ENGINEERING AUDITORY SKILLS WITH A MUSIC THERAPY PROGRAM

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We hereby recommend that the thesis prepared under our supervision by Mary T. Brownell entitled "Engineering Auditory Skills with a Music Therapy Program"

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CHAPTER I

INTRODUCTION

Need for the Study

In 1970, Congress defined "Learning Disabled Children" in Public Law 91-230 as children ranging in age from 3 to 21:

> . . . who have a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which disorder may manifest itself in imperfect ability to listen, think, speak, read, write, spell or do mathematical calculation. Such disorders include such conditions as perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia. Such term does not include children who have learning problems which are primarily the result of visual, hearing, or motor handicaps, or mental retardation, or emotional disturbance, or of environmental disadvantage. (U.S., 1970, p. 177)

This definition attempted to provide more universal criteria upon which the learning disabled child can be identified and appropriately placed in an educational program which can meet his needs.

More recently Public Law 94-142 (U.S., 1975) was passed to assure that all handicapped children will be provided with a free and appropriate education. In concordance with this law, the Individual Educational Program, a specifically-designed program written to meet the handicapped child's needs, is required. This program not only includes the plan devised for the child by the special educator, but also includes other related services. These services include the following: (a) physical therapy, (b) speech therapy, (c) occupational therapy, (d) music therapy, and (e) others (Westplate, 1981).

Through work with learning disabled students in language arts, this particular researcher became interested in the important role that music therapists may play in developing programs to remediate perceptual difficulties. The majority of students are poor readers and seem to lack or have underdeveloped auditory skills. These students often encounter difficulty in sound discriminations and remembering aural directions. Possibly, lack of auditory skills is hindering their reading ability.

Music appears to be a viable medium through which perceptual abilities can be developed. It is the organization of selected sounds. "Understanding the nature and value of music is learning the selection and organization of sound that is music and learning to select and organize those sounds to create or recreate music" (Welsbacher, 1975, p. 138). The music therapist becomes responsible for guiding handicapped children into "generalizing the understanding of selection and organization of sounds to other academic areas which also require the selection and organization of sounds" (Sears, 1968, p. 33). The therapist uses music as a catalyst for learning academic skills (Sears, 1968).

Purpose of the Study

The purpose of this research is twofold: first, to determine the auditory discrimination and memory abilities of 18 learning disabled students as measured by the Goldman-Fristoe-Woodcock Battery of Auditory Skills; and second, to develop a basic music skills assessment to cover the above areas. Based upon the results of these assessments, a music therapy program will be developed to aid in the remediation of deficits indicated by the tests.

In order to provide a framework upon which an auditory remedial program can be developed, this study includes: (a) a description of the various characteristics of the learning disabled child; (b) a discussion of possible causative factors of learning disabilities; (c) a review of the research on the relation of auditory perceptual abilities to learning disabilities and poor academic achievement; and (d) a review of research concerning the relationship of music to auditory abilities.

CHAPTER II

RELATED LITERATURE

The Learning Disabled Child--Characteristics and Causes

According to the definition provided earlier, this particular child can be identified by many characteristics. The learning disabled population is a very heterogeneous group, not easily identified.

Bryan (1975) identifies 10 characteristics most frequently mentioned in describing the learning disabled child. The child may exhibit one or several of these characteristics: hyperactivity; perceptual motor impairments; emotional lability; general coordination deficits; disorders of attention; impulsivity; disorders of memory or thinking; specific learning disabilities (such as: inability to learn or to remember reading, writing, arithmetic, or spelling); difficulty in comprehending or remembering spoken language; and equivocal neurological signs.

There seem to be several factors which may be related to this particular type of disorder in children. For example, Wallace and McLoughlin (1975) state that the following environmental factors can contribute to learning disabilities: inadequate nutrition; poor maternal health; poor health of the child; head traumas; lack of sensory stimulation; lack of language stimulation (language is a crucial aspect of the child's environment because of its important role in thinking and learning other skills); immature emotional and social development; and physiological factors, such as overt to minimal damage to the central nervous system. The latter cause handicaps in certain skill areas necessary for academic development. This type of damage is also referred to as minimal brain dysfunction (Wallace and McLoughlin, 1975).

Minimal Brain Damage is a term which is commonly associated with the learning disabled population. It is thought to be a "dysfunction in the brain which is not manifested in gross neurological abnormalities," but causes serious deficits in learning (Johnson & Myklebust, 1967, p. 2). Johnson and Myklebust (1967) believe that this term can be stigmatizing for both the child and parents. They are of the opinion that dysfunctions in the brain may not be due to damage. This may be developmental or indigenous (hereditary) in nature. They realize that this term arose as an attempt to distinguish between children whose involvement is minimal in comparison with diffuse.

The learning disabled child is often associated with the term developmentally disabled. Several factors can contribute to incomplete development in children, for example, inadequate and inappropriate instruction (Wallace & McLoughlin, 1975). Some teachers have never developed the necessary skills to teach basic school subjects. Lerner and List (1970) surveyed phonic knowledge of teachers responsible for reading instruction and concluded that there were serious flaws in their backgrounds. It is also noted that some learning disabled children may not have developed the necessary prerequisite skills for their level of instruction. This problem may be due to inadequate instruction, improper amount of time spent on developing necessary subskills, lack of opportunities to respond verbally, and learning to use visual and auditory cues in acquiring new material. Use of inappropriate methods, materials, and curriculum may also be related to learning deficits. For instance, reading series do not always provide for cultural diversity. Some children may have difficulty identifying with and reading material which is unlike their natural environment (Wallace & McLoughlin, 1975).

