AN EXPERIMENTAL STUDY OF A SPEECH CUE RHYTHMIC
SUBDIVISION DESIGN IN THE REMEDIATION OF
RHYTHMIC PERFORMANCE SKILLS OF
JUNIOR HIGH SCHOOL MIXED CHOIRS

Dissertation

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by
Richard L. Mallonee, B.A., M.A.

* * * * *
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Dissertation Committee:
James Major
Jerry Lowder
Helen Swank

Approved By
Advisor
School of Music
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VITA

April 23, 1950 . . . . . . . . . . Born - Dayton, Ohio

1972 . . . . . . . . . . . . . . . . B.A., Anderson College
Anderson, Indiana

1972-1975 . . . . . . . . . . . . . . St. Mary's School
Anderson, Indiana

1975-1984 . . . . . . . . . . . . . . Park Hills High School
Choral/Vocal Director
Fairborn, Ohio

1978 . . . . . . . . . . . . . . . . M.A., Ball State University
Muncie, Indiana

1981-Present . . . . . . . . . . Wright State University
Faculty Associate of Voice
Director, University Chorus
Dayton, Ohio

FIELDS OF STUDY

Major Field: Music

Studies in Music Education. Professors James Major,
Jerry Lowder, Jere Forsythe

Studies in Voice Pedagogy. Professor Helen Swank

Studies in Choral Conducting. Professor Maurice Casey

Studies in Music History. Professor Herbert
Livingston

Studies in Church Music. Professors Jerry Lowder,
James Major

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CHAPTER I
INTRODUCTION

The quality of music education in this country, particularly choral music education, has been the topic of debate for decades, with a variety of judgments being rendered. The consensus appears to be, however, that although choral music education has survived, and in some areas even flourished, we still seem to have failed in our major objective—to train students to become sensitive and literate musicians. One of the major problems continues to be the battle between note and rote (Jordan, DeCarbo, 1986, p.38).

Robert Petzold (1960) describes the music reading process as being dependent upon three perceptual levels:

1) the auditory perception of sounds; 2) the visual perceptions of musical symbols; 3) the integrative internalized process through which the individual organizes previously auditory and visual perceptions of given stimuli as they appear in new learning situations (p.271).

Other researchers have agreed with Petzold's "sight, symbol, transfer" approach (Mainwaring, 1951, p.113; Pflederer, 1964; Gordon, 1980), and it is considered valid learning theory by most music educators.
This theory of musical learning is also supported by the concepts of behavioral and developmental psychology. Both of these theories conceptualize learning as taking place in an orderly, sequential, integrative, and hierarchical manner.

The genetic epistemologist Jean Piaget believed that cognitive schemata are developed in an invariant sequence through which all children must pass, and that curriculum must be designed with this sequence in mind. Children will be unable to learn if they do not have the prerequisite skills (Wadsworth, 1971, pp. 120-121). Robert Gagne (1962, 1965) also conceptualizes learning as a function of prior or prerequisite learning. The various prerequisites create a hierarchy that can be logically derived. Experimental testing of Gagne's logically derived hierarchies have produced generalizable results (Gagne, 1962). Research by Case (1978, 1983) based on the work of Pascal-Leone (1970) attempts to account for observed stages of cognitive development in terms of increasing the capacity of working memory. The basic implication of this theory is that instruction must be designed so as not to exceed the processing capacity of the learner. This is accomplished by simplifying the structure of the strategy to be taught as much as possible, and by designing instruction so that the number of new skills introduced at each step is minimized. This information-processing approach is described in more detail in Chapter II.
Differences among the learning theories occur in the areas of the organization and importance of experiences in the learning process. The cognitive theory assumes that organization is internal within each individual; the behaviorist position is that external organization is necessary for optimum learning (Wadsworth, 1971, p.126). Despite the differences in the theories of learning, they all apply to music learning in an important way: only with a solid, conceptually sequential approach to music reading, which begins with the young learner and continues in a hierarchical manner through the student's musical experience, can the goal of a "sensitive and literate" choral musician be met.

What happens, however, if some of the "steps" or "chains" in a student's music reading experience are missed or fail to be cognitively processed by the student? One area of music reading that often exhibits a processing deficit is rhythm. The way in which rhythmic notation is represented, coded, and eventually decoded for performance is influenced by cognitive processing variables (Gartmann, 1985). If choral students are lacking in the ability to cognitively process rhythmic concepts, or if the teaching process has not stressed the hierarchy of concept formation, serious rhythmic reading deficits will occur.

This phenomenon may be detected initially at the middle school or junior high level where students often participate
in their first formal, large group choir experiences. Without previous instruction that has been carefully guided and sequential, serious rhythmic reading problems will likely have developed. The middle school or junior high teacher is then faced with the problem of "remediating" the students in the very basic rhythm skills in order to instill durational relationships and rebuild the hierarchy to continue the learning process. Because this appears to many music teachers as a monumental (if not impossible) task, the rote method is often employed rather than a systematic music reading approach. This leads to a quality of rhythmic instruction that is highly inadequate and often results in an overemphasis on performance due to the stress upon product rather than process (Major, 1976, p.4).

**Need for the Study**

If choral music programs in the schools are to survive, continual progress toward the goal of producing independent musicians must be made. Unfortunately, most junior high students cannot read even the simplest musical score. The National Assessment of Education reported that between 85 and 92 percent of all 13 year-olds could not individually sight-read a very simple phrase of music. Many junior high choral teachers are finding that most of their students lack even the most basic music reading skills. The elimination of elementary music classes led by music specialists, and the
policy of requiring students to choose between participation in choral and instrumental programs are two factors often cited to account for these deficiencies (The First National Assessment of Music Performance, 1974, pp.15-20).

Whatever the reasons for the problems, junior high choral teachers are often faced with remediating music reading skills, especially rhythmic skills, in order to bring students to the minimum competency levels prescribed by the course of study.

The idea of remediation is taken from Competency Based Education (CBE) which requires intervention and remediation of students unable to meet the minimum established competencies. Presently the state of Ohio requires that CBE programs be in place in public schools by 1989 for mathematics, English, writing and citizenship. Although there are no current plans to require competency testing for the social sciences or the arts, the state of Ohio guidelines strongly recommend that all courses of study include provisions for remediation of students who do not meet course objectives.

Given the unique nature of remediation strategies, research is needed to evaluate a pedagogical procedure for rhythmic instruction which emphasizes remediation of deficits and which is adaptable to a large-group choral situation.
The Problem

Purpose of the Study

The purpose of this research study is to assess the impact of an instructional program in the remediation of rhythmic skills for junior high choral students. The parameters of the project implement remediation research in the following ways:

1. The instructional factors must be feasible and realistic for students with limited musical experiences.

2. The materials and methods must be presented in a treatment that is short term, accessible to delivery in a formal classroom setting, and effective in a performance-oriented class.

3. The remediation must be seen as non-threatening and independent of the grading system.

A summary of the research on rhythm and remediation used as the basis for the research design for this project is outlined in Chapter II.

Definition of Terms

Remediation is the process by which cognitive deficits are identified and corrected. The process involves subjecting each skill to a task analysis, thus creating a hierarchy of skills, then teaching each skill in a sequential manner.

Rhythmic Performance Accuracy is the ability of a student to perform given rhythm patterns as indicated by a score based on the percentage of correct responses.
Response Unit is a single skill or unit of content in the sequential chain developed from the task analysis that is used as the basis for each remediation lesson.

Design of the Study

An experimental design was employed using the Solomon Four-Group Design in order to assess the impact of an experimental rhythmic instructional approach that utilizes subdivision and speech cues against a traditional control method which stresses quarter note pulse and numerical counting strategies. The Design features are outlined in detail in Chapter III.

Two intact seventh grade choirs from the same school (N=80) participated in the 10-week treatment period of the study. Both choirs met three days a week, with a portion of each class period designated for rhythm instruction. The treatments were administered by the investigator while the regular choral director conducted a rehearsal with the remaining group.

Students were pretested individually for rhythmic ability and prior musical experience and were randomly assigned to groups.

The experimental group received instruction emphasizing use of the smallest rhythmic unit as the pulse and the utilization of speech cues that have durational values closely corresponding to the values of the notes with which they were
paired.

The control group received instruction incorporating the findings of Boyle (1969) using quarter note pulse and numerical counting strategies.

Both groups used rhythm worksheets containing a variety of rhythmic exercises that were designed by the investigator for this study. Following the treatment, the 80 subjects were given the posttest on an individual basis.

**Null Hypotheses**

1. There are no significant differences in rhythmic performance skills among groups utilizing a subdivision and speech cue approach versus groups using a traditional rhythmic instructional approach (quarter note pulse and numerical counting).

   1a. The pretest will not affect posttest scores.

   1b. The pretest will not interact with treatment type.

   1c. The pretest and posttest measures are not equivalently valid and cannot be used to indicate rhythmic performance abilities.

2. There are no significant differences between treatment types for students with minimal musical experience.

3. There are no significant differences between treatment types for students with previous musical experience.

**Assumptions Pertinent To The Study**

1. Rhythm is a skill that can be learned and improved at the middle school/junior high level.

2. All students can benefit from improved rhythmic skills.
3. The four treatment group populations are sufficiently structured to allow reliable and valid norms for comparison. (The groups are all of similar ability.)

4. The junior high choir is an elective subject, and student attitude toward choral music is positive.

5. The investigator was an auxiliary member of the staff and was known to the students; therefore, the possibility of reactive effect will be reduced.

6. The external variables of environment, musical ability, pretesting and socioeconomic status will not affect the results of the study significantly when using the Solomon Four-Group Design.

**Delimitations**

1. The study was limited to comparing one experimental approach to rhythmic remediation with a traditional approach to teaching rhythm.

2. The study measured rhythmic performance skills only and not rhythmic dictation abilities.

3. Four treatment groups were formed from two intact seventh grade mixed choirs in one school at the junior high level.

4. Students could not be moved from one choir to another to form totally equivalent groups.

5. The study was limited to a 10-week period with classes meeting three times each week.

6. None of the students in any of the treatment groups was also involved in the school band or orchestra program due to the existing building schedule.

7. The investigator worked with each of the four treatment groups for only 15 minutes during each of the 30 sessions. The remainder of each class period was spent in the normal choral rehearsal under the direction of the regular teacher.

8. The investigator and the regular choral director conducted the individual posttesting. Investigator
bias was reduced by the fact that posttest scoring was nonreactive and required little value judgment.

9. The results of this study may not be generalizable beyond the tested population.

Questions Related To The Study

1. Will an experimental rhythmic instructional approach that stresses subdivision and speech cue be more effective in remediating and improving rhythmic skills than a traditional control approach which utilizes quarter note pulse and numerical counting strategies?

2. Will the pretest create a sensitization to the posttest and affect posttest results?

3. Will the existence of the pretest interact with treatment type?

4. Will the experimental treatment be more effective than the control treatment for students with little previous musical experience?

5. Will the experimental treatment be more effective than the control treatment for students with previous musical experience?

