positive learning experiences for the students.37

Coffman's study was concerned with whether abilities in rhythm discrimination (the ability to discern whether two sounded rhythmic examples were the same or different) and rhythmic action (the ability to "play back" on a drum a sounded rhythmic example) could be determined by testing and improved with training and/or drill. Tests used were the Seashore Rhythm Discrimination Test (1939 "A" & "B"), and two tests developed by the experimenter: the Coffman


Rhythm Discrimination Test and the Coffman Motor Rhythm Test. Following intensive individualized training, definite improvement was shown by those in the experimental group in all areas except the Coffman Rhythm Discrimination Test, but the control group showed no significant gain in any area.\(^{38}\)

Coffman's findings showed that rhythm discrimination tests are useful in locating rhythm-deficient students who are in need of individual help, and that training will improve a student's ability in this area. These factors make Coffman's investigation relevant to this study.

Summary

The books and studies discussed in this chapter clearly demonstrate that it is practical and feasible to use tape recorded material together with self-instructional programs to develop aural skills in music. These same books and studies also reveal how relatively little has been done in music education to adapt and utilize the positive findings regarding such materials. By using programmed learning techniques, a basis for careful sequencing of musical learnings can be provided. While programmed instruction is not the answer to all problems of learning, it is a technique which music educators should utilize to a greater extent, especially since it can be of such benefit to the student.

CHAPTER III

PROCEDURES FOR DEVELOPMENT OF INSTRUMENT
AND COLLECTION AND TREATMENT OF DATA

Development of Instrument

Thirty examples from two to seven measures in length, based on their rhythmic appropriateness, were selected from existing choral literature, and in all but two of them rhythmic alterations were made in accordance with the List of Rhythmic Errors Commonly Made by Choirs in Rehearsal, which appears on pages nine and ten. A copy of the test, an explanation of the way Test I was rearranged to become Test II, the information sheet which accompanied Test I, the instructions for taking the test, and a list of the music used are all included in Appendix A. After the music scores had been prepared, eight voice students from the North Texas State University School of Music, under the direction of the researcher, rehearsed and recorded the examples. Regarding the prepared errors, there were no degrees of correctness or incorrectness; responses were either correct or incorrect. Problems of beginning and ending syllables and/or words (which must be rhythmical) were controlled in the preparation of the tapes so that there were no possibilities of confusion about the correctness or incorrectness of the rhythmical responses. Each example
was sung several times, the best of which was used for the test tape. The original tape was carefully edited and put into the final test form, which is described below (p.33).

To validate the test, the prepared scores, the correct scores, and the tape were presented to a panel of five judges, all of whom are recognized choral directors. They are Frank McKinley and Grant Williams, both of North Texas State University; Lloyd A. Pfautsch, Southern Methodist University; William A. Hunt, Oklahoma University; and James Henderson, North Mesquite High School, Mesquite, Texas. These judges compared the prepared scores and the correct scores to determine if the errors in the prepared scores were valid and representative of the type named, and placed each error into one of seven categories of types of errors. Then each judge listened to the tape to determine if the errors in the prepared scores were clearly and validly presented on the tape and usable as intended. A compilation of the validation sheets are in Appendix B. For each of the thirty items, if any of the three areas being validated was judged invalid by three or more of the judges, that particular item was removed from the test. One item was lost by this process, leaving a total of twenty-nine items in the test.

The test was given to seventeen members of a choral conducting class, all of whom were of junior standing at North Texas State University. Using the split-half method, the test was shown to have a reliability index of .2490, and,
using the Spearman-Brown formula, the estimated reliability index for the whole test was .3987. Another sample of seventeen students, junior choral conducting students at Oklahoma University, was tested, and the reliability index for this sample was as follows: split-half, .5518; the estimated reliability index for the whole test, .7112, or .71. The probable reason for there being such a difference between the two groups is that three of the seventeen North Texas State University students were not music majors, one other was on academic probation, and another had been suspended for one semester because of grades. Seven of the seventeen, it turns out, did not satisfactorily complete all the rhythmic requirements of the course. The instructor of the North Texas group had judged that his class was an unusual group, and the results of the test seemed to support his evaluation.

After the data became available, reliability index figures were also computed on Tests I and II. The size of these samples was twenty-five, or eight larger than the other two groups. (Test III was exactly the same as Test I, so its reliability index was not figured). Test II was a rearrangement of the items in Test I, which in effect created a new test. Therefore, even though Group A had been exposed to the program prior to Test II and Group B had not, it seemed that reporting Test II reliability figures was necessary. Reliability index figures for the two tests
are as follows: Test I: split-half, 0.5729; estimated reliability for the whole test, 0.7285; Test II: split-half, 0.5972; estimated reliability for the whole test, 0.7478. The average of the four reliability indexes computed (0.3987, 0.7112, 0.7285, and 0.7478) is 0.6465, or 0.65, which is well above the generally accepted minimum of 0.60 needed before any given test should be used.

Collection of Data

The Rhythmic Error Detection Test.—A series of musical examples, numbers one through twenty-nine, from two to seven measures in length were presented by a recording group on tape. This test contains 162 prepared errors and requires approximately one hour to administer. The student was provided a correct score for each of the examples. Each example was played two times with a twenty-second pause after each playing. The first time each example was played, the number for each was stated on the tape so as to agree with the number on the score; the second time the number was not stated. It was the students' responsibility to circle each note or rhythmic figure in each voice part that was sung incorrectly rhythmically. If a note was held too long or not long enough, that note was to be circled on the score. The student could do his marking while the tape played or he could wait until the pauses. The student needed to remember that the scores were correct but that each taped example might contain one or more errors, or no errors. If
a rhythmic figure was incorrect, the beat or beats on which that error occurred were to be circled; that is, the entire figure of which all or a part were incorrect. For example, if a dotted eighth and sixteenth were sung as two even eighths or as a quarter and an eighth in triplet relationship, the dotted eighth and sixteenth were to be circled as the rhythmic figure (or beat) incorrectly sung. Another example would be two half notes sung as a dotted half and a quarter. The two half notes were to be considered the incorrect figure to be circled. In compound time, the unit of measure (what kind of note gets the beat) was the dotted note corresponding with the meter signature, such as the dotted quarter in six-eight time and the dotted half in six-four time. The student was instructed that an incorrect rhythmic figure would include all of one or more beats, and in circling such errors the whole beat or beats were to be circled. Each prepared error on the tape not marked on the score was considered a mistake on the part of the student. Instructions to the test stressed that no guessing should be done since marks on the score where prepared errors did not appear on the tape would also be considered mistakes (mistaken errors).

A low score on the test was considered a good score. The object was to detect as many prepared errors as possible, and to commit as few mistaken errors as possible. The number of prepared errors left undetected was counted, as was the
number of mistaken errors committed. The combination of these two figures gives the total errors, which is the score given for the test.

Preceding the test proper were three examples. The prepared errors on the example scores were already marked to demonstrate the manner in which the student was to mark the scores of the test. The examples on the tape which correspond with the pre-marked example scores were separated by twenty-second pauses, just as in the test proper, to demonstrate the pace at which the test would proceed. Immediately after Example Three the test began; once the tape started it was not stopped until the conclusion of the test. This test was used as the pre-test (Test I), the mid-test (Test II), and as the post-test (Test III). The arrangement of the examples, however, was changed in the mid-test.

The Program.—A set of seven tapes was developed on which a recording group of eight voices sang a completely different series of examples. These tapes contain from fifteen to twenty-two examples each. The tapes are from ten to eighteen minutes each in length, the total tape time being one hour and twenty-five and one-half minutes. On the tapes each example was sung two times: (A) once with a rhythmic error (or errors) in one or more voices, and (B) another with all rhythms sung correctly. The student was allowed, even encouraged, to repeat Part A until he thought he had
located all errors. The student was provided with a booklet containing two musical scores for each example sung on the tapes. Both scores were correctly notated. The first score was used by the student on which to mark the errors as he heard them on the tapes. On the second score, all the errors which are on the tapes were pre-marked. This score was to be kept covered until the student had done his best to locate all the errors. Then, and only then, the student was to check his markings against the pre-marked score. After checking his own marked score against the pre-marked score, the student was again to replay Part A and watch the pre-marked score. At this point, the student was allowed to play Part B while watching his score, so that the difference between the two parts on the tapes could be observed. Following this the student was ready to move on to the next example and repeat the process. All scores for the program are in Appendix C.

After the program was prepared, it was used by selected members of the choral conducting class, Music 382, taught by Paul F. Roe, in the School of Music at North Texas State University. Selection was made in the manner described below. All students in the class had had some specific rhythmic skills training as pertains to choral conducting. The class was given a pre-test (Test I—see Appendix A) to determine the status, as regards error detection, of each class member. The class was then divided into two groups,
one of twelve and one of thirteen. Comparability of the groups was assured by first matching pre-test scores which were not significantly different from each other. Following this division, some additional balancing was necessary to assure an equal or near-equal distribution of voice parts between the two groups. Then the mean and standard deviation for each group was computed to assure that the groups were comparable. This information is contained in Table II.

TABLE II

MEANS AND STANDARD DEVIATIONS OF THE TWO GROUPS FOLLOWING THE PRE-TEST

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>122.61</td>
<td>29.62</td>
</tr>
<tr>
<td>B</td>
<td>122.08</td>
<td>22.84</td>
</tr>
</tbody>
</table>

Treatment of Data

The following statistical measures were used in testing Hypotheses One through Eleven. All calculations were done by computer.

Hypotheses 1 through 4. — The t test for dependent (related) samples was used, in which the independent variable was Test I and the dependent variable was Test II. A level of significance at or above .05 on the one-tailed test was set as acceptable for each of the hypotheses as stated.
Hypothesis 5.—The t test for independent (non-related) samples was used, requiring a level of significance less than .05 to accept this hypothesis as stated.

Hypothesis 6.—To test the correlations between initial error detection ability (Test I) and the variables named in this hypothesis, the following procedures were used:

- age: Pearson product moment
- sex: Point biserial
- number of years of private voice study: Pearson product moment
- number of years sung in high school and/or college choirs: Pearson product moment

Hypothesis 7.—Each of the five variables in this hypothesis was correlated with initial error detection ability scores (Test I) by use of the Pearson product moment.

Hypotheses 8 and 9.—To test the correlations between the gains in error detection ability and the variables named in these hypotheses, the following procedures were used:

- sex: Point biserial
- number of years of private voice study: Pearson product moment
- number of years sung in high school and/or college choirs: Pearson product moment

Hypotheses 10 and 11.—Each of the six variables in these hypotheses were correlated with the gains in error detection ability by use of the Pearson product moment.

Hypothesis 12.—Separate charts were prepared for Test I, Test II, and Test III showing the percentage of errors each student detected in each of the four parts. Percentages of errors detected were given rather than the actual number of errors because the four parts do not contain equal numbers
of errors. The use of percentages among the parts makes generalizations possible. These charts showed the initial error detection ability of each student in relation to the voice part that particular student sang, as well as the changes and trends in error detection ability which occurred following use of the self-instructional program. The charts and a discussion of them will be found in Chapter IV.