Lack of sensory stimulation may also be a cause of developmental disabilities in children. The developing child requires the input of his senses both to learn about his environment and himself. In this particular type of child it is not the child's sensory organs and peripheral nervous system which are damaged, but the perceptual processes. Subtleties involved in basic seeing and hearing often escape casual screening efforts. Children who do not receive the proper amount and kind of stimulation are unable to use these skills appropriately for academic learning (Johnson & Myklebust, 1967).

Language development is another crucial aspect of the child's environment because of its role in thinking and learning other skills. Learning disabled children who exhibit language disorders may be handicapped as a result of improper or insufficient language stimulation. Children must be offered opportunities at home and school to express themselves verbally and offered adequate oral models in order to develop satisfactory language abilities (Wallace & McLoughlin, 1975).

Maturational lag may be another causal factor related to learning disabilities. The apparent immaturity of some children with learning disabilities may be related to a lag in the maturation of some central nervous system components (Silver & Hagin, 1960). However, this immaturity may not imply a structural deficiency, loss, or even a limitation of potential (Bateman, 1966). Wallace and McLoughlin (1975) observed that children with learning disabilities due to maturational lag may overcome this difficulty as they grow older.

Johnson and Myklebust (1967) combine the latter two causative factors into the term Psychological Learning Disability. This classification indicates an alteration in learning processes, and that these modifications are the result of neurological dysfunction. "It is the neurology of learning which has been impaired and that result is a disability, not an incapacity for learning" (p. 8). The manifestations of this type of disability are initially behavioral not neurological; and the most observable symptoms of this handicap are psychological (Johnson & Myklebust, 1967).

Johnson and Myklebust (1967) make clear what seems to be a common theme in the literature on the learning disabled child; that is, that children classified as learning disabled have adequate motor ability, average to superior intelligence, adequate hearing and vision, and sufficient emotional capacity. These are combined, however, with a learning deficiency which constitutes the basis for homogeneity.

The Perceptually-Handicapped Child

Perception is defined by Wallace and McLoughlin (1975) as:

> . . . the ability to organize on-going stimuli in a useful way. It can be thought of as a change or transduction of sensory information into electric or neurological impulses. (p. 31)

The classification perceptually handicapped is often used synonymously with the term learning disabled (Wallace & McLoughlin, 1975). A high incidence of perceptual disturbance has been reported by several researchers in children with learning disabilities; and also positive correlations between perceptual deficits and conceptual deficits, memory deficits, and language deficiencies were reported (Frostig, 1975). Often the learning disabled child experiences disorders in perception in terms of the various channels (visual, auditory, motor, tactually, and olfactory) either separately or together, which are thought to be related to neurological dysfunction (Johnson & Myklebust, 1967). This thesis concentrates particularly on children with auditory dysfunctions.

Some research (Zigmond & Cicci, 1968) indicates that most of the tests and programs developed for the learning disabled child place a heavier emphasis on visual disabilities and give minimal attention to the area of auditory disabilities. Johnson and Myklebust (1967) state that inadequate auditory abilities often impair the child's capacity to acquire language by impeding the receiving, storing, recalling, and categorizing of information. The student may hear perfectly well, but be unable to interpret correctly what she/he has heard. She/he may not be capable of associating what is heard with the sound, or differentiating between sounds, or blending sounds into isolated words. She/he also has difficulty selecting the word which she/he has heard. Children with auditory dysfunctions may still be capable of attaching meaning to what they hear, but may have short or long-term memory disturbances (Wallace & McLoughlin, 1975).

These problems may be catalogued as follows:

1. Auditory attention--the ability to concentrate on a task for the necessary period of time needed to localize and receive the essential features of the stimuli (Johnson & Myklebust, 1967). If a child cannot receive the stimuli, the disturbance could be inhibiting to language acquisition. Attention is considered the first step in the information process. If a child

cannot attend to a task, she/he cannot acquire it (Westplate, 1981).

2. Auditory discrimination--the ability to distinguish differences between two stimuli on the basis of certain traits appears to be the next step in the information gathering process. A child with a dysfunction in this area is unable to distinguish between two sounds such as /b/ and /p/ (Falck, 1973). The inability to distinguish what was heard is probably a great hinderance to the acquisition of receptive and expressive language.

3. Auditory sequencing--the capacity to arrange selected incoming stimuli in a correct order (Falck, 1973). The child must be able to structure the auditory world to meet his needs. Children without this capacity are:

   a. unable to follow several directions;

   b. unable properly to blend sounds together to form words;

   c. unable to recognize the first and last sounds of words and phrases; and

   d. unable to determine adequate meaning from the sequence of words.

This particular child hears "he went home and played ball" as "he played ball and went home." Children with a dysfunction in this particular area are not able to gather adequate meaning from what is being said. Without this capacity, necessary concepts vital to the acquisition of language cannot be formed (Falck, 1973).

4. Auditory memory--the ability to remember selected stimuli auditorally. There are two types of auditory memory which can be impaired:
    a. Auditory sequential memory, which refers to the ability to store auditory information on a permanent basis in language coded form.
    b. Memory for ideas or meaningful material which refers to the ability to comprehend verbally presented material (Falck, 1973).