Summary

In his first major study as Secretary of Education (a report on elementary education titled *First Lessons*), William J. Bennett wrote:

The arts are an essential element of education, just like reading, writing, and arithmetic . . . . Music, dance, painting, and theater are keys that unlock profound human understanding and accomplishment (1986, p.35).

Music educators agree wholeheartedly with this statement, yet music and other arts programs have been, and continue to be, cut by many school districts. One reason given for this
reduction is that music programs are failing to produce literate musicians who can effectively utilize their musical knowledge independently. Because of an emphasis on performance and a neglect of sight-reading practice, choral programs have been particularly suspect. It is the responsibility of choral directors to guide their students, at whatever level, to develop their music reading skills. This will require remediation of basic skills which students may be lacking.

The purpose of this study is to evaluate a procedure for the remediation of rhythmic skills at the junior high/middle school level. Chapter II reviews recent literature related to perception, the causes and effects of rhythmic deficits, strategies for intervention and remediation, and pedagogical techniques for implementing these strategies. Chapter III outlines procedures utilized in the experimental and control treatments. Chapter IV presents an analysis and interpretation of the data as related to the hypotheses proposed by the study. Chapter V summarizes the entire study and offers suggestions for further research.
CHAPTER II
REVIEW OF LITERATURE

The importance of rhythm to the quality of the overall choral performance has been propounded by many experts in the field. Mursell has stated that "rhythm gives life, sparkle, reality and expressiveness to the performance of music" (1956, p.254; as cited in Major, 1976, p.2). Gaston goes further, explaining that rhythm is the organizer and energizer of music (1968). Ehmann agrees that "rhythm is the unifying, binding element and the governing principle in music" (1968, p.93). Even Jean Piaget, in his only known written comment on music, said:

Music is . . . inner mathematics. Music rhythm is in fact of all temporal metrics the most directly graspable and is most assuredly not foisted on us by our environment (Wohlwill, 1974, p.393, translated from Piaget).

The development of sight-reading skills, including rhythm, was a major objective of public school music programs in America around the turn of the century. Soon after, however, sight-reading began to diminish in importance. This came about as a result of the movement away from the "content-centered" educational approach toward a more "child-centered" approach (Tellstrom, 1971, p.144). The
"song method," which used rote learning of songs as a basis for music instruction, replaced the drill method of teaching music (Birge, 1966). Despite the rise of high school instrumental programs, which have emphasized the teaching of music fundamentals, vocal music education in this century has continued to follow the trend of the song approach (Daniels, 1986, p. 280). Results from several recent surveys have shown a strong correlation between instrumental experience and sight-reading ability, but no significant relationship between level of sight-reading ability and participation in public school chorus (Hales, 1961; Colwell, 1963; Tucker, 1969; Major, 1976).

The review of the literature, presented in this section, will provide historical bases and theoretical guidelines for the research project described in this study. The literature is divided into four sections: 1) recent studies of perception in general and rhythmic perception specifically; 2) causes of rhythmic deficits and the effect on the overall musical performance; 3) research into intervention and remediation strategies; and, 4) pedagogical techniques for teaching rhythm and correcting rhythmic deficits.

**PERCEPTION**

According to Van Nuys and Weaver, the inability to read rhythms accurately from notation is often the cause of difficulty in music reading for both beginners and experienced
performers (Van Nuys and Weaver, 1943). The "encoding and decoding of aural and visual stimuli in the task of music reading is a complex perceptual process requiring extensive instruction" (Shehan, 1987, p.117).

The person reading music must use a computational system which determines time and duration based on the proportion each note bears to others in the same measure (Wilson, 1986, p.26). The visual signals must be processed through a specialized circuit which can decode and rewrite the signals into a language that the auditory and motor systems recognize. Since the brain cannot respond to the light stimulus the eye receives, the retina converts the light energy to electrical impulses which are transported to the brain by the optic nerve. The main receiving station for this information is the occipital cortex located in the back part of the brain. The performance of written rhythms utilizes a complex system of computation and translation of visual stimuli (Wilson, 1986, p.26). Psychologists who have made a study of the reading skills of musicians tell us that during perception, notes become grouped into clusters that are taken in all at once and treated as a unit (Wilson, Part II, 1986, p.25). This is in agreement with recent research in perception. When eyes read a line of print or musical notation, they make little jumps, called "saccades," and pauses, called "fixations." Visual information is taken in during the fixation period, but the eyes register nothing during the saccade. During an act of
perception, the eyes fixate for about 50 milliseconds (abbreviated as msec. and equal to one-thousandth of a second). After this, what was taken in during the first 50 msec. is conveyed to short-term memory where it is forgotten within seconds or is transferred into long-term memory if some use is found for the information or if it is rehearsed. The process of analyzing the information in short-term memory and sorting it out takes an additional 200 msec. (Gillet and Temple, 1982, pp.4-5).

All humans can make about four fixations per second: 50 msec. of visual intake and 200 msec. to process the information. During the fixation (intake) period, only five to seven items can be attended to, give or take a couple (Smith, 1978, 1979). This limitation of five to seven items depends on how the perceiver has organized the visual stimuli--an item may be a single unit or a group of several units that have been combined in some meaningful way. Combining items into meaningful units during perception is known as chunking (Smith, 1978). Chunking allows the perceiver to take in more information during each fixation. Given the nature of perception, the reader can process letter by letter (note by note), word by word (pulse by pulse), phrase by phrase (measure by measure) or sentence by sentence (musical phrase by musical phrase). Whether or not chunking occurs depends in large part on the mode of presentation (Gillet and Temple, 1982, p.6).
Recent studies have been concerned with differences between the ways that novices and experts use chunking to organize their knowledge (Chase and Simon, 1973; Simon and Simon, 1978; Larkin, McDermott, Simon and Simon, 1980; Chi et al., 1982). Experts tend to organize their knowledge into bigger chunks than novices. Furthermore, the chunks are organized differently. Experts tend to organize knowledge based on higher-order principles, whereas novices store their knowledge in more isolated bits or sort it on the basis of surface characteristics.

This research has strong implications for music. Bebeau has suggested that the inability to read rhythmic phrases accurately is likely a function of the student's inability to process the information in time to make the desired response (Bebeau, 1982, p.118).

In the 1970's a new approach to the study of human perception called information-processing began to gain widespread support. The information-processing approach describes thought processes in terms of symbol manipulation (Siegler, 1982). It focuses on the processing and representation of information and attempts to achieve a high degree of precision in describing cognition.

Most information processing approaches share certain assumptions about the organization of the information processing system. It is generally assumed that there are three structural levels of the system: a sensory or intake
register, a working memory, and a long-term memory. All information enters the system through the sensory register, but it can only be held there for a short period of time. To remain in the system, information must enter the working memory, where it can be combined with information from the long-term memory. All operations on information occur in the working memory. The constraint on the working memory is that it is extremely limited in capacity and can only attend to a few chunks of information at a time. The long-term memory is potentially unlimited in capacity, but the problem seems to be accessing the information that is stored there. In addition to these basic structural features of the system, most information processing approaches assume the existence of control processes that monitor the operation of the system. These include routines like rehearsal strategies for storing information in long-term memory (Wittrock, 1986, p.853).

Information processing systems relate to music reading in that literacy, with respect to a musical score, is based on utilization of a strategy for simplifying and organizing the material. Leafbald (1982) found that music reading is facilitated by the visual grouping of symbols.

**RHYTHMIC DEFICITS - Causes and Effects**

The acquisition of rhythmic skills is considered important in music learning (Patzold, 1963, 1981; Thachray, 1969; Hufstader, 1977; Rainbow, 1977; Sink, 1983), and achieving
high standards of performance in rhythm is a goal of all conscientious music teachers (Drake, 1968, p.329). Research, however, indicates that despite the importance of rhythmic skill to the development of independent music reading, teachers often have difficulty teaching rhythmic notation. This is true even though the students may demonstrate obvious rhythmic understanding kinesthetically (Upitis, 1986). One possible reason for this difficulty is that standard music notation describes the metric relationships among durations, while children often respond to the different figural form of the rhythmic structure (Upitis, 1986).

Rhythmic reading skill deficiencies also directly affect the quality of the overall performance:

People often hear a performance and immediately become aware that something is wrong. The tones may appear to be correct, but for some reason the musical performance is not effective. It has been suggested that often the problem with the performance is rhythmic in nature (Major, 1976, p.2).

The inability to decode rhythmic patterns has also proven to be a major source of error in sight-reading music (Van Nuys and Weaver, 1942; Thompson, 1953; Bebeau, 1982). Several researchers have attributed this to the inability to maintain a steady pulse (Ellison, 1959; Elliott, 1960; Cheyette and Cheyette, 1969; Gelineau, 1970; Garretson, 1976). Boyle’s investigation (1969) indicated that students who read rhythms using a traditional approach made significantly greater gains
if they were required to maintain an overt pulse at all times. The application of the mathematical relationships inherent in this approach requires concentration on the part of the student to avoid approximation of the durational values of the symbols.

As previously discussed, however, the data from Bebeau's (1982) study suggest that the inability to read rhythms accurately is a result of the student's inability to process the information early enough to make the desired response, rather than an inability to maintain a steady pulse.

Other factors also affect the student's ability to make the desired rhythmic response. In a study of the effects of rhythmic and melodic alteration on rhythmic perception, Sink (1983) discovered that "the simultaneous presentation of melody and rhythm may result in reduced attention to the absolute rhythmic structure in music" (p.111). Gabrielsson's earlier study (1973) found similarly that subjects had difficulty concentrating on rhythmic information amidst melodic information. Moog (1979) also demonstrated that melodic information interfered with some subjects' auditory processing of rhythmic structures. The implication was that eliminating the melodic aspect would assist in developing rhythmic performance skills.

A later study by Sink (1984) revealed several influences on rhythmic processing by students:
1. Alterations in tempo, duration, pitch characteristics, rhythmic and melodic phrase patterning and monotony may serve as organizers of rhythmic processing (p.190).

2. For some subjects, presenting rhythmic patterns in a monotonic or melodic-rhythmic context did not affect their rhythmic processing.

3. Other subjects, however, found that even though they recognized that pitch and melodic alterations were not considered rhythmic alterations, these changes influenced their judgments of rhythmic similarities.

Christ (1983) discovered that the ability to combine pitch with another quality did not occur until the subjects were in at least the Piagetian stage of late concrete operations.

These studies indicate that a rhythmic remediation strategy at the middle school level should isolate the rhythmic element for initial instruction.

**INTERVENTION/REMEDICATION**

There is much that musicians can learn from the research on intervention and remediation as it has been applied to basic skill areas. James H. Block begins with the teacher's attitude toward the learner and concludes that the teacher must accept two hypotheses before remediation can be implemented. The first assertion is that students can master what is to be taught; the second, that the teacher can teach so that all students will learn (Block, 1976).

Block advocates the use of mastery learning for remediation. Mastery learning, as advocated by John Carroll and
expanded upon by Benjamin Bloom, is based upon three basic tenets:

1. The task needing remediation begins at a point of inability and moves along the time line until the student is able to perform at the level prescribed by the teacher.