Data gained from the inspection of the program booklets each student used was also charted, and these charts and appropriate discussions of them are also to be found in Chapter IV.
CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

Hypothesis One

The t-test for dependent (related) samples was used to test the first four hypotheses. A level of significance at or above .05 on the one-tailed test was required to retain any of the four hypotheses as stated. Statistics for these hypotheses will be found in Table III.

Hypothesis One states that students in Group A will show a significant mean gain from Test I to Test II. This hypothesis was retained, with a mean difference of 41.69231 (S.D. = 21.08469), resulting in a t of 7.12952 (df = 12), and a p < 0.0001. This is significant. Table IV reveals that only one student did not decrease the number of prepared errors detected from Test I to Test II, but this same student had a sharp reduction in the number of mistaken errors committed from Test I to Test II, resulting in a reduction by over one-half his total errors from Test I to Test II.

Hypothesis Two

Hypothesis Two states that students in Group B will show no significant mean gain from Test I to Test II, this being a time during which no planned activities are engaged in by which error detection ability might be improved.
TABLE III

TABLE SHOWING \( t \) TEST FOR CORRELATED MEANS OF GROUPS A AND B FROM TEST I TO TEST II AND TEST II TO TEST III

<table>
<thead>
<tr>
<th>Group</th>
<th>Test I</th>
<th>Test II</th>
<th>Test III</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>A</td>
<td>122.61538</td>
<td>31.03906</td>
<td>80.92308</td>
</tr>
<tr>
<td>B</td>
<td>122.08333</td>
<td>23.85737</td>
<td>100.66667</td>
</tr>
<tr>
<td></td>
<td>41.69231</td>
<td>21.08469</td>
<td>2.84615</td>
</tr>
<tr>
<td></td>
<td>21.41567</td>
<td>19.78732</td>
<td>3.74935</td>
</tr>
</tbody>
</table>

\( t \) and \( p \) values for the \( t \) test are also shown.
This hypothesis was rejected, with a mean difference of 21.41667 (S D = 19.78732), resulting in a t of 3.74935 (df = 11), and a p<0.0035. A possible reason for this group's showing improvement even before going through the program could be familiarity with the testing procedure. (This could be true for both groups). An examination of the scores in Table V reveals that the number of mistaken errors made by the members of this group reduced greatly for all except two from Test I to Test II, thus significantly reducing the total errors committed. This was possible even though the number of prepared errors overlooked did not become greatly lower.

Hypothesis Three

Hypothesis Three states that students in Group B will show a significant mean gain from Test II to Test III. This hypothesis was retained, with a mean difference of 22.58333 (S D = 14.92075), resulting in a t of 5.24310 (df = 11), and a p<0.0005. This is significant. Again referring to Table V, a further reduction in the number of mistaken errors committed by the members of this group is in evidence. Even in the case of student number 16, whose mistaken errors committed actually increased from Test II to Test III, his reduction of prepared errors overlooked effected a lower total errors on Test III, even though his overall reduction from Test I to Test III was not as great as some of the other members of this group.
### TABLE IV

**COMPARISON OF SCORES ON TESTS I, II, AND III, FOR GROUP A**

<table>
<thead>
<tr>
<th>Student Number</th>
<th>Prepared Errors*</th>
<th>Mistaken Errors**</th>
<th>Total Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Test I Test II Test III</td>
<td>Test I Test II Test III</td>
<td>Test I Test II Test III</td>
</tr>
<tr>
<td>1</td>
<td>46  47  40</td>
<td>83  16  28</td>
<td>129  63  68</td>
</tr>
<tr>
<td>3</td>
<td>60  47  30</td>
<td>30  16  5</td>
<td>90  63  35</td>
</tr>
<tr>
<td>4</td>
<td>74  53  76</td>
<td>51  30  18</td>
<td>125  83  94</td>
</tr>
<tr>
<td>5</td>
<td>69  51  54</td>
<td>22  11  2</td>
<td>91  62  56</td>
</tr>
<tr>
<td>7</td>
<td>106  83  65</td>
<td>58  20  28</td>
<td>164  103  93</td>
</tr>
<tr>
<td>11</td>
<td>43  40  38</td>
<td>11  8  4</td>
<td>54  48  42</td>
</tr>
<tr>
<td>12</td>
<td>56  45  50</td>
<td>50  14  9</td>
<td>106  59  59</td>
</tr>
<tr>
<td>14</td>
<td>88  46  61</td>
<td>63  31  9</td>
<td>151  77  70</td>
</tr>
<tr>
<td>17</td>
<td>97  88  83</td>
<td>53  30  30</td>
<td>150  118  113</td>
</tr>
<tr>
<td>20</td>
<td>102  93  83</td>
<td>50  20  26</td>
<td>152  113  109</td>
</tr>
<tr>
<td>21</td>
<td>64  63  66</td>
<td>50  34  23</td>
<td>114  97  89</td>
</tr>
<tr>
<td>22</td>
<td>99  54  72</td>
<td>34  44  7</td>
<td>133  96  79</td>
</tr>
<tr>
<td>25</td>
<td>101  51  83</td>
<td>34  17  27</td>
<td>135  68  108</td>
</tr>
</tbody>
</table>

*Errors on tapes not circled on scores
**Notes or rhythmic figures circled on scores which did not occur on tapes
Hypothesis Four

Hypothesis Four states that students in Group A will show no significant gain from Test II to Test III, this being a time during which no planned activities are engaged in by which error detection ability might be improved. This hypothesis was retained, with a mean difference of 2.84615 (SD = 16.33425), resulting in a $t$ of 0.6285 (df = 12), and a $p = 0.2738$. Referring to Table IV, it is observed that seven (over half the group) showed increases in prepared errors overlooked from Test II to Test III, with the number of mistaken errors committed increasing also for four. However, even though four students actually had increases in total errors from Test II to Test III, the group had a decrease in total errors from Test I to Test III.

Hypothesis Five

The $t$ test for independent (non-related) samples was used to test Hypothesis Five. A level of significance less than .05 was required to retain this hypothesis as stated.

This hypothesis states that no difference will be found between the mean gain made by Group A between Test I and Test II and the mean gain made by Group B between Test II and Test III. Rejection of the hypothesis was necessary at the .05 level, the probability of the calculated $t$ being 0.0154 ($t = 2.5948$, df = 23).
<table>
<thead>
<tr>
<th>Student Number</th>
<th>Prepared Errors*</th>
<th>Mistaken Errors**</th>
<th>Total Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Test I</td>
<td>Test II</td>
<td>Test III</td>
</tr>
<tr>
<td>2</td>
<td>58</td>
<td>61</td>
<td>55</td>
</tr>
<tr>
<td>6</td>
<td>95</td>
<td>101</td>
<td>77</td>
</tr>
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<td>8</td>
<td>82</td>
<td>74</td>
<td>73</td>
</tr>
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<td>9</td>
<td>96</td>
<td>85</td>
<td>65</td>
</tr>
<tr>
<td>10</td>
<td>58</td>
<td>46</td>
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<tr>
<td>13</td>
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<td>117</td>
<td>92</td>
<td>71</td>
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<td>16</td>
<td>88</td>
<td>97</td>
<td>68</td>
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<tr>
<td>18</td>
<td>95</td>
<td>85</td>
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<tr>
<td>19</td>
<td>92</td>
<td>98</td>
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<td>23</td>
<td>68</td>
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<td>45</td>
</tr>
<tr>
<td>24</td>
<td>100</td>
<td>94</td>
<td>62</td>
</tr>
</tbody>
</table>

*Errors on tapes not circled on scores
**Notes or rhythmic figures circled on scores which did not occur on tapes
TABLE VI
DIFFERENCE OF MEAN GAINS BETWEEN GROUP A AND GROUP B

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>S.D</th>
<th>t</th>
<th>F-Ratio</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>41.69231</td>
<td>21.08469</td>
<td>2.5948</td>
<td>6.7329</td>
<td>0.0154</td>
</tr>
<tr>
<td>B</td>
<td>22.58333</td>
<td>14.92075</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Hypothesis Six

To test the correlations between initial error detection ability (Test I) and the variables named in Hypothesis Six, the Pearson product moment was used for all variables. For sex the point biserial was used. Statistics for this hypothesis will be found in Table VII.

This hypothesis states that no significant correlation will be found to exist between initial error detection ability of the combined groups and each of four variables. None of the four variables achieved any significant correlation at any level, therefore the whole hypothesis was retained as stated. The separate variables and their correlation coefficients are as follows:

a. age; correlation coefficient 0.3192 (less than .396)
b. sex; correlation coefficient -0.1940 (less than .396)
c. number of years of private voice study; correlation coefficient 0.1608 (less than .396)
d. number of years sung in high school and/or college choirs; correlation coefficient 0.1862 (less than .396)
<table>
<thead>
<tr>
<th>Variable</th>
<th>Correlation Coefficients</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Test I</td>
<td>Test II</td>
</tr>
<tr>
<td>Age</td>
<td>0.3192</td>
<td>0.3936</td>
</tr>
<tr>
<td>Sex</td>
<td>-0.1940</td>
<td>---</td>
</tr>
<tr>
<td>Number of Years of Private Voice</td>
<td>-0.1608</td>
<td>-0.0448</td>
</tr>
<tr>
<td>Number of Years sung in Choirs</td>
<td>-0.1862</td>
<td>0.0770</td>
</tr>
<tr>
<td>Number of Years of Private Piano</td>
<td>-0.2266</td>
<td>-0.1954</td>
</tr>
<tr>
<td>Number of Years of Private Instrument Study</td>
<td>-0.3612</td>
<td>-0.3013</td>
</tr>
<tr>
<td>Number of Years Played in Bands/Orchestras</td>
<td>-0.5129</td>
<td>-0.5231</td>
</tr>
<tr>
<td>SAT Math Score</td>
<td>-0.5357</td>
<td>-0.2561</td>
</tr>
<tr>
<td>Sophomore Music Theory Grade</td>
<td>-0.3910</td>
<td>-0.4847</td>
</tr>
</tbody>
</table>

Hypothesis Seven

Each of the five variables in Hypothesis Seven was correlated with initial error detection ability (Test I) by use of the Pearson product moment. Statistics for this hypothesis will be found in Table VII.