    Children with a malfunction in this area are unable to: follow standard classroom direction, focus attention, recall orally presented material, form meaningful concepts about stories or other information presented to them, and retrieve words which they recognize (Falck, 1973).

Golden and Steiner (1969) found auditory sequential memory to be a significant skill in the mastery of the reading process. They theorize that the omission or distortion of speech sounds and syllables is characteristic of a child with reading disturbances. The child may read member for remember and may have some difficulty in remembering initial consonants.

Wepman's (1960) theory of auditory discrimination includes the following viewpoints: (a) that there is a strong positive relationship between slow development of auditory discrimination and incorrect pronunciation; (b) that there is a positive correlation between poor reading and poor auditory discrimination; (c) that poor auditory discrimination may be the basis for both reading and speaking difficulties, but usually only affects reading or speaking; and (d) that there is little if any relation between the development of intelligence and auditory discrimination. He states that the ability to retain individual sounds in one's memory can serve as a model for later speech as part of the development of his/her phonic analysis skills.

Wepman (1960) compared auditory discrimination, articulation, intelligence, and reading achievement of 156 first graders and second graders to find a basis for his theory. He found definite relations between weak articulation and poor discrimination and between low reading achievement and poor discrimination. He notes that the relationship between auditory discrimination and reading is even more significant in the lower grades, a time when phonics plays a crucial role in learning to read. He also concludes that visual learners and auditory learners must be grouped separately in order to minimize their problems and maximize their strengths. He suggests sight reading for children with poor auditory discrimination skills and phonics for good discriminators.

Grassi (1970) compared normal children and learning disabled children in various areas to determine their ability to discriminate sounds for purposes of obtaining a reward. He found that these learning disabled children had greater difficulty in discriminating between tones, were more incapable of following instructions, and profited less from practice in learning how to obtain the reward.

Bryan (1972) compared learning disabled and normal children on a task which involved learning a list of words visually and auditorally. His data indicate that both groups learned a list of words with fewer trials when the stimulus was visual, but the learning disabled children did significantly poorer than the comparison group under both treatment modalities. These learning disabled children appeared to have inadequate capacities for processing information presented auditorally, and that performance decreased when auditory information became more complex. He suggests that learning disabled children may not have a dysfunction which hinders their processing of auditory information, but are slower in learning from such information. Their lack of improvement even with practice seems to indicate this.

Payne and Carr (1980) measured three groups of third, fourth, fifth, and sixth graders' ability to make sameness or difference judgments of pairs of Morse code-like patterns when stimuli were presented intramodally or crossmodally. The results indicated that inaccuracy in the intramodal conditions was lower than for the cross-modal conditions, especially when the first pattern of a pair was auditory rather than visual or tactual. They state that this may indicate a deficit in auditory memory rather than cross-modal perception and appears to be a factor in poor reading comprehension.

Vande Voort and Senf (1974) compared normal readers and retarded readers on two successively presented auditory patterns. Performance of the normal readers was significantly better than matched retarded readers. They also noted that the poor readers performed more unsatisfactorially in any condition involving audition as the modality of the first pattern. They conclude that a deficit in auditory sequential memory appears to be a major factor in reading retardation.

McCroskey, Kidder, and Herman (1980) studied 135 children ages 7 through 9. These subjects were divided into groups by age and were further designated as normal, reading disordered, or learning disabled. Each child was tested individually on a task of auditory fusion. Two tones were presented to the subject whose pulses moved closer in time until the listener heard them as one event (fusion). The child was then told to respond as to whether she/he was perceiving a single or double tone. Results on this test indicated that a significant difference in scores occurred between these reading disordered, learning disabled, and normal children, but a statistical difference between the reading disordered and the learning disabled children was not noted. Both performances were consistently poorer than the normal children's. They conclude that normal children's auditory systems handle time and frequency far more efficiently than reading disordered or learning disabled children.

Richardson, Dibenedetto, Christ, and Press (1980) investigated a sample of 77 poor readers from a racially and ethnically heterogeneous elementary school population in New York City. Each child was tested on the Illinois Test of Psycholinguistic Abilities. Correlational analyses were done on each of the subtests comparing I.Q. and reading scores to subtest scores. Their results indicate that only two of the skill measures (Auditory Closure and Sound Blending) were related to a wide variety of reading measures independent of I.Q. They conclude the following from their study: First, both tests required the children to translate phonemic units into whole words, and the greater the reading disability the more poorly the children performed in these areas. Second, the ability to process phonemes in this way is vital to all areas of reading skill development, and children who lack skills in this area will be deficient readers.

Golden and Steiner (1969) indicate that auditory blending, auditory memory, and auditory sequential memory correlate significantly with the reading achievement of children with average intelligence.

Hardy (1965) claims that if "auding" is damaged in children an apparent deafness for language and speech can develop. He defines auding as "integrative functions in the brain's management of accoustic information; for example, "auditory temporal imperception" can incapacitate a child's ability to differentiate between lips and lisp (p. 3).

Aten and Davis (1968) tested 21 children with "minimal cerebral dysfunction" and learning difficulties on three nonverbal tests and a battery of seven verbal tests. These children had difficulty with both types of tests, particularly on a test which involved reformulating scrambled sentences. The subjects made the following errors consistently on the tests given: ommission of words and regression to usage of more familiar grammatical forms, including words which lessened the general maturity of the response.