2. Tasks defined in behavioral terms require both the teacher and student to judge when the task is completed.

3. Almost any student, when given direction and time to follow those directions, can move from a state of inability to a state of ability (Carroll, 1963, pp.723-733; Davis, 1983, p.3).

Bloom developed preconditions for mastery which include teacher knowledge of student abilities, specific objectives and instructional content, and evaluation and prescriptive design (Bloom, 1974). The teacher's knowledge of the student's abilities helps the teacher to define the tasks and set up the necessary prerequisites for the hierarchy. From this knowledge, goals and objectives for the instructional content are developed. Goals and objectives establish first of all where the learner is, but also provide a statement about where the learner should be when instruction is complete. Instructional content is the method used to achieve the goals and objectives.

Evaluation should be both formative and summative and should provide information about how well the student has processed the instructional content and achieved the goals and objectives. The formative aspect of the evaluation process is
to provide feedback to both the student and the teacher. The student receives specific directions from the teacher and receives feedback in a non-threatening and non-graded way. The teacher uses the student performance to evaluate how successful the instructional process has been. Summative evaluation provides a cumulative indicator of the student's progress. The goal is for the student to feel that the evaluation of the performance is measured against the criteria of the objectives, not as a comparison against other students (Davis, 1983, p.3). The aspect of prescriptive design involves contingency plans made to assist students who have still not met the unit objectives through the evaluation process.

Research on behavioral interventions with academic deficits has focused on several important issues:

1. Any significant academic deficit can be remediated, as the deficit consists of a number of separate behaviors that are generally independent (Lahey, McNees, and Schnelle, 1977).

2. An intervention is judged to be successful only if it eliminates the deficiency within the regular functioning of the classroom. (There must be transfer to the regular tasks of the classroom.)

3. The intervention must be based on a detailed task analysis of the behavior to be remediated, with instructional strategies aimed at the specific aspects of the difficulty (Gearhart, 1976; Smith, 1981).
4. The intervention and remediation approach must be feasible to use within the restrictive demands of the classroom (Treib and Lahey, 1983, p.114). This is important in a rhythmic remediation where choral teachers are most often required to work with large numbers of students.

5. When dealing with deficiencies, it is especially important that the instructional method used be based on valid theories of learning more precisely than usual: "Specifically it is essential to . . . reduce the size of the unit of response in order to create a high probability of success . . ." (Treib and Lahey, 1983, p.114).

This "small step" approach is particularly useful when teaching younger students, slower students, and students of all ages and abilities during the first stages of instruction with unfamiliar material (Berliner, 1982). Similarly, these ideas best apply when learning hierarchical material because learning builds upon well-formed prior learning.

The learning theory of Robert Gagne, as discussed previously, provides a solid framework for remediation.

Learning is a change in human disposition or capability which persists over a period of time and which is not simply ascribed to processes of growth . . . the inference of learning is made by comparing what behavior was possible before the individual was placed in a "learning situation" and what behavior can be exhibited after treatment. The change may be . . . an increased capability for some type of performance (Gagne, 1977, p.3).

The recent research on human information-processing corresponds highly with the research on effective teaching. The information-processing approach relates in three areas: the limits of working memory, the importance of elaboration and practice, and the importance of continuing practice until
the students are fluent. When teachers present new information, they should avoid presenting too much information at once. Current information-processing theories suggest that humans are "limited-capacity processors,"--there are limits to the amount of information learners can attend to effectively (Miller, 1956; Beck, 1978).

When too much information is presented at once, working memory becomes swamped (Norman and Brobow, 1975). Learners can then become confused, omit or skip material, or be unable to complete the processing correctly (Tobias, 1982). This suggests that when teaching new or difficult material, a teacher should proceed in small steps and provide practice on one step before adding another. This enables the student to process manageable pieces of information or skills.

A second finding from the information-processing approach is that students have to process new material in order to transfer it from working memory to long-term memory. They have to elaborate, review, rehearse, summarize, or enhance the material (see Gagne, 1985).

A third point is that new learning is easier when prior learning is readily accessible or automatic. Retention and application of previously learned knowledge and skills comes through overlearning or practicing beyond the point where the student has to work to give the correct response. This results in automatic processes which are rapidly executed and require little or no conscious attention. When prior learning
is automatic, space is freed in working memory, which can then be used for additional learning (La Berge and Samuels, 1974; Spiro, 1981).

The information-processing system has important implications for instruction in music. When learning new musical material, it is important for the learner to be provided "instructional support" by the teacher (Tobias, 1982). When providing such support, a teacher must: a) break the material into small steps; b) give the learner practice in each step before increasing the complexity by adding another step; c) provide for elaboration and enhancement in order to help the learner move the material from working memory into long term memory; and, d) provide for additional practice and overlearning of basic material and skills so that the learner’s use of these skills is fluent and automatic (Wittrock, 1986, p.378).

Any remediation in music must be based on proven principles of learning theory and make use of the current research on information-processing. In addition, James Mursell (1937) says that any discussion of the musical experience "is based upon certain psychological assumptions and implies a certain view of the nature and functioning of the musical mind" (pp.287-288).

Edwin E. Gordon (1980) has established five levels of musical learning that can be used to apply the theories of learning and the principles of intervention and remediation:
1. **Aural/Orai Level** - verbal or sound patterns (students are introduced aurally to the basic pulse and other patterns).

2. **Verbal Association** - symbols associated with the sound (rhythmic notation symbols) are introduced.


4. **Symbolic Association Level** - match sounds with written symbols and respond rhythmically.

5. **Composite Synthesis Level** - student deals with rhythmic patterns in a series. The process continues with accumulation of more rhythmic patterns.

These five levels are perceptual in nature and must occur in order if the learning is to be retained. These levels are well adapted to a remedial rhythmic approach.

If music teachers are going to accept the challenge of remediating rhythmic skills, the approach utilized should: a) be easy to comprehend and teach; b) be effective in a minimum amount of time, as teachers have many other skills to cover in limited rehearsal time; c) be easily accessible and successful with large groups; and, d) require a minimum amount of set-up time or equipment.

**PEDAGOGICAL TECHNIQUES FOR TEACHING RHYTHM AND CORRECTING RHYTHMIC DEFICITS**

Prior to 1980, little experimental research had been conducted to substantiate the effectiveness of various rhythm-reading procedures and methods. Many of these studies were based on a traditional approach to teaching rhythm as outlined by Boyle (1969). Elements of this approach included:
1. Using the quarter note initially as the pulse in the given meter signature;

2. Setting up an overt steady pulse response with accent on the appropriate pulse;

3. Making a motor response on the appropriate pulse by using the mathematical concepts common to rhythm training.

Boyle's investigation indicated that students who read rhythms in the traditional way made significantly greater gains as a result of rhythm reading if they were required to maintain an overt pulse at all times. Foot-tapping was shown by Boyle to be an effective aid to accurate rhythmic performances.

Other researchers have suggested that acquisition of a pulse response, preferably through kinesthetic activity, is a necessary prerequisite to rhythm-reading instruction, and that the inability to maintain a steady pulse may be a major cause of inaccurate rhythmic reading (Ellison, 1959; Elliott, 1960; Ernst and Gary, 1965; Cheyette and Cheyette, 1969; Gelineau, 1970; Garretson, 1976). Results of these studies indicated that the traditional method of rhythm reading should be introduced only after children can maintain the underlying beat and apply the necessary mathematical concepts.

Bebeau's study (1982) suggested that the importance of requiring students to maintain a separate, overt pulse response may be a unique requirement of the traditional method and not generalizable to other methods. Students in her non-traditional speech cue treatment (discussed in detail
later in this chapter) were not required to maintain a separate overt pulse response, yet they read rhythmic phrases with greater precision than students trained in the traditional method. The application of the mathematical relationships inherent in the traditional method requires a great deal of cognitive processing and concentration on the part of the student. Bebeau reported that if the student does not concentrate on maintaining the underlying pulse, there is a tendency to approximate the durational values of the symbols. The improved accuracy obtained in Boyle's study may have been the result of increased practice in the mathematical relationship established by the overt pulse response (Bebeau, 1982, p.118).

Bebeau's conclusions indicated that the errors in rhythm reading were likely a result of the student's inability to visually and cognitively process the information quickly enough to make the desired response. She concluded that it seemed "doubtful that methods that stress early acquisition of pulse response would be any more effective in assuring accurate rhythm reading than methods that do not" (Bebeau, 1982, p.118).

Major (1976, 1982) compared a subdivision approach to rhythm reading with imitation and determined the subdivision approach to be superior and equally effective for high, medium and low rhythm achievers (1986, p.45). This experiment compared three matched choirs in a 10-week project utilizing
subdivision treatment, imitation treatment, and a control group which received no organized treatment. The two treatment groups used rhythm booklets developed by the experimenter. The subdivision rhythm booklet contained rhythms using a traditional arithmetic subdivision system (1 e & a) and incorporating the rhythm building concept. Each note in the pattern was visually represented as being either equal to, or a multiple of, the smallest note value in the pattern. The imitation rhythm booklet used only the appropriate arithmetic indication of the pulse. Major concluded that:

... an analytical procedure appears to be involved in all developed rhythmic competencies, although the analytical activity may be subconscious. . . . If this is true, rote kinds of rhythmic teaching strategies would be of limited value (Major, 1982, p.46).

In the past few years, several studies have examined various aspects of rhythm pedagogy based upon the earlier syllabication strategies of Gordon (1965), Bolden (1967), and Benham (1971). Robert Pace (1954), a well known piano pedagogue, first introduced and published a syllable technique for understanding and reading rhythmic notation in his piano book series. Syllabication techniques use neutral syllables or related word phrases that vocalize the rhythmic patterns.

A study by William Jarvis (1981) demonstrated that a verbalization strategy was significantly better than a performance strategy in improving the recognition of notation.
Jarvis also showed that although musically high aptitude subjects did significantly better than low aptitude subjects in the recognition of notation, there was no significant difference between high and low aptitude subjects in the performance of notation.

James Stockton (1983) used Gordon’s rhythm syllable approach with non-music majors at the college level. Although the approach was designed as a simplified approach for use with younger children, the college students in this study showed a greater level of understanding than those taught with a traditional approach. The research indicated that a simplified method in the initial stages of instruction may be beneficial at any level.

The study by Bebeau (1982) mentioned previously has provided one of the most comprehensive looks at the simplified speech cue method. The method was based on the works of both Orff and Kodaly. From Orff, it paired a speech cue with the value of each rhythm symbol. These speech cues were permanently paired with the symbols as in Kodaly.

Bebeau conducted two experiments with third graders to compare the effectiveness of teaching rhythm reading using a traditional mathematical cue approach versus a simplified speech cue method. The experimental treatment utilized a combination of speech and movement cues. When the rhythmic symbols were read by applying speech cues, the student:
1) identified the symbol by word and hand movement; 2) spoke the word and executed the body motion that simultaneously performed the rhythmic response; and, 3) maintained a steady pulse while accenting the appropriate pulse (Bebeau, 1982, p.109). Children in the traditional treatment were given the visual mathematical cues for reading the notes or rests. They counted pulses as they clapped the rhythmic patterns of the notes. Instruction consisted of presentation of 12 rhythmic concepts in 4/4 meter.