This hypothesis states that a significant correlation will be found to exist between initial error detection ability (Test I) of the combined group and each of five variables. Two variables achieved significance, although inverse, even at the .01 level; three were rejected, although
one did achieve significance at the .10 level. The separate variables, whether retained or rejected, and the correlation coefficient for each variable are as follows:

a. number of years of private piano study; rejected, the correlation coefficient of -0.2266 being less than the .05 level (.396)

b. number of years of private instrumental study; rejected, but the correlation coefficient of -0.3612 does achieve an inverse significance at the .10 level (.337) even though it does not at the .05 level, suggesting that the more years of private instrumental study, the lower the scores on Test I

c. number of years played in bands and/or orchestras; retained, as an inverse correlation, even at the .01 level (.505), the correlation coefficient of -0.5129 being greater than .505, strongly suggesting that the more years played in bands and/or orchestras, the lower the scores on Test I

d. math score on SAT; retained, as an inverse correlation, even at the .01 level (.505), the correlation coefficient of -0.5357 being greater than .505, strongly suggesting that the higher the SAT math scores, the lower the scores on Test I

e. grade in sophomore music theory; rejected, the correlation coefficient of -0.3190 being less than the .05 level (.396)

Hypothesis Eight

To test the correlations between the gains in error detection ability and the variables named in Hypotheses Eight and Nine, the Pearson product moment was used for all except sex. Point biserial was used for sex. Statistics for Hypothesis Eight will be found in Table VIII.

Hypothesis Eight states that no significant correlation will be found to exist between the gains in error detection ability from Test I to Test II for members of Group A and
each of three variables. None of the variables achieved significance at any level. Therefore, the whole hypothesis was retained, all of the correlation coefficients being less than the .05 level of .553. The separate variables and their correlation coefficients are as follows:

a. sex; -0.2684
b. number of years of private voice study; -0.1805
c. number of years sung in high school and/or college choirs; -0.0609

Table VIII

Correlation Coefficients for Group A of All Variables With Means of Test I and Mean Differences of Test I and Test II, Test II and Test III

<table>
<thead>
<tr>
<th>Variable</th>
<th>Correlation Coefficients</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Test I - Test II</td>
<td>Test I - Test III</td>
</tr>
<tr>
<td>Age</td>
<td>-0.2978</td>
<td>-0.1167</td>
</tr>
<tr>
<td>Sex</td>
<td>-0.2684</td>
<td>-0.0998</td>
</tr>
<tr>
<td>Number of Years of Private Voice</td>
<td>-0.1805</td>
<td>-0.3104</td>
</tr>
<tr>
<td>Number of Years Sung in Choirs</td>
<td>-0.0609</td>
<td>-0.1989</td>
</tr>
<tr>
<td>Number of Years of Private Piano</td>
<td>-0.0750</td>
<td>-0.3021</td>
</tr>
<tr>
<td>Number of Years of Private Instrument Study</td>
<td>0.2617</td>
<td>-0.6660</td>
</tr>
<tr>
<td>Number of Years Played in Bands and/or Orchestras</td>
<td>0.0762</td>
<td>-0.5476</td>
</tr>
<tr>
<td>SAT Math score</td>
<td>-0.4141</td>
<td>-0.5555</td>
</tr>
<tr>
<td>Sophomore Music Theory Grade</td>
<td>-0.2202</td>
<td>0.4162</td>
</tr>
</tbody>
</table>
Hypothesis Nine

Statistics for Hypothesis Nine will be found in Table IX. This hypothesis states that no significant correlation will be found to exist between the gains in error detection ability from Test II to Test III for members of Group B and each of three variables. As in Hypothesis Eight and Group A, none of the variables achieved significance at any level. Therefore, the whole hypothesis was retained, all of the correlation coefficients being less than the .05 level (.576). The separate variables and their correlation coefficients are as follows:

a. sex; -0.3470
b. number of years of private voice study; 0.0279
c. number of years sung in high school and/or college choirs; 0.0427

Hypothesis Ten

Each of the six variables in Hypotheses Ten and Eleven were correlated with the gains in error detection by use of the Pearson product moment. Statistics for these hypotheses will be found as follows: Hypothesis Ten, Table VIII; Hypothesis Eleven, Table IX.

Hypothesis Ten states that a significant correlation will be found to exist between the gains in error detection ability by members of Group A from Test I to Test II and each of six variables. The whole hypothesis was rejected because none of the six variables achieved a correlation coefficient
at or above the .05 level (.553). The separate variables and their correlation coefficients are as follows:

a. age; -0.2978
b. number of years of private piano study; -0.0750
c. number of years of private instrumental study; 0.2617
d. number of years played in bands and/or orchestras; 0.0782
e. math score on SAT; -0.4141 (This did achieve an inverse significance at the .10 level (.377)
f. grade in sophomore music theory; -0.2202

TABLE IX
CORRELATION COEFFICIENTS FOR GROUP B OF ALL VARIABLES WITH MEANS OF TEST I AND MEAN DIFFERENCES OF TEST I AND TEST II, TEST II AND TEST III

<table>
<thead>
<tr>
<th>Variable</th>
<th>Test I - Test II</th>
<th>Test II - Test III</th>
<th>Test I - Test II</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.2113</td>
<td>0.0266</td>
<td>0.4766</td>
<td>12</td>
</tr>
<tr>
<td>Sex</td>
<td>-0.0799</td>
<td>0.0728</td>
<td>-0.3470</td>
<td>12</td>
</tr>
<tr>
<td>Number of Years of Private Voice</td>
<td>-0.3482</td>
<td>0.0279</td>
<td>0.0327</td>
<td>12</td>
</tr>
<tr>
<td>Number of Years Sung in Choirs</td>
<td>0.2693</td>
<td>0.0427</td>
<td>0.2114</td>
<td>12</td>
</tr>
<tr>
<td>Number of Years of Private Piano</td>
<td>-0.3046</td>
<td>0.3271</td>
<td>-0.3276</td>
<td>12</td>
</tr>
<tr>
<td>Number of Years Played in Bands and/or Orchestras</td>
<td>-0.4635</td>
<td>0.0418</td>
<td>-0.7348</td>
<td>12</td>
</tr>
<tr>
<td>SAT Math Scores</td>
<td>-0.4753</td>
<td>0.0960</td>
<td>-0.4647</td>
<td>8</td>
</tr>
<tr>
<td>Sophomore Music Theory Grade</td>
<td>0.1016</td>
<td>0.2656</td>
<td>-0.1602</td>
<td>11</td>
</tr>
</tbody>
</table>
Hypothesis Eleven

Hypothesis Eleven states that a significant correlation will be found to exist between the gains in error detection ability by members of Group B from Test II to Test III and each of the variables listed in Hypothesis Ten above. As in Hypothesis Ten, none of the six variables achieved a correlation coefficient at or above the .05 level (.576). Therefore, the whole hypothesis was rejected. The correlation coefficients for the separate variables are as follows:

- a. age; 0.0266
- b. number of years of private piano study; 0.3217
- c. number of years of private instrument study; 0.0416
- d. number of years played in bands and/or orchestras; 0.0793
- e. math score on SAT; -0.0960
- f. grade in sophomore music theory; -0.2656

Hypothesis Twelve

Separate tables were prepared for each of the three tests, showing the percentage of errors each student detected for each voice part. These numbers are shown in relation to the voice part each particular student sang (See Tables X through XIV). Because the four voice parts did not contain equal numbers of errors, numbers of errors were converted to percentages so that comparisons could be made.

Part (a) of this hypothesis states that at the beginning of the experiment each subject would tend to detect errors in the following order:
### Table X

**Chart Showing Order of Percentage of Errors Detected by Each Student in Relation to His or Her Voice Part and Other Voice Parts for Combined Groups Following Test I**

<table>
<thead>
<tr>
<th>Student</th>
<th>Hypothesized Order of Detections</th>
<th>Order of Detections</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hypothesized Percentages</td>
<td></td>
</tr>
<tr>
<td></td>
<td>His voice</td>
<td>Other</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>67.57</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>70.27</td>
</tr>
<tr>
<td>3</td>
<td>A</td>
<td>64.86</td>
</tr>
<tr>
<td>4</td>
<td>A</td>
<td>56.76</td>
</tr>
<tr>
<td>5</td>
<td>A</td>
<td>62.16</td>
</tr>
<tr>
<td>6</td>
<td>A</td>
<td>37.84</td>
</tr>
<tr>
<td>7</td>
<td>B</td>
<td>35.71</td>
</tr>
<tr>
<td>8</td>
<td>B</td>
<td>47.62</td>
</tr>
<tr>
<td>9</td>
<td>T</td>
<td>43.18</td>
</tr>
<tr>
<td>10</td>
<td>A</td>
<td>70.27</td>
</tr>
<tr>
<td>11</td>
<td>B</td>
<td>71.43</td>
</tr>
<tr>
<td>12</td>
<td>T</td>
<td>65.61</td>
</tr>
<tr>
<td>13</td>
<td>S</td>
<td>46.15</td>
</tr>
<tr>
<td>14</td>
<td>S</td>
<td>48.72</td>
</tr>
<tr>
<td>15</td>
<td>S</td>
<td>25.64</td>
</tr>
<tr>
<td>16</td>
<td>A</td>
<td>43.24</td>
</tr>
<tr>
<td>17</td>
<td>S</td>
<td>41.03</td>
</tr>
<tr>
<td>18</td>
<td>S</td>
<td>41.03</td>
</tr>
<tr>
<td>19</td>
<td>A</td>
<td>43.24</td>
</tr>
<tr>
<td>20</td>
<td>S</td>
<td>38.45</td>
</tr>
<tr>
<td>21</td>
<td>S</td>
<td>58.97</td>
</tr>
<tr>
<td>22</td>
<td>S</td>
<td>38.45</td>
</tr>
<tr>
<td>23</td>
<td>S</td>
<td>53.85</td>
</tr>
<tr>
<td>24</td>
<td>S</td>
<td>41.03</td>
</tr>
<tr>
<td>25</td>
<td>A</td>
<td>35.14</td>
</tr>
<tr>
<td>Number</td>
<td>Part</td>
<td>His or her own part</td>
</tr>
<tr>
<td>--------</td>
<td>------</td>
<td>---------------------</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>70.20</td>
</tr>
<tr>
<td>3</td>
<td>A</td>
<td>72.79</td>
</tr>
<tr>
<td>4</td>
<td>A</td>
<td>70.27</td>
</tr>
<tr>
<td>5</td>
<td>A</td>
<td>72.97</td>
</tr>
<tr>
<td>7</td>
<td>B</td>
<td>50.00</td>
</tr>
<tr>
<td>11</td>
<td>B</td>
<td>73.81</td>
</tr>
<tr>
<td>12</td>
<td>T</td>
<td>65.91</td>
</tr>
<tr>
<td>14</td>
<td>S</td>
<td>69.23</td>
</tr>
<tr>
<td>17</td>
<td>S</td>
<td>46.15</td>
</tr>
<tr>
<td>20</td>
<td>S</td>
<td>43.59</td>
</tr>
<tr>
<td>21</td>
<td>S</td>
<td>61.54</td>
</tr>
<tr>
<td>22</td>
<td>S</td>
<td>64.10</td>
</tr>
<tr>
<td>25</td>
<td>A</td>
<td>64.85</td>
</tr>
</tbody>
</table>

*No change in order of detections from Test I.
All percentages increased
TABLE XII