Carpenter and Willis (1972) present a case history of a boy who was referred to the Oklahoma Medical Center because of reading problems. When he was tested the clinicians became aware of several auditory problems which were possibly factors underlying his ability to read. On the Gates-McKillop Recognizing and Blending Common Word Parts subtest John had considerable difficulty recalling sounds associated with phonograms and individual letters; showed deficits on the Initial Letters and Final Letters subtest of the Gates-McKillop Auditory Discrimination Test; and was unable to distinguish the exact parts of a word-pair which created the similarities or differences he heard. John also exhibited difficulty in auditory analysis, auditory blending, and auditory learning. With these particular deficits John may be unable to generalize previous sound learning to new learning situations.

Golden and Steiner (1969) investigated the relationships between reading performance and specific auditory and visual functions. Twenty grade school children were selected for this study and were administered the following two examinations: the Illinois Test of Psycholinguistic Abilities and the Monroe Visualization Test. After scoring the examinations, the researchers found that good readers scored significantly superior to poor readers on the three tests of auditory functions: sound blending ($p < .01$), auditory sequential memory ($p < .05$), and auditory closure ($p < .10$). On the three tests of visual functions, the good readers performed significantly better only on the Monroe Visualization Test ($p < .02$ and $p < .01$). They concluded that poor readers had the greater deficits in auditory functions as compared with visual.

Doehring and Rabinovitch (1969) compared the auditory abilities of children with learning disabilities to normal-learning children. Twenty children were tested on a series of auditory oddity tasks. Results showed that neither group differed significantly in loudness discrimination on the first two pitch discrimination tasks. They did, however, on a second pitch discrimination test, and on tests involving the discrimination of simultaneous tones, successive tones, and speech sounds. These learning disabled children performed significantly more poorly on all measures. The authors indicate in their discussion that the learning disabled child's inability to correctly discriminate the complex stimuli might be due to an impairment of some type of auditory memory.

Music Therapy and Auditory Abilities

Sears (1968) defined one of the processes involved in music therapy as "Experience Within Structure," and suggested that when applied to perceptually disabled children music may counteract their inability to define the structure of the stimuli (p. 33). Stimuli must be sorted out by their distinguishing features before they can be sorted for recall. Therefore, auditorally disabled children need experience in discriminating the stimuli they receive in order to sort sound and structure for meaning (Baxley, 1979).

> The music therapist is responsible for guiding the child into generalizing the understanding of selection and organization of sounds to other academic areas which also require the selection and organization of sounds. In this way, music becomes the catalyst for learning academic skills. (Sears, 1968, p. 33)

Roskam (1979) planned a series of music activities to expand auditory perception and improve language skills in learning disabled children. Thirty-six children diagnosed as learning disabled were tested on measures of reading and spelling achievement and verbal and nonverbal auditory achievement. The children were then divided into three treatment groups: a music therapy treatment group, a combination group of music therapy and a prescribed program for remediation of learning disabilities, and the usual prescribed learning disabilities remedial program group. The results did not show any statistical differences between treatments, but the mean pre/post difference was greater for subjects in the music therapy condition in four of the five measures.

Huritz, Wolff, Bortnick, and Kokas (1975) compared the performances of two groups of primary grade children on tasks involving temporal and spatial abilities. Both groups were matched for age, social class, and for ordinal position in the family. The experimental group was involved in an intensive Kodaly Music Training Program, while the other group was not. Their results indicated that the performance of the music group was more effective on both temporal and spatial tasks than the control group. They conducted a second study comparing the academic achievement of first grade children who had received a year of Kodaly instruction and first grade children who had received no Kodaly instruction on the Metropolitan Achievement Test. Results from the test indicated that the overall reading percentile for the experimental group was 87.9 and 72.3 for the control group (a significant difference at $p < .01$).

Rejto (1973) discusses a case study of a learning disabled boy, and the use of music as a therapeutic tool in aiding poor visual and auditory perception. She states that music may be effective in enhancing the learning disabled child's perceptual processes, because it involves three sense modalities: visual, auditory, and tactual. She noted that her client made significant gains on the WISC, ITPA, and Frostig Developmental Test of Visual Perception which she maintains was due to private piano instruction. She indicated that music may be implemented in a particular instructional program designed to aid in the remediation of learning disabilities.

Herbert (1974) conducted an "ad hoc" comparison of 150 first grade children receiving Kodaly instruction and 541 first grade children in the district who were not receiving instruction. Both groups were tested on visual motor tasks, auditory sequencing tasks, and vocabulary tests similar to those used on the Binet and WISC tests of intelligence. Analysis of the data indicated a mean score difference ($p < .01$) in performance in favor of the group receiving Kodaly instruction. The group receiving Kodaly instruction also performed significantly better on the Tapped Patterns Task and on sections of the vocabulary test.

Other researchers (McIntyre, 1975; Baxley, 1979) found that instructional programs in music reading skills coexistent with instruction in reading skills may improve reading performance. Often music is a subject which is separated from academic subjects; however, music integrates the cognitive and affective domains and should be ideal for enhancing the acquisition of academic skills.

Movesian (1968) found that when music reading skills were taught concurrently with basic reading skills, first grade students performed significantly better on tests of reading comprehension. There were no differences on reading vocabulary measures except second grade students receiving treatment were more efficient on both. More interesting is that these results could not be reproduced with third graders. Auditory training may only be effective before the age of nine.