The results of Bebeau’s experiment indicated that:

... third graders taught to read rhythm phrases in 4/4 meter by either method can make dramatic gains in rhythm reading as a result of systematic, regular instruction but results significantly favored the speech cue method (p.117). The study also suggested that children can be taught to read even complex rhythm patterns if the instructional procedures have been subjected to task analysis and empirical verification (p.118).

After conducting the experiment, Bebeau raised several questions about the simplified speech cue method that need to be addressed in further research. Why do students make so many mistakes when reading by the traditional method? Will the speech cue method be equally effective for all ages of beginning students, even older students who can more readily apply the mathematical concepts? Will accuracy in rhythmic performance in the speech cue method be obtained for meter
bases other than 4/4 and for complex rhythms? The data presented in Chapters III and IV of this study will attempt to answer some of these questions raised by Bebeau.

The recent research on visual perception and memory has been used in several current studies related to rhythm. Early research on memory by Kintsch (1970) showed vocalization (such as speech cue) to be a more effective strategy than visual imagery in preserving items from short-term to long-term memory. The importance of the aural aspect in music has long been an established element of music programs. Mainwaring (1951, p.113) stressed that children should hear the sound of a rhythm pattern before experiencing the visual notation, and that symbols should be taught within the context of their musical meaning.

Dickel (1983) determined that rhythmic patterns, such as groups of digits or abstract words, were best remembered when they were associated with concrete words or syllable groupings that shared the same consonant, and when they were combined with the visual mode. These mnemonic devices served as memory aids to enable the learner to organize and categorize new materials and combinations. Mnemonics have figured prominently as an effective aid in the "chunking" of information which facilitates perception and short-term memory.
A study by Shehan (1987) examined the opposing views in the acquisition of rhythm patterns through the visual or oral/aural modes of presentation. The study utilized second and sixth grade students to examine the effects of four modes on rhythmic reading and short-term retention:

1. Audio-rhythm (rhythm pattern sounded on a woodblock);
2. Audio-mnemonics (rhythm presented using mnemonic syllables);
3. Visual-rhythm; (audio woodblock plus bold-black notation on 11" x 14" card);
4. Visual-mnemonics (audio combination of notation and vocalization of mnemonic syllables).

Results of Shehan's study showed that the simultaneous use of auditory and visual modes facilitated learning and retention at both the second and sixth grade levels. She concluded that:

. . . music reading skills are learned most efficiently through a multifaceted approach that includes the rhythm sound, its associated mnemonics and the notational symbols (p.125).

CONCLUSION

Although rhythm continues to be a troublesome area in music, research on memory, perception, rhythmic deficits, remediation, and learning modes provides the structure for future research in rhythm instruction. Specifically, a study needs to be conducted that:
1. Considers the nature of rhythmic deficits (Bebeau, 1982; Christ, 1983; Upitis, 1986);

2. Utilizes the research on perception and allows for symbol groups that facilitate the chunking of information (Smith, 1978; Leafbald, 1982);

3. Designs instructional procedures reflecting how information is processed by students (Case, 1983) and providing strategies for simplifying and organizing the material;

4. Builds upon recent research on effective rhythmic instruction (Major, 1976; Jarvis, 1981; Bebeau, 1982; Stockton, 1983; Dickel, 1983; Shehan, 1987);

5. Plans instructional strategies that will effectively allow for remediation of deficits (Berliner, 1982; Robias, 1982; Davis, 1983; Treiber and Lahey, 1983).

Experimental studies utilizing these areas of research are needed to determine specific pedagogical techniques that will result in significant growth in the rhythmic reading skills of students.
CHAPTER III
MATERIALS AND PROCEDURES

The experimental remediation treatment for this study employed the combination of two ideas that have been separately verified through research but have not been tested as a single instructional method. The first is the use of the smallest rhythmic unit as the pulse throughout (Mursell, 1937; Drake, 1968; Palmer, 1976; Major, 1976; Tindali, 1978; Wang, 1984). The second is the utilization of speech cues that have durational values closely corresponding to the values of the notes with which they are paired (Bolden, 1967; Benham, 1971; Gordon, 1971, 1980; Jarvis 1981; Bebeau, 1982; Stockton, 1982). The experimental treatment combined verbal speech cues with rhythmic subdivision concepts. The elements of the approach included remediating rhythmic skills by:

1. Using the smallest rhythmic unit as the pulse;
2. Adding pulses together to form the longer durational values rather than subdividing from the quarter note for shorter durations;
3. Verbalizing the symbol or pattern name as the method of reinforcement rather than using the arithmetic counting device.
The traditional mathematical cue method was used as the control treatment and incorporated the findings of Boyle (1969).

Elements of this treatment included:

1. Using the quarter note initially as the pulse in a given meter signature;

2. Setting up an overt steady pulse response with accent on the appropriate pulse;

3. Making a motor response on the appropriate pulse by using the mathematical concepts common to rhythmic reading.

Instruction consisted of the presentation of a variety of isolated rhythmic concepts in both methods. The rhythmic patterns included tied notes, multi-meter, and some simple syncopation. A complete sample of the worksheets used in the treatment sessions is included in Appendix D.

The maintenance of a steady pulse is an important aspect in the performance of rhythm patterns; however, the importance of the steady pulse needs to be put into perspective. The inability to maintain a steady pulse is often thought to be a major cause of inaccurate rhythmic reading (Ellison, 1959; Elliott, 1960; Cheyette and Cheyette, 1969; Gelineau, 1970; Garretson, 1976). Boyle's (1969) investigation indicates that students who read rhythms using a traditional approach make significantly greater gains if they are required to maintain an overt pulse at all times. Data from Bebeau's study (1982), however, suggest that the
inability to read rhythms accurately is a function of the student's inability to process the information in time to make the desired response rather than the ability to maintain a steady pulse.

For this study maintenance of a steady pulse, as indicated by the metronome, was expected but did not receive as much emphasis as the accuracy of the performed rhythms. The durational relationships between the various symbols received more weight than an absolutely maintained tempo.

The experimental and control treatments were carefully grounded in the learning theories and concepts discussed in Chapter II. Specifically built into the design were two assumptions important to remediation: learning problems can be remediated, and the teacher can teach in such a way as to ensure success. Rhythmic skills were subjected to task analysis to develop the prerequisites necessary to build the learning hierarchy. A rhythm pretest and rhythm worksheets were developed from the task analysis, and the pretest was field tested to determine needed revisions. Rhythm lessons for both experimental and control groups were developed from the task analyzed skills. Each lesson introduced a small area of rhythmic reading skill so as to reduce the size of the response unit. In addition, the five levels of learning developed by Gordon (1980) were incorporated into the instructional sequence.
This study also attempted to address the questions raised in Bebeau's (1982) study. Specifically, will the accuracy in rhythmic performance obtained with the speech cue method extend to rhythms in meter bases other than 4/4? Will older children who can more readily apply mathematical relationships also read rhythms using the speech cue method? Although this study does not take a direction identical to Bebeau's, the results prove generalizable to the questions she presented (see Chapter IV).

**DESIGN OF THE STUDY**

In order to assess the impact of the experimental rhythmic instructional approach that utilized subdivision and speech cues against a traditional control method which stressed quarter note pulse and numerical counting strategies, an experimental design was employed using the Solomon Four-Group Design. The design features can be shown as follows:

- **R** = randomly selected group
- **O** = process of measurement or testing
- **X** = experimental treatment
- **C** = control treatment

<table>
<thead>
<tr>
<th>Group</th>
<th>Pretest</th>
<th>Treatment</th>
<th>Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>01</td>
<td>X</td>
<td>02</td>
</tr>
<tr>
<td>R4</td>
<td>03</td>
<td>C</td>
<td>04</td>
</tr>
<tr>
<td>R3</td>
<td>X</td>
<td></td>
<td>05</td>
</tr>
<tr>
<td>R2</td>
<td></td>
<td>C</td>
<td>06</td>
</tr>
</tbody>
</table>
This design has several advantages. First, the design controls all factors for internal validity—factors which could affect the posttest scores or could produce changes which might be mistaken for the results of X. The following internal validity factors are satisfactorily controlled when correctly applying the Solomon Four-Group Design:

a) **History** is controlled in that events that might have produced a $0_i - 0_j$ difference would also produce a $0_j - 0_i$ difference. Intrasession history is controlled by rotating treatment sessions.

b) **Maturity** factors are controlled in that they should be manifested equally in randomly selected experimental and control groups.

c) **Instrumentation** is controlled by student responses to a fixed instrument (pretest/posttest) which is a nonreactive measure, in that it is a passive record of the students' behavior.

d) **Regression** against mean differences is controlled even if pretest scores are extreme. If both experimental and control groups are randomly assigned from the same extreme pool, regression, if it indeed occurs, appears in both groups.

e) **Randomization** has achieved group equality in *selection*. Matched pairs or "blocking" is not particularly helpful when used to overcome initial group differences (Campbell, 1963, p.15) and is not feasible with the Solomon Four-Group Design in which two groups are not pretested.
f) **Subject mortality**: When using public school students, it is difficult to control absences that might affect the treatment received. Dropping these students from the study, however, might bias the group toward the conscientious or healthy, thus losing group equivalency. All selected experimental and control students who completed the pretest and posttest were scored.

The Solomon Four-Group Design also represents the first "explicit consideration of external validity factors" (Campbell, 1963, p.24):

a) **Reactive or interactive effect of testing** - "By paralleling the design elements with experimental and control groups lacking the pretest, both the main effects of testing and the interaction of testing and X are determinable" (Campbell, 1963, p.25). Since it was desirable that the results of this study be generalizable beyond the tested groups to future studies, it was important that the question of "pretest sensitization" be addressed. In the Solomon design, the effect of X is replicated in four different ways, which increases generalizability (O_1-O_1; O_2-O_2; O_3-O_3; O_4-O_4).

The "testing of X" interactions in this design permits one to interpret future pretest/posttest design results. By comparing O_1 with O_2 and O_3, a combined effect of maturation and history can also be noted (Campbell, 1963, p.25).

b) **Interaction of selection and X** - Randomization controls internally for selection, but even in the Solomon
Four Group Design, it is possible that the effects, validly demonstrated, might be specific only to the tested population and not generalizable to other students. This was expressed as a limitation of the study.

c) Reactive arrangements - Campbell and Stanley (1963) state their opinions about how to avoid negative reactive arrangements:

As a result of personal observations of experimenters who have published data in spite of having such poor rapport that their findings were quite misleading, the present authors are gradually coming to the view that experimentation within the schools must be conducted by regular staff of the schools concerned, whenever possible, especially when findings are to be generalized to other classroom situations (p.21).