CHART SHOWING ORDER OF PERCENTAGE OF ERRORS DETECTED
BY EACH STUDENT IN RELATION TO HIS OR HER VOICE
PART AND OTHER VOICE PARTS FOR GROUP B
FOLLOWING TEST III

<table>
<thead>
<tr>
<th>Number</th>
<th>Part Song</th>
<th>His or her own part</th>
<th>soprano</th>
<th>bass</th>
<th>The part immediately below</th>
<th>The part immediately above</th>
<th>Two voices away if an inside voice</th>
<th>Order of Detections</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>A</td>
<td>67.57</td>
<td>75.68</td>
<td>61.90</td>
<td>63.64T</td>
<td>...</td>
<td>...</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>6</td>
<td>A</td>
<td>56.76</td>
<td>48.72</td>
<td>50.00</td>
<td>54.55T</td>
<td>...</td>
<td>...</td>
<td>4 1 2 3</td>
</tr>
<tr>
<td>8</td>
<td>B</td>
<td>52.38</td>
<td>53.85</td>
<td>...</td>
<td>...</td>
<td>56.82T</td>
<td>56.76A</td>
<td>3 2 1 4</td>
</tr>
<tr>
<td>9</td>
<td>T</td>
<td>56.82</td>
<td>61.54</td>
<td>61.90</td>
<td>...</td>
<td>59.46A</td>
<td>...</td>
<td>3 2 1 4</td>
</tr>
<tr>
<td>10</td>
<td>A</td>
<td>78.38</td>
<td>76.92</td>
<td>66.67</td>
<td>72.73T</td>
<td>...</td>
<td>...</td>
<td>*2 1 3 4</td>
</tr>
<tr>
<td>13</td>
<td>S</td>
<td>66.67</td>
<td></td>
<td>50.00</td>
<td>59.46A</td>
<td>...</td>
<td>68.18T</td>
<td>2 3 1 4</td>
</tr>
<tr>
<td>15</td>
<td>S</td>
<td>56.41</td>
<td></td>
<td>54.76</td>
<td>59.46A</td>
<td>...</td>
<td>54.55T</td>
<td>2 3 4 1</td>
</tr>
<tr>
<td>16</td>
<td>A</td>
<td>54.05</td>
<td>58.97</td>
<td>59.52</td>
<td>52.27T</td>
<td>...</td>
<td>...</td>
<td>2 3 4 1</td>
</tr>
<tr>
<td>18</td>
<td>S</td>
<td>61.54</td>
<td></td>
<td>52.33</td>
<td>59.46A</td>
<td>...</td>
<td>56.82T</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>19</td>
<td>A</td>
<td>43.24</td>
<td>51.28</td>
<td>50.00</td>
<td>40.91T</td>
<td>...</td>
<td>...</td>
<td>1 3 4 2</td>
</tr>
<tr>
<td>23</td>
<td>S</td>
<td>74.36</td>
<td></td>
<td>73.81</td>
<td>67.57A</td>
<td>...</td>
<td>68.18T</td>
<td>1 3 4 2</td>
</tr>
<tr>
<td>24</td>
<td>S</td>
<td>66.67</td>
<td></td>
<td>64.29</td>
<td>56.76A</td>
<td>...</td>
<td>59.09T</td>
<td>1 3 4 2</td>
</tr>
</tbody>
</table>

*No change in order of detections from Test I. All percentages increased
TABLE XIII

CHART SHOWING ORDER OF PERCENTAGE OF ERRORS DETECTED
BY EACH STUDENT IN RELATION TO HIS OR HER VOICE
PART AND OTHER VOICE PARTS FOR COMBINED
GROUPS FOLLOWING TEST II

<table>
<thead>
<tr>
<th>Student</th>
<th>Part Studied</th>
<th>His or her own part</th>
<th>Other parts</th>
<th>Bass</th>
<th>The part immediately below</th>
<th>The part immediately above</th>
<th>Two voices away, if any</th>
<th>Inside voice</th>
<th>Order of Detections</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>70.27</td>
<td>69.23</td>
<td>66.67</td>
<td>70.45T</td>
<td></td>
<td></td>
<td></td>
<td>3 2 1 4</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>62.16</td>
<td>66.67</td>
<td>61.90</td>
<td>59.09T</td>
<td></td>
<td></td>
<td></td>
<td>2 1 4 3</td>
</tr>
<tr>
<td>3</td>
<td>A</td>
<td>72.97</td>
<td>71.79</td>
<td>65.29</td>
<td>70.45T</td>
<td></td>
<td></td>
<td></td>
<td>2 1 3 4</td>
</tr>
<tr>
<td>4</td>
<td>A</td>
<td>70.27</td>
<td>78.38</td>
<td>65.67</td>
<td>63.18T</td>
<td></td>
<td></td>
<td></td>
<td>*1 2 3 4</td>
</tr>
<tr>
<td>5</td>
<td>A</td>
<td>72.97</td>
<td>71.79</td>
<td>64.29</td>
<td>65.91T</td>
<td></td>
<td></td>
<td></td>
<td>2 1 3 4</td>
</tr>
<tr>
<td>6</td>
<td>A</td>
<td>37.84</td>
<td>35.46</td>
<td>35.71</td>
<td>38.64T</td>
<td></td>
<td></td>
<td></td>
<td>3 1 2 4</td>
</tr>
<tr>
<td>7</td>
<td>B</td>
<td>50.00</td>
<td>48.72</td>
<td></td>
<td></td>
<td>47.73T</td>
<td>48.65A</td>
<td>1 2 3 4</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>B</td>
<td>45.24</td>
<td>51.28</td>
<td></td>
<td></td>
<td>54.55T</td>
<td>56.76A</td>
<td>3 1 2 4</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>T</td>
<td>47.73</td>
<td>46.15</td>
<td>40.48</td>
<td></td>
<td>38.64A</td>
<td></td>
<td></td>
<td>2 4 1 3</td>
</tr>
<tr>
<td>10</td>
<td>A</td>
<td>72.79</td>
<td>71.79</td>
<td>69.05</td>
<td>72.73T</td>
<td></td>
<td></td>
<td></td>
<td>3 1 2 4</td>
</tr>
<tr>
<td>11</td>
<td>B</td>
<td>73.81</td>
<td>79.49</td>
<td></td>
<td></td>
<td>70.45T</td>
<td>72.97A</td>
<td>1 3 4 2</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>T</td>
<td>65.91</td>
<td>76.92</td>
<td>76.19</td>
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<td>S</td>
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</tr>
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<td>42.86</td>
<td>40.91T</td>
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<td>S</td>
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<td></td>
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<td>S</td>
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<td>61.90</td>
<td>61.36T</td>
<td></td>
<td></td>
<td></td>
<td>1 2 4 3</td>
</tr>
</tbody>
</table>

*No change in order of detections from Test I.
All percentages increased.
### TABLE XIV

**CHART SHOWING ORDER OF PERCENTAGE OF ERRORS DETECTED BY EACH STUDENT IN RELATION TO HIS OR HER VOICE PART AND OTHER VOICE PARTS FOR COMBINED GROUPS FOLLOWING TEST III**

<table>
<thead>
<tr>
<th>Student Number</th>
<th>Hypothesized Order of Detections</th>
<th>Order of Detections</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>His part</td>
<td>Soprano</td>
</tr>
<tr>
<td>1 A</td>
<td>75.68</td>
<td>74.86</td>
</tr>
<tr>
<td>2 A</td>
<td>67.57</td>
<td>75.68</td>
</tr>
<tr>
<td>3 A</td>
<td>85.78</td>
<td>87.12</td>
</tr>
<tr>
<td>4 A</td>
<td>59.46</td>
<td>58.97</td>
</tr>
<tr>
<td>5 A</td>
<td>75.68</td>
<td>66.67</td>
</tr>
<tr>
<td>6 A</td>
<td>56.76</td>
<td>48.72</td>
</tr>
<tr>
<td>7 B</td>
<td>59.52</td>
<td>61.54</td>
</tr>
<tr>
<td>8 B</td>
<td>52.38</td>
<td>53.85</td>
</tr>
<tr>
<td>9 T</td>
<td>56.82</td>
<td>61.54</td>
</tr>
<tr>
<td>10 A</td>
<td>76.38</td>
<td>76.92</td>
</tr>
<tr>
<td>11 B</td>
<td>83.33</td>
<td>79.49</td>
</tr>
<tr>
<td>12 T</td>
<td>65.91</td>
<td>74.36</td>
</tr>
<tr>
<td>13 S</td>
<td>66.67</td>
<td>. . . .</td>
</tr>
<tr>
<td>14 S</td>
<td>61.54</td>
<td>. . . .</td>
</tr>
<tr>
<td>15 S</td>
<td>56.41</td>
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<td>16 A</td>
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<td>18 S</td>
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</tr>
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<td>19 A</td>
<td>43.24</td>
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<td>20 S</td>
<td>43.59</td>
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<td>. . . .</td>
</tr>
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<td>22 S</td>
<td>58.97</td>
<td>. . . .</td>
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<tr>
<td>23 S</td>
<td>74.36</td>
<td>. . . .</td>
</tr>
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<td>24 S</td>
<td>66.67</td>
<td>. . . .</td>
</tr>
<tr>
<td>25 A</td>
<td>45.95</td>
<td>51.28</td>
</tr>
</tbody>
</table>

*No change in order of detections from Test I. All percentages increased*
(1) his or her own part
(2) soprano
(3) bass
(4) the part immediately below
(5) the part immediately above
(6) the part two voices away if an inside voice

As shown in Table X, no student detected the errors in the hypothesized order. Only eight of the twenty-five students detected errors in their own voice parts better than in the other three voice parts, and only two of that eight also detected more errors in order (for the second voice part) according to the hypothesized order. Errors were detected quite evenly among the four parts. The largest number was in the bass part (Table XVII), with nine detections, and the other three parts were the same, with eight each. Therefore, Part (a) of this hypothesis cannot be retained.

Part (b) of this hypothesis states that after the program had been completed the student would detect errors equally well in all parts. Part (a) revealed that this was already the case with Test I, and it did not change appreciably for either Group A or B following Tests II and III respectively. Following the program, Test II revealed the order of detections for Group A still evenly distributed as follows: soprano, 8; alto, 7; tenor, 8; and bass, 7 (Table XV). Following the program for Group B, the order of detections was even more equally distributed at five each for soprano, alto, tenor, and bass (Table XVI). The use of the program did not seem to affect one way or the other the order of detections for either
group. Tables XV, XVI, and XVII tend to suggest that for this particular class of conducting students Part (b) of this hypothesis can be retained.

Two students in Group A, numbers 4 and 17 (Table XI), did not change the parts order in which they detected errors following the program (from Test I to Test II), and one student in Group B, number 10 (Table XII), following the program retained the parts order in which she initially detected errors (from Test I to Test III).