Berman (1976) developed a nonverbal reading prototype using music which parallels the verbal decoding process. From this prototype she developed a nonverbal audio-visual instructional program which also parallels the verbal decoding process. This program was then used to study learning profiles of good and poor readers, and to identify specific audio-visual deficits in poor readers. Twenty poor and good readers were instructed in the tonal reading program. Results indicated that the poor readers performed significantly poorer in certain phases of the program. Berman concluded from her findings that the apparent audio-visual pairing difficulties of poor readers were symptoms of basic auditory difficulties that need to be remediated. She suggested that her results supported the need for perceptual skill training, and the application of a nonverbal reading prototype using music in reading programs to train nonverbal reading subskills.

Madsen, Madsen, and Michel (1975) were interested in improving the discrimination of word pairs, as measured by the Wepman Auditory Discrimination Test, by pairing tonal stimuli with words. Their results indicated that auditory discrimination was significantly improved when subjects were trained using tonal cues with word pairs and stories set to melodies.

Baxley (1979) studied 64 learning disabled students in the area of auditory discrimination and developed a five-week treatment program to train subjects to discriminate musical pitches in order to assess effects on speech discrimination. Her results indicated that there was a small positive correlation between pitch discrimination and speech-sound discrimination as measured by the Wepman Test of Auditory Discrimination.

Goldman-Fristoe-Woodcock Auditory Skills Test Battery

The G-F-W Battery of Auditory Skills is a comprehensive auditory-perceptual test originating from the Goldman-Fristoe-Woodcock Test of Auditory Discrimination. It was developed to provide a more extensive and intensive measure of auditory skill than the G-F-W Test of Auditory Discrimination (Woodcock, 1976).

The development of the test is guided by the following criteria:

1. the assessment of a broad spectrum of skills ranging from simple auditory attention and discrimination to complex sound-symbol associations in written language; the test is not meant, however, to test auditory acuity or higher-order functions of auditory comprehension;

2. the need for a test which can be used clinically to distinguish fine differences between subjects at lower developmental levels and among subjects whose performance is deficient for their age;

3. the development of a test which can provide detailed diagnostic information in two areas of auditory skill: speech-sound discrimination and knowledge of grapheme-to-phoneme correspondence; and

4. the desire to construct a test which can minimize the effects of irrelevant subject chacteristics. Prior knowledge of vocabulary is minimized by using pointing responses instead of verbal responses.

The G-F-W Battery measures 12 different areas, 5 of which utilize pictures and require only a pointing response from subjects; these are the tests of selective attention, discrimination, memory for content, memory for sequence, and sound recognition. The other tests require more verbal responses.

The Auditory Selective Attention Test measures an individual's ability to attend to auditory stimuli in the presence of competing noise. The competing noise is varied in intensity and type (fan-like noise, cafeteria noise, and voice).

Three subtests of auditory discrimination measure subjects' ability to discriminate between specific speech sounds. One subtest also pinpoints sound confusions. Only words within the receptive vocabulary of young children are used.

The Auditory Memory portion of the battery contains three subtests: a recognition memory subtest which measures ability to recognize the occurrence of an element in a recent auditory event; a test for memory content which measures ability to recognize all the elements occurring in a recent auditory event; finally, Memory for Sequence tests the subject's capacity to remember the correct sequence of elements in a recent auditory event.

The rest of the battery lies within the sound-symbol portion of the test. There are seven tests to this section, and each one measures the different abilities which underlie the development of particular oral and written language skills. These subtests are listed as follows:

1. Sound Mimicry (ability to imitate syllables),

2. Sound Recognition (ability to recognize speech sounds,

3. Sound Analysis (ability to isolate and identify component sounds of syllables),

4. Sound Blending (ability to integrate isolated sounds into meaningful words),

5. Sound-Symbol Association (ability to learn new auditory-visual associations),

6. Reading of Symbols (ability to make grapheme-to-phoneme translations), and

7. Spelling of Sounds (ability to make phoneme-to-grapheme translations) (Woodcock, 1976).

CHAPTER III

STATEMENT OF PROBLEM AND METHOD

Statement of Problem

H_1--Following a music therapy program, the experimental group will not perform significantly better than the control group from pre-test to post-test on the Auditory Discrimination subtest of the G-F-W Auditory Skills Test Battery.

H_2--Following a music therapy program, the experimental group will not perform significantly better than the control group from pre-test to post-test on the Recognition Memory subtest of the G-F-W Auditory Skills Test Battery.

H_3--Following a music therapy program, the experimental group will not perform significantly better than the control group from pre-test to post-test on the Memory for Content subtest of the G-F-W Auditory Skills Test Battery.

H_4--Following a music therapy program, the experimental group will not perform significantly better than the control group from pre-test to post-test on the

Memory for Sequence subtest of the G-F-W Auditory Skills Test Battery.

H_5--Following a music therapy program, there will be no significant gain for the experimental group from pre-test to post-test on the pitch discrimination subtest of the informal music skills assessment.

H_6--Following a music therapy program, there will be no significant gain for the experimental group from pre-test to post-test on the rhythmic discrimination subtest of the informal music skills assessment.

H_7--Following a music therapy program, there will be no significant gain for the experimental group from pre-test to post-test on the rhythmic sequential memory sub-test of the informal music skills assessment.