The fact that this investigator functioned as an auxiliary member of the staff, was known to students, and had worked with them regularly reduced reactive arrangements due to investigator unfamiliarity. In addition, the treatments were a variant of normal classroom events and routines, and the pretesting and posttesting were considered a part of regular classroom performance testing. By these measures, the negative effects of reactive arrangements were reduced.

Subjects

The four treatment groups were formed from two intact seventh grade choirs within one junior high school in a local suburban school district. The total school enrollment was 1,100. Each choir had approximately 45 students, met three
days a week for 45 minutes, and was an elective subject. One choir met during the first period, the other during the second period of the day. The choirs used in this study were two of five choirs existing in the school. These two particular choirs were selected because:

a) Both choirs had the same director. The remaining three choirs had a different director.

b) Both choirs met at essentially equivalent times (period one and two in the morning).

c) The choirs had identical courses of study, prepared the same music, and performed together in concerts.

d) The two choirs had similar abilities (based on director screening auditions) and were approximately the same size.

e) None of the choir students was also a member of any other school performing group such as band or orchestra. Students were required to select choir, band, orchestra, or general music.

f) The two choirs utilized the same facilities and equipment. The choir population was predominantly Caucasian, as was the population of the school, with the majority of the students coming from middle to lower-middle class homes.

**Procedures**

All students in the two choirs were given a Musical Experience Survey to determine those students with significant previous musical experience such as private piano instruction or participation in elementary band or orchestra. Students whose responses indicated substantial previous musical experience were randomly assigned to one of the four treatment groups. This allowed each treatment group to represent a
population of students with previous musical experience equivalent to the percentage of the total population with previous musical experience.

Prior to the assignment of groups, all students were given a vocabulary test consisting of all notes and corresponding rests from whole notes and rests through sixteenth notes and rests. Students who failed to pass the test at a 90 percent level were given additional instruction and retested. Students who failed the retest were dropped from the study, as their inability to recognize and correctly utilize the correct terminology could affect the results of the study. Students with a previously indicated poor attendance record were also dropped from the study, as their failure to regularly attend treatment sessions over the 10-week period might affect posttest results. The remainder of students in each choir were randomly assigned to the experimental or control group within their respective choir. Students with previous musical experience were assigned to groups as stated previously.

The pretest and posttest were field tested prior to their use with these subjects in order to provide a correlation between the pre- and posttest and to demonstrate that the two forms of the test were equivalent. Students in the two pretested groups (one experimental and one control) were individually pretested by the experimenter, who tape recorded responses for future scoring. Students were permitted to use any method they wished for performing the items. Since most
of the students had little formal rhythmic training, testing was stopped if a student missed three consecutive items. During the posttest, all students completed items by clapping and were directed to verbalize either the counting or the speech cues as each item was clapped. Posttest results were tape recorded for future scoring by the investigator.

The students were instructed by the investigator in four separate groups (two for each choir), and the order of instruction for each group was reversed each week. All instructional settings were conducted by the investigator in the nearby general music room. The regular director ran simultaneous rehearsals with the other groups in the auditorium. The students were familiar with the investigator, as he had functioned as an auxiliary staff member, and the students were accustomed to small groups meeting in the general music room for sectional rehearsals. Bi-weekly makeup sessions were conducted for absentees to maintain equivalency of the groups.

Each group received 15 minutes of instruction for a total of 30 class sessions over 10 weeks. The students in the experimental group were taught utilizing eighth note pulse and verbal speech cues. Students in the traditional group were taught the value of the note and number of pulses it receives in a given meter. Practice in clapping and reading the rhythmic patterns that contained the new rhythm concept was provided for each group. This was followed by practice
exercises that combined the new symbol with symbols previously presented. All practice exercises were written on the chalkboard. Exclusive of the first three lessons, where the eighth note pulse was established versus the quarter note pulse, the notation was identical for each group. The notation was written on various places on the staff, in either clef, in the range common to the choral music being studied.

Analysis Of Data - Statistical Procedures

The posttest scores can be treated with a two by two analysis of variance design:

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Experimental</th>
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<tbody>
<tr>
<td>Pretested</td>
<td>$O_4$</td>
<td>$O_7$</td>
</tr>
<tr>
<td>Unpretested</td>
<td>$O_4$</td>
<td>$O_5$</td>
</tr>
</tbody>
</table>

The column means provide information about the main effect of $X$ (experimental treatment). The row means show the main effect of pretesting. The cell means indicate the interaction of testing with $X$. (See p.38.)

If the main and interactive effects of pretesting are negative, an analysis of covariance of $O_4$ versus $O_5$ can be run, the pretest scores being the covariant.

The statistical data will also yield additional information about the study:

1. Analysis of variance on the posttest scores for:
   a) Effects of the pretest to show whether the pretest biased students toward the posttest, thereby limiting the effects of the treatment results;
b) Group differences at posttest to indicate treatment results;

c) Pretest/Group interaction (pretested versus non-pretested results).

2. Analysis of covariance can be run to test differences among groups if the main effects of the study are not significant. The pretested groups, O<sub>i</sub> vs. O<sub>i</sub>, will be used in the covariant test. (Are the results congruent with the original analysis of variance in regards to the effects of the pretest?)

**Equipment**

Minimal equipment was required for the experiment. Necessary materials included a chalkboard and metronome, cassette tape recorder deck and tapes, microphone, and flashcards with rhythm patterns for the pre- and posttest. An overhead projector and transparencies for the skill taught in each lesson is helpful, however not mandatory.

**The Intervention**

The experimental and control groups were individually taken out of the choral rehearsal and moved to a general classroom setting with standard desks and chairs. This was the location where the treatment of both groups was administered. Each group was given identical rhythmic exercises to work on during each session. The exercises were written on the chalkboard, and an individual rhythm worksheet was given to each student.

Each group was introduced to an audible "click," provided by an electronic metronome, representing the basic pulse
<table>
<thead>
<tr>
<th>Notated Note</th>
<th>Name of Note</th>
<th>Verbalization</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Eighth note</td>
<td>Eighth</td>
</tr>
<tr>
<td></td>
<td>Two eighth notes</td>
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</tr>
<tr>
<td></td>
<td>Three eighth notes</td>
<td>Three eighth notes</td>
</tr>
<tr>
<td></td>
<td>Quarter note</td>
<td>Quarter</td>
</tr>
<tr>
<td></td>
<td>Dotted quarter note</td>
<td>Dotted quarter dot</td>
</tr>
<tr>
<td></td>
<td>Half note</td>
<td>Half note</td>
</tr>
<tr>
<td></td>
<td>Whole note</td>
<td>Whole note hold it</td>
</tr>
<tr>
<td></td>
<td>Eighth rest</td>
<td>Rest</td>
</tr>
<tr>
<td></td>
<td>Quarter rest</td>
<td>Rest - ing</td>
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<tr>
<td></td>
<td>Dotted quarter rest</td>
<td>Rest - ing dot</td>
</tr>
<tr>
<td></td>
<td>Half rest</td>
<td>Half - rest</td>
</tr>
<tr>
<td></td>
<td>Whole rest</td>
<td>Whole rest hold it</td>
</tr>
<tr>
<td></td>
<td>Two sixteenth notes</td>
<td>Six - teents</td>
</tr>
<tr>
<td></td>
<td>Four sixteenth notes</td>
<td>Four six-teenth notes</td>
</tr>
<tr>
<td></td>
<td>Eighth note triplet</td>
<td>Tri - pe - let</td>
</tr>
<tr>
<td></td>
<td>Tie</td>
<td>Tie</td>
</tr>
</tbody>
</table>

Figure 1. Speech cue verbalizations used by the Experimental Group, Periods 1 and 2.
(eighth note for the experimental group and quarter note for the control group). The tempo was set at either 50 or 100 pulses per minute for both groups.

Members of the experimental group were asked to clap and speak out loud the name of the note that they were reading to the speed of the basic eighth note pulse. (See Figure 1.) With the eighth note pulse established, the group clapped a series of eighth notes saying, "eighth, eighth, eighth, eighth, eighth, eighth, eighth, eighth." When given the following pattern, eighth, eighth, qua-ter, two-eighths, qua-ter the experimental group responded by clapping and saying, "eighth, eighth, qua-ter, two-eighths, qua-ter."

Rhythm patterns containing dotted notes were clapped and spoken as quar-ter, two-eighths, qua-ter, dot, eighth "qua-ter, two-eighths, qua-ter dot, eighth."

Simple syncopated patterns of tied note across a barline were easily performed: two-eighths, two-eighths | tie, eighth, qua-ter "two-eighths, two-eighths, | tie, eighth, qua-ter."

Sixteenth notes, rests and triplets were clapped and spoken as two-eighths, four sixteenth notes, rest-ing, tri-pel-et "two-eighths, four six-teenth notes, rest-ing, tri-pel-et."

Members of the control group were instructed in their sessions to verbally count and clap the same rhythmic exercises using traditional numbers. were counted as "one - and, two - and, three - and, four - and."
was counted "one - and, two - and, three -
and, four - and."

All additional rhythmic patterns containing dotted notes and ties across barlines were performed in the traditional manner. Each exercise was practiced at the speed of 50 and advanced to 100.

The difficulty of rhythmic exercises progressed with each treatment intervention. Over the duration of the study the students read rhythm passages ranging from eighth notes, dotted notes, triplets, unmetered and metered note groupings, and ties across the barline in standard simple, compound and multi-meter examples. (See Appendix D.)

Upon completion of the 10 week intervention, students were tested on their ability to accurately speak and clap rhythmic patterns by sight. The accuracy differences of the experimental (subdivision/speech cue) group were measured and compared to the traditional control (quarter note pulse) group. The pretest/posttest is found in Appendix C.

Collection of Data

The students' correct responses were recorded on a scoring sheet designed by the investigator. Four data sets of raw scores were derived by recording the 24 item pre-posttest as follows:
1. One point was given when the student correctly performed one full set of four measures for each of the 24 rhythmic patterns at the metronomic speed of 50 pulses per minute.

2. One point was given when the student correctly performed one full set of four measures for each of the 24 rhythmic patterns at the metronomic speed of 100 pulses per minute.

3. One point was given when the student correctly performed a full measure of each of the 24 rhythmic patterns at the metronomic speed of 50 pulses per minute.

4. One point was given when the student correctly performed a full measure of each of the 24 rhythmic patterns at the metronomic speed of 100 pulses per minute.

Chapter IV reports the results of the experimental and control groups in the study.
CHAPTER IV
PRESENTATION AND ANALYSIS OF DATA

Following the completion of all evaluation and testing procedures, the scores obtained were subjected to statistical analysis. The data concerning the testing of main effects and the dependent variables of treatment group, period, measures and metronomic speed were analyzed in the computer facilities of Wright State University, Dayton, Ohio, using an IBM 3090, MVS/XA 2.2 operating the SAS statistical package version 6.06.

The organization of this chapter presents the hypotheses, the results of the statistical analysis, and a discussion. In Tables 1 through 10, "E." refers to the experimental group and "C." refers to the control group, "TRTGRP" refers to the treatment group, "Per." refers to the class period of the school day, "Measures" refers to the number of measures included in the study of the pretest/posttest and "Metro Sp." refers to the metronomic speed of 50 or 100 pulses per minute used throughout the study.