Tabulations for the combined groups following Tests II and III (Table XVII) show that there was fairly equal distribution in the order detections were made. They are as follows: Test II—soprano, 12; alto, 11; tenor, 10; and bass, 11; Test III—soprano, 10; alto, 11; tenor, 9; and bass, 11. These figures tend to further support Part (b) of this hypothesis.

Additional Data Analysis

Tables XVIII and XIX show the length of time Group A and Group B, respectively, spent on the seven tapes of the program, and the total times spent. Even though Group B had one less subject, the time spent was greater on all tapes. Both groups, as well as most individuals, spent more time on the Even Rhythms tape and the Correct Values tape. The reason for more time being spent on the Correct Values tape is obvious since it is the longest of the seven tapes. The probable reason for so much time having been
TABLE XV

TABLE SHOWING NUMBER OF DETECTIONS BY PARTS FOR GROUP A FOLLOWING TEST II

<table>
<thead>
<tr>
<th>Part</th>
<th>Soprano</th>
<th>Alto</th>
<th>Tenor</th>
<th>Bass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soprano</td>
<td>8</td>
<td>3</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Alto</td>
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<td>2</td>
</tr>
<tr>
<td>Bass</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>7</td>
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</table>

TABLE XVI

TABLE SHOWING NUMBER OF DETECTIONS BY PARTS FOR GROUP B FOLLOWING TEST III

<table>
<thead>
<tr>
<th>Part</th>
<th>Soprano</th>
<th>Alto</th>
<th>Tenor</th>
<th>Bass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soprano</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Alto</td>
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<td>3</td>
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<tr>
<td>Tenor</td>
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<tr>
<td>Bass</td>
<td>1</td>
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<td>4</td>
<td>5</td>
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TABLE XVII

TABLE SHOWING NUMBER OF DETECTIONS BY PARTS FOR COMBINED GROUPS FOLLOWING TESTS I, II, AND III

<table>
<thead>
<tr>
<th>Part</th>
<th>Soprano</th>
<th>Alto</th>
<th>Tenor</th>
<th>Bass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soprano</td>
<td>5</td>
<td>12</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Alto</td>
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<td>11</td>
<td>8</td>
</tr>
<tr>
<td>Tenor</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Bass</td>
<td>8</td>
<td>3</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Student number</td>
<td>Even rhythms (11.5 min.)</td>
<td>Dotted rhythms (12.0 min.)</td>
<td>Triplets (10.0 min.)</td>
<td>Duplets (10.5 min.)</td>
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### TABLE XVIII—Continued

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<th>Syncopation (10.0 min.)</th>
<th>Meter shift (13.5 min.)</th>
<th>Total time (65.5 min.)</th>
<th>Mean time Per tape</th>
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<td>13.57</td>
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<td><strong>21.46</strong></td>
<td><strong>190.97</strong></td>
<td><strong>22.98</strong></td>
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TABLE XIX

TABLE SHOWING NUMBER OF MINUTES SPENT ON PROGRAM TAPES BY GROUP B

<table>
<thead>
<tr>
<th>Student number</th>
<th>Even rhythms (11.5 min.)</th>
<th>Dotted rhythms (12.0 min.)</th>
<th>Triplets (10.0 min.)</th>
<th>Duplets (10.5 min.)</th>
</tr>
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<td>24</td>
<td>60</td>
<td>35</td>
<td>16</td>
<td>54</td>
</tr>
</tbody>
</table>

| Total time     | 498                      | 328                         | 256                 | 295               |
| Mean time      | *41.50                   | 27.33                       | 21.33               | 24.58             |

*This student did not do the Even Rhythms tape because there was not an accompanying booklet available. This was not discovered until after all the booklets were gathered, the final test given, and the students dismissed for the semester. The data was entered as zero, and the three other asterisks denote the totals affected.
<table>
<thead>
<tr>
<th>Correct values (18.0 min.)</th>
<th>Syncopation (10.0 min.)</th>
<th>Meter shift (13.5 min.)</th>
<th>Total time (85.5 min.)</th>
<th>Mean time Per tape</th>
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Total: 360 356 2537 382.42 352.37
37.00 30.00 29.67 30.20 30.18
spent on the Even Rhythms tape is, it being the first tape, the students were learning what would be required of them in using the materials of the program and how to pace themselves.

The figuring of a simple correlation between the gains in error detection points and the number of minutes spent on the program (see Tables XX and XXI) showed no significance for either group or the combined groups at the .05 or .01 levels on the two-tailed test. (Group B did show significance at the .10 level on the two-tailed test or at .05 on the one-tailed test.) The correlation coefficients are as follows: Group A, .0771 (df = 11); Group B, .5484 (df = 10); combined groups, .1875 (df = 23).

In this chapter, data were reported regarding the study. Observations and implications involving these data will be handled in Chapter V.
TABLE XX

TABLE SHOWING GROUP A WITH RANK ORDER OF TEST I SCORES, GAINS IN ERROR DETECTION POINTS, * SCORES FOR TESTS II AND III, AND NUMBER OF MINUTES SPENT ON PROGRAM

<table>
<thead>
<tr>
<th>Student Number</th>
<th>Rank Order Test I Scores</th>
<th>Gain Following Program</th>
<th>Test II Scores</th>
<th>Test III Scores</th>
<th>Minutes Spent on Tapes</th>
<th>Mean Time per Tape (23 min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>54</td>
<td>6</td>
<td>48</td>
<td>42</td>
<td>160</td>
<td>22.85</td>
</tr>
<tr>
<td>3</td>
<td>90</td>
<td>27</td>
<td>63</td>
<td>35</td>
<td>183</td>
<td>26.14</td>
</tr>
<tr>
<td>5</td>
<td>91</td>
<td>29</td>
<td>62</td>
<td>56</td>
<td>155</td>
<td>22.14</td>
</tr>
<tr>
<td>12</td>
<td>106</td>
<td>47</td>
<td>59</td>
<td>59</td>
<td>150</td>
<td>21.42</td>
</tr>
<tr>
<td>21</td>
<td>113</td>
<td>17</td>
<td>97</td>
<td>89</td>
<td>193</td>
<td>27.57</td>
</tr>
<tr>
<td>4</td>
<td>125</td>
<td>42</td>
<td>83</td>
<td>94</td>
<td>237</td>
<td>33.85</td>
</tr>
<tr>
<td>1</td>
<td>129</td>
<td>66</td>
<td>63</td>
<td>68</td>
<td>148</td>
<td>21.14</td>
</tr>
<tr>
<td>22</td>
<td>133</td>
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<td>98</td>
<td>79</td>
<td>95</td>
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<td>17</td>
<td>150</td>
<td>32</td>
<td>118</td>
<td>113</td>
<td>135</td>
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<td>14</td>
<td>151</td>
<td>74</td>
<td>77</td>
<td>70</td>
<td>225</td>
<td>32.14</td>
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<td>109</td>
<td>126</td>
<td>18.00</td>
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<tr>
<td>7</td>
<td>164</td>
<td>61</td>
<td>103</td>
<td>93</td>
<td>134</td>
<td>19.14</td>
</tr>
</tbody>
</table>

*Gains in error detection points result in a lowering of test scores. The lower the test score the higher the achievement.
TABLE XXI

TABLE SHOWING GROUP B WITH RANK ORDER OF TEST II
SCORES, GAINS IN ERROR DETECTION POINTS,*
- SCORES FOR TESTS I AND III,
SPENT ON PROGRAM

<table>
<thead>
<tr>
<th>Student Number</th>
<th>Test I Scores</th>
<th>Rank Order</th>
<th>Test II Scores</th>
<th>Gain Following Program</th>
<th>Test III Scores</th>
<th>Minutes Spent on Tapes</th>
<th>Mean Time per Tape (23 min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>80</td>
<td>62</td>
<td>84</td>
<td>54</td>
<td>117</td>
<td>25.28</td>
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<tr>
<td>13</td>
<td>130</td>
<td>85</td>
<td>65</td>
<td>65</td>
<td>253</td>
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<td>89</td>
<td>88</td>
<td>59</td>
<td>59</td>
<td>230</td>
<td>32.85</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>132</td>
<td>90</td>
<td>2</td>
<td>88</td>
<td>215</td>
<td>30.71</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>117</td>
<td>93</td>
<td>3</td>
<td>90</td>
<td>116</td>
<td>16.57</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>119</td>
<td>94</td>
<td>20</td>
<td>74</td>
<td>255</td>
<td>36.42</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>153</td>
<td>105</td>
<td>32</td>
<td>73</td>
<td>170</td>
<td>24.28</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>98</td>
<td>107</td>
<td>54</td>
<td>53</td>
<td>247</td>
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<td>116</td>
<td>111</td>
<td>25</td>
<td>86</td>
<td>215</td>
<td>30.71</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>156</td>
<td>123</td>
<td>21</td>
<td>102</td>
<td>248</td>
<td>35.42</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>137</td>
<td>143</td>
<td>18</td>
<td>125</td>
<td>140</td>
<td>20.00</td>
<td></td>
</tr>
</tbody>
</table>

*Gains in error detection points result in a lowering of test scores. The lower the test score the higher the achievement.
CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The \( t \) test for dependent (related) samples was used to test the first four hypotheses, with the requirement of .05 as a level of significance for retaining any of them. Hypothesis One, that students in Group A would show a significant mean gain from Test I to Test II, was retained with a probability of 0.0001 that such a gain could occur by chance. Hypothesis Two stated that students in Group B would show no significant mean gain from Test I to Test II, but was rejected with a probability of 0.5475. Hypothesis Three was retained since students in Group B did show a significant mean gain from Test II to Test III, the probability being 0.0005. It was hypothesized in Hypothesis Four that students in Group A would show no significant mean gain from Test II to Test III. This hypothesis was retained, with a probability of 0.0035.

Hypothesis Five stated that no difference would be found between the mean gain made by Group A between Test I and Test II and the mean gain made by Group B between Test II and Test III. The \( t \) test for independent (non-related) samples was used to determine that this hypothesis should be rejected at
the .05 level ($p = 0.0154$); this hypothesis could be retained, however, at the .01 level.

For Hypotheses Six through Eleven, all correlations of variables were done by use of the Pearson product moment except sex (occurring in Hypotheses Six, Eight, and Nine), for which the point biserial was used. Hypothesis Six, which stated that no significant correlation coefficient would be found between initial error detection ability of the combined groups and the four variables below, was retained, the correlation coefficients being: age, 0.3192; sex, -0.1940; number of years of private voice study, -0.1608; and the number of years sung in high school and/or college choirs, 0.1862. However, Hypothesis Seven stated that a significant correlation would be found to exist between initial error detection ability of the combined groups and the five variables below. Only partially retainable, the five variables and their correlation coefficients and whether they were retained or rejected are as follows:

a. number of years of private piano study; -0.2266; rejected
b. number of years of private instrumental study; -0.3612; rejected at .05, but retainable at .10. The negative correlation suggests that the more years a student may have of private instrumental study may increase his error detection ability.
c. number of years played in bands and/or orchestras; -0.5129; retained, even at the .01 level. This strongly suggests that perhaps the more years a student may play in bands and/or orchestras may aid him in his error detection ability.
d. math score on SAT; -0.5357; retained, even at the .01 level, strongly suggesting that the higher the SAT scores in math, the greater the error detection ability.
e. grade in sophomore music theory; -0.3190; rejected at .10, .05, and .01 levels.