Method

Subjects

This study involved 18 Northwest High School students, 5 girls and 13 boys, from the Northwest Independent School District, Justin, Texas. These students were enrolled in the high school special education program; and they attended the resource room for instruction one to three hours daily. Every child in the program was classified by the district as learning disabled due to various factors. The students' chronological age ranged from 14-19. Their grade levels included 9 through 12. School records indicated that these children were learning disabled as a result of visual and/or auditory acuity and/or mental retardation.

Materials

Apparatuses used in the study included the G-F-W Auditory Skills Test Battery, a short music assessment involving rhythm and pitch discrimination and auditory sequential measures of pitch and rhythm, tone bells, pencil and paper, mallets, and woodblocks.

Procedures

The subjects were tested individually on the auditory memory and auditory discrimination subtests of the Goldman-Fristoe-Woodcock Auditory Skills Test Battery. After testing, a control group and an experimental group were chosen on the basis of matched scores from the two subtests. The control group contained nine subjects and received no music training. The experimental group also contained nine subjects and was involved in a six-week remedial music therapy program for 15 minutes daily. It should be noted that all the subjects received daily auditory training from their participation in various phonic programs.

The experimental group was divided into three subgroups according to scores from a short informal music skills assessment devised by the researcher. The skills assessed were:

1. Pitch discrimination--the subjects were required to identify, when two successive tones were presented on the tone bells, whether the second tone was higher, lower, or the same as the first tone. The two successive tones were not separated by a range greater than an octave.

2. Rhythmic discrimination--the subjects were required to match one of two visual patterns with the rhythmic pattern they were presented aurally. The patterns did not extend beyond two measures and contained only quarter notes and eighth notes. The visual stimulus consisted of two patterns per aural presentation. Dashes represented quarter notes and dots represented eighth notes.

3. Rhythmic sequential memory--the subjects were required to repeat one and two measure patterns of 2/4, 3/4, and 4/4 time presented aurally by tapping a mallet

on a woodblock. These patterns were similar to the aural patterns used in the rhythmic discrimination tasks.

The experimental sub-group with the lowest score on the informal music assessment was trained in the following areas:

1. Pitch discrimination--each subject had to discriminate between two successive tones whether the second pitch was higher, lower, or the same as the first. The intervals used included major seconds, major and minor thirds, perfect and augmented fourths, perfect fifths, major and minor sixths, and minor sevenths. None of the intervals extended beyond the range of an octave and were played on resonator bells.

2. Rhythmic discrimination--the subjects were required to match one of two visual patterns with the rhythmic pattern they were presented aurally. This task was similar to the rhythmic discrimination task involved in the informal music assessment.

3. Auditory recall for pitch and rhythm--each subject was aurally presented with rhythmic patterns in 4/4 and 3/4 time which extended from three to five beats. One beat was equal to a quarter note. They were required to tap each of these rhythms using a mallet and a woodblock. They also were required to learn to play short

elementary songs, using only quarter notes and eighth notes, on the resonator bells. (See Appendix.)

The middle and the higher sub-groups were trained in auditory recall for pitch and rhythm. They were required to recall and tap rhythms presented aurally in 3/4, 6/8, and 4/4 time which extended from five to eight beats; one beat was equal to a quarter note. Only eighth notes, quarter notes, and dotted eighth notes were used in the patterns. The middle group learned to play short elementary songs, using the rhythms they learned from previous rhythmic patterns, on the resonator bells. The higher group learned to play more complicated popular songs on the resonator bells using similar and dissimilar rhythmic patterns to those learned previously. (See Appendix.)

Upon completion of the six-week music therapy program, the control and experimental groups were retested on the Auditory Discrimination, Recognition Memory, Memory for Content, and Memory for Sequence subtests on the G-F-W Auditory Skills Test Battery. A statistical design of analysis of covariance (ANCOVA) was then used to interpret the results of the research. The experimental group was also retested on the pitch discrimination, rhythmic discrimination, and rhythmic sequential memory subtests from the basic music skills assessment. Pre-post test scores for the basic music skills assessment were analyzed separately by dependent t-tests.

CHAPTER IV

RESULTS

Analysis of covariance (ANCOVA) was performed between the experimental and control groups on each of the following scores: Recognition, Content, Sequence, and Discrimination of the Goldman-Fristoe-Woodcock Auditory Skills Test Battery. In each ANCOVA the post-test score was analyzed as the dependent variable, with the pre-test score as the covariate. ANCOVA is the analytic method of choice for the data from a pre-test and post-test control group design experiment, such as the one reported here. ANCOVA reveals effects of treatments on post-test scores while controlling for any systematic group differences on the pre-test.

Recognition

No significant group differences resulted ($F(1,15) = .82$, N.S.). The covariate pre-test was not significant ($F(1,15) = 4.06$, N.S.). Regression of post-test on pre-test was not significantly different between groups (parallelism test: $F(1,14) = .17$, N.S.). No differences in the post-test means are attributable to treatments (see Table 1).

Content

Significant group differences resulted ($F(1,15) = 38.65$, $p < .0001$). The experimental group averaged significantly higher scores than the control group (see Table 1). The covariate pre-test was not significant ($F(1,15) = .03$, N.S.), and the parallelism test was likewise not significant ($F(1,14) = .62$, N.S.). In view of the nonsignificance of the parallelism test, post-test differences between the experimental and control groups are assumed to exist along the full range of the pre-test scores.