The raw scores were entered first into the computer which converted the raw scores into percentages. The formula used was the number correct, over the number possible, times 100.

Formula used: \[
\frac{\text{number correct}}{\text{number possible}} \times 100 = \text{percentage}
\]
The percentage scores were used throughout the remaining computations. The results were reported in the form of Type IV SS, Mean Squares, F value and the Omnibus F scores. The Omnibus F report is significant because it simultaneously tests all conditions of the study. When conditions indicate significance, the next level of investigation then looks at individual elements of the model. The Omnibus F reports the Treatment Group as significant (.0001) and Measures as significant (.0041). The Period (.6082) and Metronomic Speeds (.1255) were found not to be significant in this study. The results appear in Tables 1 through 4.

Null Hypotheses

Hypothesis 1

There are no significant differences in rhythmic performance skills among groups utilizing a subdivision and speech cue approach versus groups using a traditional rhythmic instructional approach (quarter note pulse and numerical counting).

In order to test this hypothesis, scores were derived from the raw scores of the rhythm test (See Appendix F.) and were submitted for statistical analysis. The results of this procedure appear in Table 1.

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exp.</td>
<td>57.68</td>
<td>.0001</td>
</tr>
<tr>
<td>Con.</td>
<td>31.10</td>
<td></td>
</tr>
</tbody>
</table>
As seen in Table 1, the statistical analysis indicated significant differences between the means of the treatment groups in favor of the experimental treatment. The results were significant at the .0001 level; therefore, the hypothesis is not accepted.

The dependent variable: Measures were found to be significant at the .0041 level. The results appear in Table 2.

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exp.</td>
<td>47.94</td>
<td>.0041</td>
</tr>
<tr>
<td>Con.</td>
<td>40.75</td>
<td></td>
</tr>
</tbody>
</table>

The dependent variable: Period was not found significant at the .6082 level. The results appear in Table 3.

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exp.</td>
<td>44.78</td>
<td>.6082</td>
</tr>
<tr>
<td>Con.</td>
<td>43.77</td>
<td></td>
</tr>
</tbody>
</table>

The dependent variable: Metronomic Speed was not found significant at the .1255 level. The results appear in Table 4.
Table 4. Observation \( t \) Test for Significance Between Means for the Dependent Variable of Metronomic Speed.

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>( P )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exp.</td>
<td>46.35</td>
<td>.1255</td>
</tr>
<tr>
<td>Con.</td>
<td>42.22</td>
<td></td>
</tr>
</tbody>
</table>

Hypothesis 1a.

The pretest will not affect posttest scores.

As Tables 6 through 9 (Sets 1-4) demonstrate, the pretest \( t \) Test results reflect that the pretest scores did not affect the posttest scores. The hypothesis is accepted.

Hypothesis 1b.

The pretest will not interact with treatment type.

A major strength of the Solomon design is its ability to test for internal validity. With the added safeguards of the Student Music Experience Survey and the comparative results of the pretest and posttest \( t \) Tests, the scores support the hypothesis. The hypothesis is accepted.

Hypothesis 1c.

The pretest and posttest measures are not equivalently valid and cannot be used to indicate rhythmic performance abilities.

Table 10 demonstrates that the pretest and posttest measures were significant (.0041) in this study; therefore, the hypothesis is not accepted.
The following Tables report the results of the Metronomic Speeds (50 and 100 pulses per minute) and the number of Test Items (24 or 96 measures) used during the pretest and posttest.

E = experimental group  
C = control group  
TRTGRP = treatment group  
Per. = class period of school day  
Measures = number of measures in test  
Metro Sp = metronomic speed

Table 5, Set 1. Comparison of Periods 1 and 2  
Metronomic Speed = 50, Test Items = 24

| Prd | Group  | Test | t   | PR>|T|  | Mean  | Standard Deviation | Range  |
|-----|--------|------|-----|-------|-------|-------------------|--------|
| 1   | E. vs. C. | Pst  | 3.04 | 0.0068 | 22.91 | 33.72             | 129.16 |
| 2   | E. vs. C. | Pst  | 3.63 | 0.0018 | 27.08 | 33.34             | 104.16 |
| 1&2 | E. vs. C. | Pre  | 1.83 | 0.0836 | 7.50  | 18.36             | 58.33  |
| 1&2 | E. vs. E. | Pst  | -0.24| 0.8098 | -1.66 | 30.54             | 112.50 |
| 1&2 | C. vs. C. | Pst  | -0.43| 0.6736 | -4.16 | 43.55             | 150.00 |

Table 6, Set 2. Comparison of Periods 1 and 2  
Metronomic Speed = 100, Test Items = 24

| Prd | Group  | Test | t   | PR>|T|  | Mean  | Standard Deviation | Range  |
|-----|--------|------|-----|-------|-------|-------------------|--------|
| 1   | E. vs. C. | Pst  | 2.38 | 0.0278 | 19.79 | 37.14             | 133.30 |
| 2   | E. vs. C. | Pst  | 2.44 | 0.0244 | 20.00 | 36.58             | 120.83 |
| 1&2 | E. vs. C. | Pre  | 1.29 | 0.2127 | 5.62  | 19.50             | 70.83  |
| 1&2 | E. vs. E. | Pst  | -0.70| 0.4936 | -4.16 | 26.69             | 112.50 |
| 1&2 | C. vs. C. | Pst  | -0.02| 0.9837 | -0.20 | 45.12             | 183.33 |
Table 7, Set 3. Comparison of Periods 1 and 2
Metronomic Speed = 50, Test Items = 96

| Prd | Group    | Test | t    | PR>|T| | Mean | Standard Deviation | Range  |
|-----|----------|------|------|------|------|------------------|--------|
| 1   | E. vs. C | Pst  | 3.81 | 0.0014 | 34.60 | 38.49 | 136.45          |
| 2   | E. vs. C | Pst  | 3.57 | 0.0021 | 29.58 | 37.07 | 121.87          |
| 1&2 | E. vs. C | Pre  | 1.81 | 0.0866 | 8.75  | 21.65 | 81.25           |
| 1&2 | E. vs. E | Pst  | 1.15 | 0.2668 | 8.21  | 30.36 | 111.45          |
| 1&2 | C. vs. C | Pst  | 0.88 | 0.3892 | 9.89  | 47.51 | 160.41          |

Table 8, Set 4. Comparison of Periods 1 and 2
Metronomic Speed = 100, Test Items = 96

| Prd | Group    | Test | t    | PR>|T| | Mean | Standard Deviation | Range  |
|-----|----------|------|------|------|------|------|------------------|--------|
| 1   | E. vs. C | Pst  | 3.62 | 0.0021 | 33.39 | 39.16 | 138.54          |
| 2   | E. vs. C | Pst  | 3.55 | 0.0023 | 28.23 | 34.63 | 117.70          |
| 1&2 | E. vs. C | Pre  | 2.27 | 0.0349 | 10.52 | 20.70 | 81.25           |
| 1&2 | E. vs. E | Pst  | 1.31 | 0.2068 | 9.60  | 31.05 | 115.62          |
| 1&2 | C. vs. C | Pst  | 0.77 | 0.4492 | 8.68  | 47.54 | 155.20          |

Tables 5 through 8 demonstrate that the mean scores of Periods 1 and 2, when statistically analyzed, are similar regardless of metronomic speed or number of items.
Hypotheses 2 and 3

There are no significant differences between treatment types for students with minimal musical experience.

There are no significant differences between treatment types for students with previous musical experience.

Tables 5 through 9 demonstrate a clear similarity between all the pretest and posttest t scores supporting the fact that both treatment groups and periods were very evenly matched as to musical experience and ability levels. (See Student Musical Experience Survey, Appendix A.) The hypothesis is accepted.

Table 9. Selected Comparisons of Treatment Groups by Class Periods.

| Prd | Group  | Test | Speed | Measures | t    | PR>|T| | Mean  |
|-----|--------|------|-------|----------|------|------|-------|
| 1   | E. vs. C. | Pst  | 50    | 24       | 3.04 | 0.0068 | 22.91 |
| 2   | E. vs. C. | Pst  | 50    | 24       | 3.63 | 0.0018 | 27.08 |
| 1&2 | E. vs. C. | Pre  | 50    | 24       | 1.83 | 0.0836 | 58.33 |
| 1   | E. vs. C. | Pst  | 100   | 24       | 2.38 | 0.0278 | 19.79 |
| 2   | E. vs. C. | Pst  | 100   | 24       | 2.44 | 0.0244 | 20.00 |
| 1&2 | E. vs. C. | Pre  | 100   | 24       | 1.29 | 0.2127 | 5.62  |
| 1   | E. vs. C. | Pst  | 50    | 96       | 3.81 | 0.0014 | 34.60 |
| 2   | E. vs. C. | Pst  | 50    | 96       | 3.57 | 0.0021 | 29.58 |
| 1&2 | E. vs. C. | Pre  | 50    | 96       | 1.81 | 0.0866 | 8.75  |
| 1   | E. vs. C. | Pst  | 100   | 96       | 3.62 | 0.0021 | 33.39 |
| 2   | E. vs. C. | Pst  | 100   | 96       | 3.55 | 0.0023 | 34.63 |
| 1&2 | E. vs. C. | Pre  | 100   | 96       | 2.27 | 0.0349 | 10.52 |

A summary and comparison of all the main effects on the dependent variable Score is found in Table 10.
Table 10. The SAS System General Linear Models Procedure for Comparing Main Effects of the Dependent Variable: Score.