Hypotheses Eight and Nine stated that no significant correlation would be found to exist between gains in error detection ability from Test I to Test II for Group A and from Test II to Test III for Group B, respectively, and any of the following variables:

a. sex
b. number of years of private voice study
c. number of years sung in high school and/or college choirs

Both hypotheses were retained, as none of the variables for either hypothesis achieved significance at any level. The correlation coefficients are as follows: Hypothesis Eight, (a). -0.2684; (b). -0.1605; (c). -0.0609; Hypothesis Nine, (a). -0.3470; (b). 0.0279; (c). 0.0427.

Hypotheses Ten and Eleven stated that a significant correlation would be discovered between the gains in error detection ability by members of Group A from Test I to Test II and Group B from Test II to Test III, respectively, and each of six variables. Both hypotheses were wholly rejected because none of the variables achieved significance at any level for either hypothesis. The variables are as follows:

a. age
b. number of years of private piano study
c. number of years of private instrumental study
d. number of years played in bands and/or orchestras
e. math score on SAT
f. grade in sophomore music theory
The correlation coefficients for Hypothesis Ten are: (a). -0.2978; (b). -0.0750; (c). 0.2617; (d). 0.0782; (e). -0.4141 (This shows an inverse significance at the .10 level); (f). -0.2202. The correlation coefficients for Hypothesis Eleven are: (a). 0.0286; (b). 0.3217; (c). 0.0418; (d). 0.0793; (e). -0.0960; (f). -0.2656.

Part (a) of Hypothesis Twelve stated that at the beginning of the experiment all the students would tend to detect errors in the following order:

1. his or her own part
2. soprano
3. bass
4. the part immediately below
5. the part immediately above
6. the part two voices away if an inside voice

A tabulation of the results of Test I revealed that no student detected the errors in the hypothesized order, therefore Part (a) was rejected. Part (b) stated that after the program had been completed students would detect errors equally well in all parts. This was true even after Test I, and for both groups, following Tests II and III, as well as for the combined groups, the results were basically the same. Therefore, Part (b) was easily retained.

Data gleaned from examination of the program booklets revealed no pattern of time spent which could be compared to mean gains for either group. It was observed that both groups did spend more time on the "Even Rhythms" and "Correct Values" tapes than any of the others, and that Group B spent
more time, both individually and as a group, than Group A on the entire program. In both groups, the students ranking highest in test scores ranked quite low (lowest for Group A) in gains of error detection points. There were students in both groups who ranked low on Test I and showed almost dramatic improvement with each test, especially following the program. Some of those who made the largest gains also ranked at the top in time spent on the program, but this was not a pattern. There was no general pattern reflected.

Three students in Group A (numbers 1, 4, and 25) showed actual loss of error detection points from Test II to Test III. Even though these same students showed gains in error detection points from Test I to Test III, their ranks within the group dropped with each test. This pattern did not occur in Group B, but it must be remembered that following Test II Group A did not engage in any planned activities to improve error detection ability, which may account for the forgetting or "letting down" on the parts of these students.

Only two students in Group B (numbers 16 and 23) failed to show a gain from Test I to Test II. This was the period in which Group B did not engage in any planned activities by which error detection ability might be improved, but ten of the twelve did show improvement. However, the sizes of the gains for Group B following the program were not as large as those for Group A, although there were some substantial gains made by a few.
Conclusions and Recommendations

A re-examination of the data compiled in the course of this study has led to these general conclusions and recommendations.

1. Utilization of the program developed for and described in this study does result in significant gains in rhythmic error detection ability, as measured by The Rhythmic Error Detection Test. However, the amount of time spent by each student on the program did not correlate significantly with gains made for either group. Many other variables beside time spent on the program enter into why the gains, as reflected by the tests, were or were not made. Admittedly, to measure the relationship between gains made in rhythmic error detection ability and time spent on the program was not a declared objective of the study. Even so, one group (Group A) did show a significant correlation coefficient at the .10 level. This may imply that if more control could be exercised over the time spent on the program, possibly making the program an integral part of the class rather than an activity to be done entirely outside of class, a more definite relationship between gains made and time spent might develop.

2. It was expected that Group A should show significant improvement from Test I to Test II, but for Group B also to show a gain was not expected. The mean difference for Group B from Test I to Test II was only 21.41667 (Table III), but this was over half the mean difference for Group A on the
same test (41.69231). The total differences for both groups from Test I to Test III were almost identical (Group A—44.53846, and Group B—44.00000), which appears to suggest that the groups progressed the same amount by using the program. It may also imply that the groups were well matched at the outset of the experiment. However, more testing needs to be done in an effort to determine the extent which being test-wise affects improvement of scores.

3. Of the nine variables tested with Group A, Group B, and the combined groups, only three were significantly correlated with the mean gains of the combined groups. They were the number of years of private instrumental study, number of years played in bands and/or orchestras, and the SAT mathematics scores. (The SAT mathematics scores did show significance at the .10 level for Group A). The failure of the two voice variables to achieve a significant correlation appears to be a serious indictment of the methods and procedures of voice teachers and choral directors insofar as teaching total musicianship to their students is concerned. This charge has often been directed at vocal music teachers, and these findings only give credence to such arguments.

4. One of the expectations of this study was that the students involved who had strong instrumental backgrounds would perform better in error detection activities because they are better sight-readers. This assumption gave reason for the direction given to many of the hypotheses. The
finding that the number of years of private instrumental study and the number of years played in bands and/or orchestras did correlate significantly with mean gains in error detection ability leads to the suggestion that an investigation of sight-reading ability as related to error detection ability might contribute worthwhile information.

5. This program was utilized at about the mid-point of the second semester of a choral conducting course which spans two semesters. Because of the many requirements and experiences of the class, as well as the actual practice in conducting in class, the students had already developed many skills, or were developing them, by the time the program was introduced. It seems logical to conclude that utilization of the program at the beginning of the students' conducting class experience would not have yielded the significant gains it did due to the limited experiences of the students. It is entirely possible, however, that earlier use could lead to even more gains than reported, due to the fact that there would be more room for improvement. This possibility needs to be determined, but it appears that the program served as a culminating experience for some students, bringing together some of the experiences they had in the choral conducting class and various prior experiences. It is suggested that an interesting and beneficial experiment would be to utilize the program at the very beginning of the first semester of a conducting class and again at about
the mid-point of the second semester, and compare the results. Perhaps one would have to use two separate classes, maybe even take two years, having one class use the program early in the first semester a given year and the other class at about mid-point of the second semester the following year. This would eliminate any possible memory factor and perhaps give a more valid comparison, even though other problems, such as how well the two classes might be matched, how equal in size, and so forth, would require consideration and control.

6. The fact that the average of the four reliability indexes computed (0.3937, 0.7112, 0.7285, and 0.7478) is 0.6465, or 0.65, following the initial administrations of the test, gives rise to the expectation that after further revision and improvement the reliability index of the test would increase, and make the test more valuable for use in further research in this area. It would be helpful if the hypotheses of this study could be tested in other institutional settings, and with larger samples. This would give more support to any findings and perhaps allow firmer conclusions and predictions to be made. The appearance of any significance for any of the variables even in this study, however, does offer the hope that with a larger sample the results might be even more significant and useful.

7. In the preparation of the program tapes it was necessary to record the prepared score, which contained the
prepared errors, as well as the correct score which the student was to have before him. (For a definition of these terms, see Chapter I, pp. 8 and 9). It was observed that the prepared score required more rehearsing than the correct score to execute all notated rhythms properly. Even when the correct score was rehearsed before the prepared score, more time was required to adjust rhythms from the correct to the incorrect than it did to adjust from the incorrect to the correct. This tends to support the practice of many conductors isolating certain rhythms or passages of a composition and deliberately rehearsing them "wrong." Unless overdone, this practice seems to help make the students aware of problem-spots and actually make correct executions easier.

This observation also raises a question which could bear investigation: Is there an inherent correctness of rhythms, especially when words are involved, in a composition that can be sensed or "felt" when either heard or performed? In almost every example on the tapes for this study, the recording group that made the tapes performed the rhythms in the correct scores with great ease and precision after having rehearsed, sometimes intensely, to execute the rhythms properly in the prepared scores. The experiences of this group tend to suggest that such a study might be feasible.

8. The high correlation between SAT mathematics scores and initial error detection ability (-0.5357, the minus indicating
that the higher the SAT mathematics score the lower, or better, the score on the error detection test) raises several questions. Is this another manifestation of the generally accepted belief that there is a positive correlation between math aptitude and music aptitude? And, if this is so, would music students having high SAT mathematics scores be expected to score high on a test of ability to make value judgments regarding a composition's quality (if indeed there were such a test), develop a high degree of proficiency of performance skills in music, or excell in matters of musicology or music appreciation, or is this relationship restricted to matters of theoretical emphasis, such as sight reading, part writing, or even error detection? Another question is since there was a significant relationship between initial error detection ability and SAT mathematics scores, why were the correlations between gains in error detection ability and SAT mathematics scores not better for each individual group? Also, why did Group A show so much higher a correlation (-0.4141) than Group B (-0.0960) regarding gains in error detection ability when the combined groups showed such a significant correlation regarding initial error detection ability? Were there other variables influencing this relationship, and if so, what were these variables and could their influence be measured? It is suggested that much research could be done on these and other questions arising from the observed relationship between SAT mathematics scores and error detection ability.
APPENDIX A

On the following pages are the items of The Rhythmic Error Detection Test. Also included are the instructions and the information sheet which accompanied Test I. It must be pointed out that the information sheet, the three examples, and each of the twenty-nine items of the tests appeared on separate half-sheets when presented to the students. Putting two on a page was done here in an effort to reduce the bulkiness of the report.

The items as they appear, following the three examples, are numbered as they were in Tests I and III. For Test II the information sheet and the examples were omitted and the items re-arranged in the following way: 1, 10, 11, 12, 13, 22, 23, 24, 25, 6, 7, 8, 9, 18, 19, 20, 21, 2, 3, 4, 5, 26, 27, 28, 29, 14, 15, 16, and 17. They were then re-numbered 1-29. This method of division and re-arrangement was used in order to retain the odd-even relationship among the items and maintain the internal reliability already established and reported.

Following the test items is a list of the music used in the test.

Copies of the test tapes are available through the School of Music, North Texas State University.
The Rhythmic Error Detection Test

Instructions

A series of twenty-nine musical examples from two to seven measures in length will be presented by a choir on tape. You have been provided with a score for each of the examples. Each example will be played two times with a twenty-second pause after each playing. The first time an example is played it will be announced on the tape to agree with the number on the score; the second time it will not be announced. As the tape is played you may wish to mark errors as you hear them; you may, however, wait until the pauses to do your marking. Whichever you choose to do, it is your responsibility to circle each note or rhythmic figure in each voice part that is sung incorrectly.