Sequence

No significant group differences resulted ($F(1,15) = 2.70$, N.S.). The covariate pre-test was significant ($F(1,15) = 21.77$, $p < .001$), indicating that post-test group differences are accounted for by pre-test group differences. The parallelism test was not significant ($F(1,14) = 3.13$, N.S.). Group mean differences on the post-test are accounted for by differences on the pre-test, with no additional post-test differences accounted for by treatments (see Table 1).

Discrimination

Significant group differences resulted ($F(1,15) = 5.95$, $p < .03$). The experimental group averaged significantly higher scores than the control group (see Table 1). The covariate pre-test was significant ($F(1,15 = 6.04$, $p < .03$), indicating that the pre-test accounts for significant differences between the groups on the post-test. The parallelism test was not significant ($F(1,14) = .26$, N.S.). Taken together these findings show that the treatment was effective in producing higher scores for the experimental group despite the fact that the pre- and post-tests are significantly correlated, and that post-test differences between the groups exist along the full range of the pre-test scores.

Other Analyses

Pearson correlations were computed between all pairs of variables, including a grouping code variable (1 = experimental, 2 = control; see Table 2). Negative correlations resulting between the grouping code and all other variables indicates a tendency for experimental subjects to score higher on all the other variables than the control subjects. This tendency was significant for Recognition pre- and post-tests, and for post-tests on Content

Table 1

Pre-test, Post-test, and Adjusted Post-test Means for Groups

	Experimental	Control
Recognition		
Pre-test	103.33	98.33
Post-test	102.44	97.00
Adjusted Post-test	101.01	98.43
Content*		
Pre-test	23.11	20.56
Post-test	25.33	19.11
Adjusted Post-test	25.30	19.14
Sequence		
Pre-test	41.44	39.00
Post-test	48.22	39.78
Adjusted Post-test	47.31	40.69
Discrimination*		
Pre-test	98.44	97.11
Post-test	99.11	96.33
Adjusted Post-test	98.76	96.68

*Significant differences between groups on adjusted post-test means.

Table 2

Intercorrelation of All Variables

	Group	RecPre	RecPos	ConPre	ConPos	SeqPre	SeqPos	DisPre
RecPre	-.50*							
RecPos	-.45*	.58**						
ConPre	-.38	.51*	.43*					
ConPos	-.87***	.46*	.60**	.35				
SeqPre	-.10	.24	.21	.18	.21			
SeqPos	-.33	.44*	.56**	.16	.46*	.76***		
DisPre	-.34	.20	.20	.01	.17	.01	.21	
DisPos	-.60**	.68***	.48*	.31	.42*	.11	.47*	.61**

* $p < .05$
** $p < .01$
*** $p < .001$

Key: Rec = Recognition Memory
Con = Memory for Content
Seq = Memory for Sequence
Dis = Memory for Discrimination

and on Discrimination. All other correlations were positive, and many of them significant, indicating that low ability in one area is related to low ability in another area, while high abilities in several areas are also related.

Difference or gain scores were computed for Recognition, Content, Sequence, and Discrimination by subtracting the pre-test score from the post-test score for a given test. These difference scores were then submitted to independent t-tests between the experimental and control groups. No significant differences in raw gain scores resulted. It will be recalled, however, that significant group differences on adjusted post-tests for Content and Discrimination were found by ANCOVA.

Dependent (within-group) t-tests were performed between the pre-test and post-test for all four variables. This was done for the experimental and control groups separately. Only one significant t-test resulted, that for the experimental group on Sequence ($t(8) = 3.40$, $p < .01$). A raw gain of nearly seven points was evidenced on Sequence for the experimental group (see Table 1, means).

Experimental Group Only

Pre- and post-test scores on Pitch Discrimination, Rhythmic Discrimination, and Rhythmic Sequential Memory were separately analyzed by dependent t-tests. No significant gain or loss was detected on Pitch or Rhythmic Discriminations. Significant gains in Rhythmic Sequential Memory resulted, however ($t(8) = 3.27$, $p < .01$, see Table 3).

Table 3

Experimental Group Means on Discrimination and Memory

	Pre	Post
Pitch	16.56	18.00
Rhythmic	16.89	18.89
Memory	10.67	13.33

CHAPTER V

CONCLUSIONS

H_1--Following a music therapy program, the experimental group performed significantly better than the control group from pre-test to post-test on the Auditory Discrimination subtest of the G-F-W Auditory Skills Test Battery.

H_2--Following a music therapy program, the experimental group did not perform significantly better than the control group from pre-test to post-test on the Recognition Memory subtest of the G-F-W Auditory Skills Test Battery.

H_3--Following a music therapy program, the experimental group performed significantly better than the control group from pre-test to post-test on the Memory for Content subtest of the G-F-W Auditory Skills Test Battery.

H_4--Following a music therapy program, the experimental group did not perform significantly better than the control group from pre-test to post-test on the Memory for Sequence subtest of the G-F-W Auditory Skills Test Battery.

H_5--Following a music therapy program, there was no significant gain for the experimental group from pre-test to post-test on the pitch discrimination subtest of the informal music skills assessment.

H_6--Following a music therapy program, there was no significant gain for the experimental group from pre-test to post-test on the rhythmic discrimination subtest of the informal music skills assessment.

H_7--Following a music therapy program, there was a significant gain for the experimental group from pre-test to post-test on the rhythmic sequential memory subtest of the informal music skills assessment.