<table>
<thead>
<tr>
<th>Source</th>
<th>Mean Squares</th>
<th>F Value</th>
<th>Omnibus Pr &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>TREATMENT GROUP</td>
<td>56092.36</td>
<td>104.93</td>
<td>0.0001</td>
</tr>
<tr>
<td>PERIOD</td>
<td>140.82</td>
<td>0.26</td>
<td>0.6082</td>
</tr>
<tr>
<td>TREATMENT GROUP * PERIOD</td>
<td>20.96</td>
<td>0.04</td>
<td>0.8432</td>
</tr>
<tr>
<td>MEASURES</td>
<td>4475.66</td>
<td>8.37</td>
<td>0.0041</td>
</tr>
<tr>
<td>TREATMENT GROUP * MEASURES</td>
<td>1477.38</td>
<td>2.76</td>
<td>0.0975</td>
</tr>
<tr>
<td>PERIOD * MEASURES</td>
<td>782.79</td>
<td>1.46</td>
<td>0.2272</td>
</tr>
<tr>
<td>TREATMENT GROUP * PERIOD * MEASURES</td>
<td>202.92</td>
<td>0.38</td>
<td>0.5383</td>
</tr>
<tr>
<td>METRONOMIC SPEED</td>
<td>1261.76</td>
<td>2.36</td>
<td>0.1255</td>
</tr>
<tr>
<td>TREATMENT GROUP * METRONOMIC SPEED</td>
<td>150.70</td>
<td>0.28</td>
<td>0.5959</td>
</tr>
<tr>
<td>PERIOD * METRONOMIC SPEED</td>
<td>37.97</td>
<td>0.07</td>
<td>0.7900</td>
</tr>
<tr>
<td>TREATMENT GROUP * PERIOD * METRONOMIC SPEED</td>
<td>34.60</td>
<td>0.06</td>
<td>0.7993</td>
</tr>
<tr>
<td>MEASURES * METRONOMIC SPEED</td>
<td>1634.81</td>
<td>3.06</td>
<td>0.0814</td>
</tr>
<tr>
<td>TREATMENT GROUP * MEASURES * METRONOMIC SPEED</td>
<td>105.67</td>
<td>0.20</td>
<td>0.6569</td>
</tr>
<tr>
<td>PERIOD * MEASURES * METRONOMIC SPEED</td>
<td>185.81</td>
<td>0.35</td>
<td>0.5559</td>
</tr>
<tr>
<td>TREATMENT GROUP * MEASURES * METRONOMIC SPEED</td>
<td>8.20</td>
<td>0.02</td>
<td>0.9015</td>
</tr>
</tbody>
</table>
Figure 2  Combined Means of Periods 1 and 2 of Number of Measures by Treatment.
Figure 3  Combined Means of Periods 1 and 2 of Metronome Speed by Treatment.
TRTGRP = treatment group  
Per. = class period of school day  
Measures = number of measures in test  
Metro Sp = metronomic speed  

Table 10 summarizes and compares the permutations of the 15 degrees of freedom and main effects on the dependent variable Score. The mean squares, F value and the Omnibus F are reported for each possibility. Clearly, only the Treatment Group (.0001) and Measures (.0041) were found statistically significant.

The remaining statistical analysis of the main effects demonstrates no significant differences. One area, however, still deserves mention. While not statistically significant, the combination of Measures * Metronomic Speed reports the difference between the means at the .0814 level. This may be interpreted to indicate a favorable reaction to the speed at which the measures were presented.
CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

FOR FURTHER STUDY

Literacy is . . . the ability to encode or decode meaning in any of the forms used in the culture to represent meaning. Aristotle observed long ago that 'man by nature seeks to know.' The knowing that Aristotle talked about is embedded in human experience, and human experience . . . is influenced by the forms of representation that we can meaningfully employ. School programs ought to develop literacy, that is, the ability to secure meaning from the wide range of forms that are used in the culture to express meaning . . . The meanings that are engendered through choreography, through music, and through the visual arts are unique or special to their forms . . . Not everything that we want to say can be said in language . . . The moral here for school programs is clear: those that neglect or marginalize the fine arts . . . embrace an educational policy guaranteed to graduate students who are semi-literate (Eisner, 1991, p. 14-15).

Purpose of the Study

The goal of a comprehensive music program must be to create "literate" musicians who are capable of making meaning from the musical score. Rhythmic reading, therefore, is an essential element in this process; but many choral music students are lost to the music programs due to the frustrations of trying to read music. Many students have repeatedly experienced failure with traditional methods of instruction used to teach rhythmic concepts. By the time
students reach the middle grades, choral instructors are often faced with the choice of teaching music by rote or attempting to remediate and strengthen music reading skills.

The purpose of the research study was to assess the impact of an instructional program in the remediation of rhythmic skills for junior high students. The project implemented remediation research in the following ways:

1. The instructional techniques were feasible and realistic for students with limited musical experience.

2. The materials and methods were presented in a treatment that was short term, accessible to delivery in a formal classroom setting, and effective in a performance-oriented class.

3. The remediation was independent of the grading system.

Procedure

The 80 subjects forming the four treatment groups were obtained from two intact seventh grade choirs in the suburban area of Dayton, Ohio. Both choirs were non-auditioned groups, meeting three days a week for 45 minutes each rehearsal. Each choir had approximately 45 students. None of the students was a member of a school instrumental group. The junior high enrollment was approximately 1,100. The student population was primarily caucasian and came from middle to lower-middle class homes.

A Musical Experience Survey, a note recognition quiz, and a measure of attendance were used to create equivalent
treatment groups within the already existing choirs. Treatments were performed by the investigator, who was an auxiliary member of the music staff and was known by the students. Each of the four groups received 15 minutes of instruction three times a week for 10 weeks.

Materials

In keeping with the requirements of remediation, the materials needed were minimal: chalkboard, metronome, cassette tape recorder deck and tapes, microphone, rhythm worksheets, and flashcards with rhythm patterns for the pre- and posttest.

Instruments of Evaluation

The note recognition vocabulary quiz, consisting of all notes and corresponding rests from whole notes and rests through sixteenth notes and rests, was given to all students.

The pretest and posttest were field tested prior to their use with these subjects in order to provide a correlation between the pre- and posttest and to demonstrate that the two forms of the test were equivalent.

The pretest and posttest instrument consisted of 24 items of four measure rhythm patterns in various meters. The student's correct responses were recorded on a scoring sheet designed by the investigator. Four data sets of raw scores were derived by recording the 24 item pre-posttest as follows:
1. One point was given when the student correctly performed one full set of four measures for each of the 24 rhythmic patterns at the metronomic speed of 50 pulses per minute.

2. One point was given when the student correctly performed one full set of four measures for each of the 24 rhythmic patterns at the metronomic speed of 100 pulses per minute.

3. One point was given when the student correctly performed a full measure of each of the 24 rhythmic patterns at the metronomic speed of 50 pulses per minute.

4. One point was given when the student correctly performed a full measure of each of the 24 rhythmic patterns at the metronomic speed of 100 pulses per minute.

The Student Musical Experience Survey was developed by the investigator to provide information concerning each subject's keyboard experience, choral experience, or instrumental experience other than keyboard. Students with substantial musical experience were randomly assigned among the four treatment groups to achieve equivalency.

The majority of the instruction for both the experimental and control groups centered around the rhythm worksheets developed by the investigator for the research project. Each worksheet contained three lines of four measures in a given meter. Rhythmic concepts were submitted to a task analysis, and worksheets were developed that created a hierarchy of skills.
Design of the Study

An experimental design was employed using the Solomon Four-Group design. The design was selected for its unique ability to control for internal and external validity.

The experimental group received instruction emphasizing the use of the smallest rhythmic unit as the pulse and speech cues that had durational values closely corresponding to the values of the notes with which they were paired. Remediation was instructed by:

1. Using the smallest rhythmic unit as the pulse;

2. Adding pulses together to form longer durational values rather than subdividing from the quarter note for shorter durations;

3. Verbalizing the symbol or pattern name as the method of reinforcement rather than using the arithmetic counting device.

The control group was instructed using the traditional mathematical cue method based on the findings of Boyle (1969). Remediation was instructed by:

1. Using the quarter note initially as the pulse in a given meter;

2. Setting up an overt steady pulse response with accent on the appropriate pulse;

3. Making a motor response on the appropriate pulse by using the mathematical concepts common to rhythmic reading.
Data Analysis

The raw scores from the pre- and posttests were converted to percentages and entered into the SAS computer program where the scores were tested against 15 variables. The results were reported in the form of Type IV SS, Mean Squares, F value and the Omnibus F scores. When conditions indicated significance, the next level of investigation looked at individual elements of the model. Two variables were found to be significant at the .0001 and .0041 levels.

Results

Hypothesis 1

There are no significant differences in rhythmic performance skills among groups utilizing a subdivision and speech cue approach versus groups using a traditional rhythmic instructional approach (quarter note pulse and numerical counting).

The statistical analysis indicated significant differences among the means of the treatment groups in favor of the experimental treatment. The results were significant at the .0001 level; therefore, the hypothesis is not accepted. Table 1. reports these findings. Previous studies involving both high school choirs and elementary students also have reported significant differences favoring subdivision (Major, 1976) and speech cue (Bebeau, 1982) experimental treatment techniques.

The dependent variable of Measures was found significant at the .0041 level. This finding is reported in Table 2. The
experimental group, using the eighth note pulse, performed eighth notes, dotted notes, rests, triplets, metered and unmetered note groupings and ties across the barline in standard simple, compound and multi-meter examples with greater precision than the control group. The control group consistently had difficulty when faced with rhythmic examples that required them to divide the basic quarter note pulse.

The dependent variable of Period was not found significant at the .6082 level. This finding is reported in Table 3. As discussed in Chapter III, a strength of the Solomon Four-Group Design is its ability to test for internal validity factors. History is controlled in that events that might have produced a $O_1 - O_2$ difference would also produce a $O_3 - O_1$ difference. Intrasession history was controlled by rotating the treatment sessions, and bi-weekly makeup sessions were conducted for absentees to maintain group equivalency.

The dependent variable of Metronomic Speed was not found significant at the .1255 level. Both groups demonstrated greater motivation at the higher metronomic speed; however, the rhythmic precision was found not to be significantly different at either speed.
Hypothesis 1a

The pretest will not affect posttest scores.

The pretest t Test results reflect that the pretest scores did not affect the posttest scores. The hypothesis is accepted.

Hypothesis 1b

The pretest will not interact with treatment type.

A major strength in the Solomon design is to test for internal validity. With the added safeguards of the Student Music Experience Survey and the comparative results of the pretest and posttest t scores, the scores support the hypothesis. The hypothesis is accepted.

Hypothesis 1c

The pretest and posttest measures are not equivalently valid and cannot be used to indicate rhythmic performance abilities.

The pretest and posttest measures were significant (.0041); therefore, the hypothesis is not accepted.

Hypotheses 2 and 3

There are no significant differences between treatment types for students with minimal musical experience.

There are no significant differences between treatment types for students with previous musical experience.

There was a clear similarity between all the pretest and posttest t scores supporting the premise that both treatment
groups were very evenly matched as to musical experience and ability levels. The hypothesis is accepted.

Conclusions and Implications

The purposes of this study and the results presented in Chapter IV suggest the following conclusions:

1. Seventh graders who receive systematic, regular instruction in rhythm reading can make dramatic gains using either a subdivision/speech cue method or a traditional method, but the results significantly favor the subdivision/speech cue method.

With any skill, especially one of a performance nature, systematic instruction and regular practice increase proficiency. All four treatment groups showed an improvement in their ability to read rhythms by sight from the pretest to the posttest; however, the groups instructed in the subdivision/speech cue method showed greater gains than those instructed in the traditional method.

2. The subdivision/speech cue method for performing rhythms is superior to the traditional method in remediating rhythmic deficiencies in junior high mixed choral groups.

The difference between the means of the experimental group over the control group was significant at the .0001 level.

3. Accuracy in rhythmic performance using the subdivision/speech cue method can be obtained for meter bases other than 4/4.
The experimental treatment in this study utilized rhythm exercises in 2/4, 3/4, 4/4, 5/4, 2/2, 3/2, 3/8, 5/8, 6/8, and 7/8 meter bases, and contained dotted rhythms, triplets, ties creating simple syncopation, and meter changes within the exercise. Students instructed in the subdivision/speech cue method performed all rhythms with greater accuracy than those instructed in the traditional method.