If a note is held too long or not long enough, that note should be circled on the score. Remember, the scores are correct but each taped example may contain one or more errors, or no errors. If a rhythmic figure is incorrect, both or all notes in that figure should be circled since one note of the figure cannot be sung incorrectly without causing the rest of the figure to also be incorrect. For example, if a dotted eighth and sixteenth is sung as two even eighths or as a quarter and an eighth in triplet relationship, the dotted eighth and the sixteenth should be circled (in one large circle) as the rhythmic figure (or beat) incorrectly sung. Another example would be two half notes sung as a dotted half
and a quarter. The two half notes would be considered the incorrect figure and should be circled (one large circle). In compound time, the unit of measure (what kind of note gets the beat) will be the dotted note corresponding with the meter signature, such as the dotted quarter in six-eight time. It should be remembered that an incorrect rhythmic figure will include all of one or more beats, and in circling such errors the whole beat or beats should be circled.

Each error on the tape not marked on the score will be considered a mistake on your part. Do Not Guess!!! Marking the score where errors do not appear on the tape will also be considered as mistakes on your part.

Preceding the test proper are three examples. The errors on the example scores are already marked to demonstrate the manner in which you should mark the scores of the test. The examples on the tape are separated by twenty-second pauses, just as the test proper is, to demonstrate the pace at which the test will proceed. Immediately after Example Three the test will begin. Once the tape starts it will not be stopped until the conclusion of the test.

Are there any questions?
INFORMATION SHEET  The Rhythmic Error Detection Test

Name________________________ Sex____ Age____

S A T B - Circle voice part you sing

_____ Number of years private voice study

_____ Number of years sung in high school and college choirs

_____ Number of years private piano instruction

_____ Number of years private instrumental instruction

_____ Number of years played in bands and/or orchestras

Math Score on SAT_______

Grade in Sophomore Music Theory_______

Example 1.  4 errors

\[ \text{In spring-time when birds do sing, when birds do sing,} \]

\[ \text{In spring-time when birds do sing, when birds do sing,} \]

\[ \text{In spring-time when birds do sing, when birds do sing,} \]

\[ \text{In spring-time when birds do sing, when birds do sing,} \]
Example 2.  2 errors

To hail the God, - the  Mortal, and the  King -- in Beth-le-hem.

To hail the God, - the  Mortal, and the  King -- in Beth-le-hem.

To hail the God, - the  Mortal, and the  King -- in Beth-le-hem.

Example 3.  26 errors

Saviour and Redeemer, tender babe, God's only Son; on Him all praise be-stow!

Saviour and Redeemer, tender babe, God's only Son; on Him all praise be-stow!

Saviour and Redeemer, tender babe, God's only Son; on Him all praise be-stow!
No. 1

La tierra mojada.

No. 2

Then pass forever now, all empty pleasures.

Then pass forever now, all empty pleasures.

Then pass forever now, all empty pleasures.
No. 3

Sol de la cabellera colorada

No. 4

Their peaceful course, their peaceful course pursue,
No. 5

But they shall sit every man under his vine and his fig tree;

No. 6

My soul fleth unto the Lord.

My soul fleth unto the Lord.

My soul fleth unto the Lord.
No. 7

Oh, answer what I ask of Thee!

No. 8

And if you smile, the blushing while,
No. 9

Death spreads his gentle wings, And o'er the passing soul — as it takes flight.

No. 10

Zion, thy God reigneth.

Zion, thy God reigneth.
No. 11

Make even the trees hles to shake the dead where they lie a-waiting the hearses.

No. 12

Hey ding a ding, ding; Hey ding a ding; Hey ding a ding; Hey ding a ding;
No. 13

And who will kiss those ruby lips when you are gone?

And who will kiss those ruby lips when you are gone?

And who will kiss your ruby lips when I am gone?

And who will kiss your ruby lips when I am gone?
No. 15

Angels bright with stars be their \( \text{have come to bless the sight, Sing we clear! That all men may know,} \)

Serve and sing all night  

Sing we true! That all men may know,

No. 16

be-tween- \( \text{walls of shadowy granite, in a gleaming pass,} \)

be-tween- \( \text{walls of shadowy granite, in a gleaming pass,} \)

be-tween- \( \text{walk of shadowy granite, in a gleaming pass,} \)

be-tween- \( \text{walls of shadowy granite, in a gleaming pass,} \)
No. 19

Mater ora filium
Ut post hoc exilium

No. 20

Lento moderato

Mater ora filium
Ut post hoc exilium

Mater ora filium
Ut post hoc exilium
No. 21

With a hey, and a ho, and a hey no-ni-no.

With a hey, and a ho, and a hey no-ni-no.

With a hey, and a ho, and a hey no-ni-no.

With a hey, and a ho, and a hey no-ni-no.

No. 22

And none shall make them a-fraid.

And none shall make them a-fraid.

And none shall make them a-fraid.

And none shall make them a-fraid.
No. 23

Lullaby, Lullaby, a Lullaby.

No. 24

Music that brings sweet sleep down from the blissful skies.
Queen Victoria's statue was the work of her daughter Be-a-trice.

Felle et ace to potat

Felle et ace to potat
No. 27

Allegro

Before another day we may find another girl.

No. 28

Me miras con el arado, luego con la roza de ra.

Me miras con el arado, luego con la roza de ra.
No. 29

Their frankincense and gold — they bring.

Their frankincense and gold — they bring.

Their frankincense and gold — they bring.
Music Used In Developing the Rhythmic Error Detection Test


# APPENDIX B

## RHYTHMIC ERROR DETECTION TEST

### VALIDATION SHEETS

#### COMPILATION

<table>
<thead>
<tr>
<th>Number</th>
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### Categories

1. Dotted rhythms
2. Even rhythms
3. Correct note values
4. Triplets
5. Duplets
6. Syncopation
7. Meter shift

### Signature of Judge

Reject
APPENDIX C

In Appendix C are the seven program booklets each student was provided in which to work while listening to the program tapes. Instructions for the use of these booklets and tapes are in Chapter III. Copies of the program tapes are available through the School of Music, North Texas State University.

Also included is a list of the music used in the program.
Even Rhythms

Name______________________ Group_______

Time Began:________

Time Finished:________
No. 1.

Christ found a dwelling place in thee,
No. 2

Allegro (d=132)

Let's take our pleasure now, gaily let's dance,

Let's take our pleasure now, gaily let's dance,
O God of our fathers, the wonders.

O God of our fathers, the wonders.
But after her lover, her lover,

But after her lover, her lover,
Cast care away, to the winds let it fly,
Festive lights now behold, and be joyful young and old, — And be joyful young and old,
Oh then they fell a-kissing, a-kissing, Oh then they fell a-kissing.
unto them that are of a contrite heart.

unto them that are of a contrite heart.

unto them that are of a contrite heart.

unto them that are of a contrite heart.
No. 9

Lively

5/4

Birds are a-sing-ing, Bells are a-ring-ing,

A

Birds are a-sing-ing, Bells are a-ring-ing,

B

Birds are a-sing-ing, Bells are a-ring-ing.

Birds are a-sing-ing, Bells are a-ring-ing,
No. 10

\[ \text{O when begin you to swell—so high that I may drown me in you?} \]
No. 11

Bright morning, see: night has ceased to reign.

Bright morning, see: night has ceased to reign.

Bright morning, see: night has ceased to reign.
No. 12

Listen to the heavy part the music bears— the music bears,

heavy part, the heavy part the music bears, music bears,
O--ra pro no-bis pec-ca-tor-i-bus,
O--ra pro no-bis pec-ca-tor-i-bus,
O--ra pro no-bis pec-ca-tor-i-bus,
O--ra pro no-bis pec-ca-tor-i-bus,
No. 14

Come, my beloved, where I may speak to your heart.

Come, come, my beloved, where I may speak, where I may speak to your heart.
I've gone a-way  

Across the wide Missouri.
Gently, gently life flows on,
Gently, gently, gently life flows on,
Gently, gently, life flows on,
Gently, life flows,
We lay beneath the starry light shining forth from heaven;

We lay beneath the starry light shining forth from heaven;

We lay beneath the starry light shining forth from heaven;

We lay beneath the starry light shining forth from heaven.
DOTTED RHYTHMS

Name________________ Group________

Time Began:________

Time Finished:_______
Listen, listen and you hear time saying

Listen, listen and you hear time saying

Listen, listen and you hear time saying

Listen, listen and you hear time saying

Listen, listen and you hear time saying

Listen, listen and you hear time saying
Full fath—om five—thy fa—ther lies.
No. 3

O God of our fathers the wonders,
No. 4

Wild, wild the storm, and the high seas running,

Wild, wild, wild, wild, the storm, the storm, the high seas running,
No. 5

Grærtes nunc, gratætes omnes

Grærtes nunc omnes

Grærtes nunc, gratætes omnes

Grærtes nunc omnes
Festive lights now behold, and be joyful young and old,—And be joyful, young and old,—


No. 7

Allegro (\textit{d} = 132)

*Cast care away, to the winds let it fly,*

*Cast care away, to the winds let it fly,*
No. 8

Pleasure has a thousand guises,

Pleasure has a thousand guises,

has a thousand guises,
and the seed didst plant
and the seed didst plant of our people,
and the seed didst plant
and the seed didst plant of our people,
No. 10

\[ \text{Hap-ly I may re-mem-ber,} \]

\[ \text{Hap-ly I may re-mem-ber,} \]

\[ \text{Hap-ly I may re-mem-ber,} \]

\[ \text{Hap-ly I may re-mem-ber,} \]
and the seed didst plant of our people, and the seed didst plant of our people, and the seed didst plant of our people, and the seed didst plant of our people.
But the Bethlehem star may lead me To the sight of Him

But the Bethlehem star may lead me To the sight of Him

But the Bethlehem star may lead me To the sight of Him

But the Bethlehem star may lead me To the sight of Him
Thou hast the hea-then caused to go,

Thou hast the hea-then caused to go,

Thou hast the hea-then caused to go,
No. 15

of his bones are coral made; Ding-Dong,

of his bones are coral made; Ding-Dong,

of his bones are coral made; Ding-Dong,
TRIPLETs

Name________________Group________

Time Began:________

Time Finished:______
No. 1

Lento

ritenuto

Where a-waits a cradle vernal, There is my darling one welcome.

Lento

ritenuto

Where a-waits a cradle vernal, There is my darling one welcome.

Lento

ritenuto

Where a-waits a cradle vernal, There is my darling one welcome.
No. 2

For Jehovah knew the way of the righteous;

For Jehovah knew the way of the righteous;
No. 3

Therefore the wicked shall not stand in the judgment.
Keep time - with my salt tears — Keep time - with my salt tears;
I shall not see the shadows, I shall not feel the rain;

I shall not see the shadows, I shall not feel the rain.
No. 6

All nations, Barbarisms, Civilizations, Languages.
es se hominum solum.
es se hominem solum.
es se hominum solum.
et nos erit e.
erit nos erit e.
ser vos erit.
eser vos erit.

No. 7
No. 8

Suffer her self - to be desired,

suffer her self - to be desired,

suffer her self - to be desired.
No. 9

Hap-ly I may re-member,

Hap-ly I may re-member,

Hap-ly I may re-member,
Eternal Wisdom, scatter the darkness of our ignorance.

Eternal Wisdom, scatter the darkness of our ignorance.

Eternal Wisdom, scatter the darkness of our ignorance.

Eternal Wisdom, scatter the darkness of our ignorance.
No. 11

Listen to the heavy part the music bears, the music bears,

Listen to the heavy part the music bears, the music bears,

Listen to the heavy part the music bears, the music bears,

Listen to the heavy part the music bears, the music bears,
No. 12

Before this clean moment has gone,

Before this clean moment has gone,

Before this clean moment has gone,

Before this clean moment has gone,
No. 13

Very Slow

\[ \text{But the Bethlehem star may lead me to the sight of Him} \]

\[ \text{But the Bethlehem star may lead me to the sight of Him} \]

\[ \text{But the Bethlehem star may lead me to the sight of Him} \]

\[ \text{But the Bethlehem star may lead me to the sight of Him} \]
No. 14

For ever this sorrowful human face in eternity's window

human face in eternity's window
No. 15

Nothing of him that doth fade,
But doth suffer a sea-change.

Nothing of him that doth fade,
But doth suffer a sea-change.

Nothing of him that doth fade,
But doth suffer a sea-change.

Nothing of him that doth fade,
But doth suffer a sea-change.
DUPLETS

NAME ____________ GROUP _____

TIME BEGAN: ______

TIME FINISHED: ______
No. 1

wrapped in cloud of sorrow, pity move, And tell the raving-er of my soul

wrapped in cloud of sorrow, pity move, And tell the ravisher of my soul
No. 2

Lullay, Jesu, lullay, lullay, mine own dear mother, sing lullay

Lullay, Jesu, lullay, lullay, mine own dear mother, sing lullay
An-gels in hea-v-en know that I love you, that I love you.

An-gels in hea-v-en know that I love you, that I love you.

An-gels in hea-v-en know that I love you, that I love you.
No. 4

know I love you.  

Roses love sunshine, violets love dew,

know I love you, Know I love you, dear, Know I love you.

know I love you.  

Roses love sunshine, violets love dew,

know I love you, Know I love you, dear, Know I love you.
No. 5
For this time is perceptible to man—by a re-

mark-able still ness—and se-ren-i-ty of soul.

mark-able still ness—and se-ren-i-ty of soul.
snow, swirl, spray, slush, snow,
snow, swirl, spray, slush, snow,
In their gold coats spots you see;

Cow-slips tell her pensioners be——

Cow-slips tell.

Cow-slips tell her pensioners be——

Cow-slips tell.
No. 9

And red reynard creeps to his hole near the river.

And red reynard creeps to his hole.

And red reynard creeps to his hole.
Follow your saint, Follow with accents, sweet.
No. 11

child of water and wind and of flame undenied,

child of water and wind and of flame undenied,

child of water and wind and of flame undenied,
No. 12

Allegro

and to our God, for he will abundantly pardon.

and to our God, for he will abundantly pardon.

and to our God, for he will abundantly pardon.

and to our God, for he will abundantly pardon.
No. 13

Poco animato

O give thanks unto the Lord, call-up on this name,

O give thanks unto the Lord, call-up on this name,

O give thanks unto the Lord, call-up on this name,
No. 14

Allegro

and the unrighteous man his thoughts: and let him return unto the Lord.
With these kisses let me remove your tears.

With these kisses let me remove your tears.

With these kisses let me remove your tears, The clouds,

With these kisses let me remove your tears.

With these kisses let me remove your tears.

With these kisses let me remove your tears, The clouds,
Correct Values

Name_________________ Group_____

Time Began:_________

Time Finished:_______
et dimittete nobis debita nostra,
et dimittete nobis debita nostra,
No. 2

were re-told to us, Thy Glories great

Thy Glories great were re-told us — Thy Glories great

were re-told to us, Thy Glories great

Thy Glories great were re-told us — Thy Glories great
I have seen his ways, and will heal him, and restore comforts

I have seen his ways, and will heal him, and restore comforts
Lively - 1: 88-92

I heard you singing a mer-ry air.
Keep time - with my salt tears - Keep time - with my salt tears -
But after her lover, her lover,

But after her lover, her lover,

But after her lover, her lover,

But after her lover, her lover,
No. 9

Oh then they fell a kissing, a kissing, Oh then they fell a kissing.

Oh then they fell a kissing, a kissing, Oh then they fell a kissing.
And there our fathers in their stead placed.

And there our fathers in their stead placed.

And there our fathers in their stead placed.
No. 11

Time says hush. By the gong of time -- you live.

Time says hush. By the gong of time -- you live.

Time says hush. By the gong of time -- you live.
unto them that are of a contrite heart.

unto them that are of a contrite heart.

unto them that are of a contrite heart.
No. 13

and the seed didst plant

and the seed didst plant of our people,

and the seed didst plant

and the seed didst plant of our people,
Eternal Wisdom, scatter the darkness of our ignorance.
When the tides of youth are strong, life is full of fine surprises.

When the tides are strong, life is full of fine surprises, love and joy.

When the tides of youth are strong, life is full of fine surprises.
No. 16

Motto tranquillo (d = 56)

There is a lady sweet and kind, was never face so pleased my mind,

There is a lady sweet and kind, was never face so pleased my mind,

There is a lady sweet and kind, was never face so pleased my mind,

There is a lady sweet and kind, was never face so pleased my mind, my mind,
No. 17

Gently, gently life flows on,

Gently, gently, gently life flows on,

Gently, gently, life flows on,

Gently, gently, life flows,

Gently, gently life flows on,

Gently, gently, gently life flows on,

Gently, gently, life flows on,

Gently, gently, life flows,
No. 18

The wind took up the northern things and piled them in the south,

The wind took up the northern things and piled them in the south,

The wind took up the northern things and piled them in the south,

The wind took up the northern things and piled them in the south,
No. 19

and the seed didst plant of our people, and the seed didst plant of our people, and the seed didst plant of

of our people, and the seed didst plant of our people, and the seed didst plant of our people, and the seed didst plant of

of our people, and the seed didst plant of our people, and the seed didst plant of our people, and the seed didst plant of

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of our people, and the seed didst plant of our people, and the seed didst plant of our people, and the seed didst plant of

of our people, and the seed didst plant of
No. 20

Ding-dong,

Ding-dong,

of his bones are coral made; Ding-dong,
No. 21

and the seed didst plant
of our people, of
didst plant of our people,
and the seed didst
didst plant of our people,
didst plant of our people, of
SYNCOPATION

NAME___________ GROUP____

TIME BEGAN: ______

TIME FINISHED: ______
No. 1

Allegro

Feeding her flock near to the mountainside,

Feeding her flock near to the mountainside,
Says the little boy to the little girl Shall I, oh shall I?

Says the little boy to the little girl Shall I, oh shall I?
No. 3

shall raise me up,
and leap into a dance, into a dance. Such as no mortals use to tread.
No. 5

Young hearts are calling, life is enthralling, come greet the morning, let us be gay.

Life is enthralling, come greet the morning, let us be gay.
Oh then they fell a-kissing, a-kissing, oh then they fell a-kissing.
No. 7

Maids to bed—cover coale;

Maids to bed—cover coale;

Maids to bed—cover coale;

Maids to bed—cover coale;
No. 8

No mortal ear hath heard

No mortal ear hath heard
No. 9

Time -- says hush. By the gong of
time -- you live.

Time -- says hush. By the gong of
time -- you live.

Time -- says hush. By the gong of
time -- you live.
No. 10

$\text{D} = \frac{\text{D}}{\text{D}}$

Shake off your heavy trance and leap into a dance.

Shake off your trance and leap into a dance.

Shake off your trance and leap into a dance.

Shake off your trance and leap into a dance.
Grant that, at thy next appearing,
No. 12

Allegro moderato

The Lord is nigh unto them that are of a contrite heart.

Allegro moderato
No. 13

Lively cresc.

Watching the fire dance—on the floor.

Lively cresc.

Watching the fire dance—on the floor.
of Flowers. Up - on her cheekes she wept, in
The wind took up the northern things and piled them in the south,
No. 16

Allegro

and to our God, for he will abundantly pardon.

and to our God, for he will abundantly pardon.

and to our God, for he will abundantly pardon.
METER SHIFT

NAME _______ GROUP ______

TIME BEGAN: _____

TIME FINISHED: _____
Bring me men—

To match my moun-
tains, Bring me

men!
Thy holy Gospel on my mind. Thy Word with me shall
No. 3

He's gone away, for to stay a little while,

He's gone away, for to stay a little while,

He's gone away, for to stay a little while,
No. 4

my fair one, and come away. For lo, the winter is past.

my fair one, and come away.

my fair one, For lo, the winter is past,
No. 5

cheer-ily ro-bins sing, and cheer-ily, cheer-ily, cheer-ily ro-bins sing.

cheer-ily ro-bins sing, and cheer-ily, cheer-ily, cheer-ily ro-bins sing.
No. 6

frag' ihn den die Liebe kost',
Lies' und frage deine Brust,

frag' ihn den die Lieber bost,
Lies' und frage deine Brust,
Where secrets are, sweeping, like veils of lofty balm,

Where secrets are, sweeping, like veils of lofty balm,
No. 8

Molo moderato

while he may be found, call ye up-on him while he is near:

Seek ye the Lord while he may be found, call ye up-on him while he is near:

call ye up-on him while he is near:
No. 9

will not fail to please. Thru Common and Treble we jointly have run,

will not fail to please. Thru Common and Treble we jointly have run,

will not fail to please. Thru Common and Treble we jointly have run,

will not fail to please. Thru Common and Treble we jointly have run,
Thy kind hands now before us spread. Thy hand doth reach us
Weep not, child, Weep not, my darling,

Weep not, child, Weep not, my darling,

Weep not, child, Weep not, my darling,

Weep not, child, Weep not, my darling,
No. 15

The heaven of heavens with all their hosts, the earth, and all things — that are therein,
Music Used in the Program


Stevens, Halsey, "Psalm 1: Beatus Vir" (Blessed Is the Man), Marquette, Michigan, Mark Foster Music Co., 1966.


Sweelinck, Jan P., "We Have Heard the Words," New York, Edward B. Marks Music Corporation, 1959.


BIBLIOGRAPHY

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Davison, Archibald Thompson, Choral Conducting, Cambridge, Massachusetts, Harvard University Press, 1940.


Articles


Reports


Unpublished Materials