4. Effective instruction in rhythm that meets the requirements of remediation can be achieved within the large group choral setting. Results of the study strongly favor the use of the subdivision/speech cue method.

In order to meet the requirements of remediation, the instructional factors must be feasible and realistic for students with limited musical experience. The subdivision/speech cue method simplifies the structure and facilitates instruction so that the number of new skills introduced at each step is minimized. The experimental treatment in this study also supports remediation in that the materials and methods may be presented in a treatment that is short-term, accessible to delivery in a formal classroom setting, and effective in a performance-oriented class with either individuals or groups.

Recommendations for Further Research

From the findings and limitations of this study, additional research is needed to:
1. Explore the effects of the subdivision/speech cue method with younger students in elementary school;
2. Consider the nature of rhythmic deficits and the relationship of these deficits to perception and visual processing;
3. Explore how the notation of rhythm and the context in which it appears supports the "chunking" of information, thereby facilitating visual processing;
4. Determine the effect of a variety of tempi on rhythmic performance;
5. Determine the effects of pitch on the development and performance of rhythmic concepts.

If choral music programs in the schools are to survive, continual progress toward the goal of producing literate, independent musicians must be made. The subdivision, speech cue method detailed in this study provides a way to successfully remediate rhythmic deficits in choral students and re-establish the learning hierarchy that leads to musical literacy.
LIST OF REFERENCES
REFERENCES


Davis, Kay L. *Mastery Learning and Musical Performance Groups*. Southwest Missouri State University, 1983.


Miller, G.A. The magic number seven, plus or minus two: Some limits on our capacity for processing information. *Psychological Review*, 1956, 63, pp. 81-97.


APPENDIX A

Student Experience Survey
STUDENT EXPERIENCE SURVEY

Name ____________________________________________

<table>
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<tr>
<th>Male</th>
<th>Female</th>
<th>Period 1</th>
<th>Period 2</th>
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Please answer the following questions about your previous musical experience. Feel free to add additional information you would like me to know about you.

1. Do you play the piano or a keyboard instrument? ______
   If yes, how long have you studied? ______

2. Have you sung, or are you now singing, in a church or community choir? ______
   If so, describe the group and tell how long you have participated.

3. Did you participate in band or orchestra in elementary school? ______
   If yes, for how many years did you participate? ______
   What instrument(s) did you play? ______

4. Did you participate in elementary school choir? ______
   If yes, for how many years did you participate? ______

5. What elementary school did you attend? _______________
APPENDIX B

Note Recognition Quiz
NOTE RECOGNITION QUIZ

Name ___________________________
Period __________________________

1. _____________________________
   A. Quarter Note
   B. Whole Note
   C. Eighth Note Triplet
   D. Dotted Half Note
   E. Half Note
   F. Quarter Note Triplet
   G. Two Eighth Notes
   H. Two Sixteenth Notes
   I. Eighth Note (flag)
   J. Sixteenth Note (flag)

2. _____________________________

3. _____________________________

4. _____________________________

5. _____________________________

6. _____________________________

7. _____________________________

8. _____________________________

9. _____________________________

10. _____________________________
APPENDIX C

Pretest/Posttest
1. 4

2. 4

3. 4

4. 4

5. 4

6. 4

7. 4

8. 4
APPENDIX D

Student Rhythm Worksheets
APPENDIX E

Pretest/Posttest Recording Sheet
APPENDIX F

Student Raw Scores

for the Pretest/Posttest
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% Ranges
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APPENDIX G

Computer Program Code
FILENAME IN1 'ACCPB.LIB.MALLONEE(SET1)' DISP=SHR;
FILENAME IN2 'ACCPB.LIB.MALLONEE(SET2)' DISP=SHR;
FILENAME IN3 'ACCPB.LIB.MALLONEE(SET3)' DISP=SHR;
FILENAME IN4 'ACCPB.LIB.MALLONEE(SET4)' DISP=SHR;
    OPTIONS NOSOURCE;

/*****************************/
/*****  REQUESTOR:  MALLONEE, MUSIC DEPT.  *****/
/*****  DESCRIPT.:  TEST EFFECTS OF DIFFERENT *****/
/*****  INSTRUCTION METHODS.  *****/
/*****  PROGRAMMER:  C.P.BREZOVIC  *****/
/*****  DATE:  AUGUST, SEPTEMBER 1990  *****/
/*****************************/

PROC FORMAT;
   VALUE TRT 1='PRE-TEST' 2='POSTTEST';
DATA SET1(DROP=JUNKLINE);
   SET=1;
   INFILE IN1 FIRSTOBS=4 END=EOF;
   MISSING M;
   DO SUBJLST=1 TO 20;
      IF SUBJLST GE 1 THEN INPUT JUNKLINE @10 @;
      DO PERIOD=1 TO 2;
         DO GRP=1 TO 2;
            DO TEST=1 TO 2;
               IF GRP=1 THEN TRTGRP='EXPERIMENTAL';
               ELSE TRTGRP='CONTROL';
               INPUT SCORE : 3. @@;
               SCORE=(SCORE/24)*100; ** GET %, NUMBER OF MEASURES
               RIGHT;
               METRO_SF=50; ** METRONOME SPEED;
               MEASURES=24; ** NUMBER OF MEASURES RATED;
OUTPUT;
END; * TEST (PRE & POST) LOOP;
END; * CONTROL VS TREATMENT LOOP;
END; * PERIOD LOOP;
INPUT; * FREE INPUT LINE;
END; * SUBJLIST LOOP;
FORMAT TEST TRT.;

DATA SET2(DROP=JUNKLINE);
SET=2;
INFILE IN2 FIRSTOBS=4 END=EOF;
MISSING W ;
DO SUBJLIST=1 TO 20;
  IF SUBJLIST GE 1 THEN INPUT JUNKLINE @10 @;
DO PERIOD=1 TO 2;
DO GRP=1 TO 2;
  DO TEST=1 TO 2;
    IF GRP=1 THEN TRTGRP='EXPERIMENTAL';
    ELSE TRTGRP='CONTROL';
    INPUT SCORE : 3. @@;
    SCORE=(SCORE/24)*100; ** GET %, NUMBER OF MEASURES RIGHT;
    METRO_SP=100;
    MEASURES=24;
    OUTPUT;
END; * TEST (PRE & POST) LOOP;
END; * CONTROL VS TREATMENT LOOP;
END; * PERIOD LOOP;
INPUT; * FREE INPUT LINE;
END; * SUBJLIST LOOP;
FORMAT TEST TRT.;
DATA SET3(DROP=JUNKLINE);
   SET=3;
   INFILE IN3 FIRSTOBS=4 END=EOF;
   MISSING M ;
   DO SUBJLST=1 TO 20;
      IF SUBJLST GE 1 THEN INPUT JUNKLINE @10 @;
      DO PERIOD=1 TO 2;
         DO GRP=1 TO 2;
            DO TEST=1 TO 2;
               IF GRP=1 THEN TRTGRP='EXPERIMENTAL';
               ELSE TRTGRP='CONTROL';
               INPUT SCORE : 3. @@;
               SCORE=(SCORE/96)*100; ** GET %, NUMBER OF MEASURES RIGHT;
               METRO_SP=50 ;
               MEASURES=96;
               OUTPUT;
               END; * TEST (PRE & POST) LOOP;
            END; * CONTROL VS TREATMENT LOOP;
         END; * PERIOD LOOP;
      END; * FREE INPUT LINE;
   END; * SUBJLST LOOP;
END;
FORMAT TEST TRT.;

DATA SET4(DROP=JUNKLINE);
   SET=4;
   INFILE IN4 FIRSTOBS=4 END=EOF;
   MISSING M ;
   DO SUBJLST=1 TO 20;
      IF SUBJLST GE 1 THEN INPUT JUNKLINE @10 @;
      DO PERIOD=1 TO 2;
         DO GRP=1 TO 2;
DO TEST=1 TO 2;
   IF GRP=1 THEN TRTGRP='EXPERIMENTAL';
   ELSE TRTGRP='CONTROL';
   INPUT SCORE : 3. @@;
   SCORE=(SCORE/96)*100; ** GET %, NUMBER OF MEASURES
   RIGHT;
   METRO_SP=100;
   MEASURES=96;
   OUTPUT;
END; * TEST (PRE & POST) LOOP;
END; * CONTROL VS TREATMENT LOOP;
END; * PERIOD LOOP;
INPUT; * FREE INPUT LINE;
END; * SUBJLIST LOOP;
FORMAT TEST TRT. ;

DATA COMBINE;
   SET SET1 SET2 SET3 SET4;
   IF TEST=1 THEN PRETEST=SCORE;
   IF PRETEST ^=.
PROC GLM DATA=COMBINE;
WHERE TEST=2; ** GET ONLY POSTTESTS, INCLUDE BOTH FOR
   COVARIANCE;
   MODEL SCORE = TRTGRP MEASURES METRO_SP PRETEST;
   LSMEANS TRTGRP MEASURES METRO_SP /STDERR PDIFF COV;
   LABEL METRO_SP='METRONOMIC SPEED';
   TITLE 'ANOVA FOR MAIN AND INTERACTION EFFECTS';
   TITLE3 '*** EXAMINE LSMEANS *** ';

** CREATE GRAPHS ;
GOPTIONS reset=global DEVICE=ps300
   COLORS=(RED BLUE WHITE GREEN) cback=black
gunit=pct hsize=5 in vsize=7 in
htitle=2.75 htext=1.9 ftext=duplex
handshake=xonxoff rotate=portrait
gsfmode=replace gsfname=malmeasr;

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lspace=4;
title2 ' ' lspace=7 h=4;
footnote1 ' ' lspace=4 h=6;

pattern1 value=E color=blue;
pattern2 value=solid color=blue;

AXIS1 label=none width=2
value=(height=1.85 'Control' 'Experimental');
AXIS2 label=none
value=(height=2.2 '24 measures' '96 measures' f=swissl);
axis3 order=(0 to 70 by 10) minor=(number=1 width=2) width=2;

proc gchart data=COMBINE;
  vbar trtgrp /group=measures sumvar=mcore type=mean
discrete width=8 gspace=4 MEAN SPACE=4
  PATTERNID=MIDPOINT maxaxis=axis1 gaxis=axis2 raxis=axis3;
  label mcore='Percent '/;
run;

title1 'Figure 2. Metronome Speed by Treatment' f=swissb
lspace=4;
title2 ' ' lspace=7 h=4;
footnote1 ' ' lspace=4 h=6;

pattern1 value=E color=blue;
pattern2 value=solid color=blue;
AXIS1 label=none width=2
   value=(height=1.85 'Control' 'Experimental');
AXIS2 label=none
   value=(height=2.2 '50 beats' '100 beats' f=swiss1);
axis3 order=(0 to 70 by 10) minor=(number=1 width=2) width=2;

proc gchart data=COMBINE;
   vbar trtgrp /group=metro_sp sumvar=m.score type=mean
      discrete width=8 gspace=4 MEAN SPACE=4
      PATTERNID=MIDPOINT maxis=axis1 gaxis=axis2 raxis=axis3;
   label m.score='Percent ';
run;