CHAPTER VI

DISCUSSION

Statistical analysis of all data from this study indicate significant gains from pre-test to post-test on the Auditory Discrimination subtest and Content Memory sub-test of the G-F-W Auditory Skills Test Battery. These results strongly suggest that music therapy programs may be significantly effective in improving certain auditory skills. The implications from these results are important, since only a small amount of research has been conducted in this area.

The experimental subjects did not, however, improve significantly on two of the four subtests: Recognition Memory and Memory for Sequence. Perhaps the auditory skills required to complete exercises presented in the music therapy program were unlike the auditory skills needed to perform on these particular subtests. Further research should be conducted to pinpoint what music skills, if any, are similar to the skills required for the Recognition Memory and Memory for Sequence subtests.

Conclusions should not be drawn too hastily about the relationship of skills required for the music therapy program and those required for the Memory for Sequence subtest. Although no significant group differences were indicated by the ANCOVA, dependent t-tests that were performed between pre-test and post-test scores for the experimental group showed a significant gain at $(p < .01)$. These results indicate that the treatment variable may have significantly improved the subjects' performance on this subtest. However, negative correlations showed a tendency for experimental subjects to score higher than control subjects on all the variables. When both groups were controlled for pre-test differences, the wide range between scores could have been enough to make the statistical relationship between pre-test and post-test for the experimental group seem insignificant. Other studies should be conducted using more equally matched subjects. The experimental group may show more significant improvement after treatment if both groups start with an equal advantage.

The apparent ineffectiveness of the treatment variables on pre-post test scores from the Recognition Memory and Memory for Sequence subtests may also indicate severe auditory perceptual impairment in these areas. Such impairment would indicate failure for any program of auditory training. These results, however, indicate that this is spurious. The Pearson Correlations computed for all pairs of variables showed low ability in one area was related to low ability in another area, while high abilities in several areas were also related. If treatment was hindered by auditory perceptual impairment, none of the four areas would have shown improvement.

It should also be noted that subjects in the experimental group who scored lowest on the basic music skills assessment made the greatest gains from pre-test to post-test. It can be surmised from these gains that weak auditory ability may not be related to auditory perceptual impairment. If the subjects with low pre-test scores suffered neurological damage to the auditory perceptual mechanism, they would be incapable of improvement after treatment. Possibly, learning disabled children have never learned to process auditory input properly or are developmentally disabled in this area. If so, they must be trained to acquire the ability to process sensory input.

Insignificant gain from pre-test to post-test for the experimental group on subtests of pitch discrimination and rhythmic discrimination may also indicate ineffectiveness of method. Resonator bells were used for the pitch discrimination exercises. These bells have many overtones which may have confused the students. Exercises for rhythmic discrimination and pitch discrimination did not vary daily. If method of presentation had been varied or completely different, significant results may have occurred.

Interestingly, the experimental group exhibited improved auditory functioning after training in music while simultaneously using two or three sensory modalities: visual, auditory, and kinesthetic. After the first week of remedial training, it was noted that the subjects had considerable difficulty learning exercises through the auditory channel. They needed to see and experience kinesthetically the rhythmic and melodic patterns as they were presented. Some subjects exhibited great difficulty learning the patterns through the combined visual and auditory channels. They had to be instructed using a physical prompt (the kinesthetic modality). Some studies concerning learning disabled children have indicated that it is not necessary that these children be instructed in the sensory modality of their greatest strength. They may be capable of learning effectively through several different modalities (Ringler & Smith, 1973; Waugh, 1973). The pre-post test differences on the Rhythmic Sequential Memory subtest of the music skills assessment from this study have indicated this.

Significant gain from pre-test to post-test was shown only on the Rhythmic Sequential Memory subtest of the basic music skills assessment. Upon closer examination of pre-post test scores from the pitch discrimination and rhythmic discrimination subtests of the basic music skills assessment, it was noted that subjects with low scores made considerable gain from pre-test to post-test. Subjects with high scores on both pre-tests tended to maintain the same score on both post-tests. These differences in scores between subjects with high ability and subjects with low ability may have influenced the significance of results from pre-test to post-test on the pitch discrimination and rhythmic discrimination subtests.

It should also be noted that learning transferred without "teaching for the test." Indications were that training children in basic music skills (for example, those used in this study) may be sufficient to improve other auditory skills not related to music. Research should be conducted using music as a medium to teach specific skills required for the G-F-W Auditory Skills Test Battery versus training in basic music skills as a means of improvement.

As noted before, auditory skills have been correlated with reading achievement (Golden & Steiner, 1969; Carpenter & Willis, 1972; Vande Voort & Senf, 1973). The results of this study have strong implications for this area of research. If music therapy programs can improve auditory skills related to reading, than these programs may also be capable of improving reading skills. More research must be conducted in this area before any valid conclusions can be drawn.

APPENDIX

BASIC MUSIC SKILLS ASSESSMENT

<u>Pitch Discrimination</u>

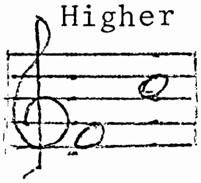
Directions:

You will hear from this tape player two tones. You must tell me whether the second tone will be the same, higher, or lower than the first tone. You will hear each exercise twice. Circle the correct answer on your paper.

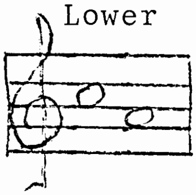
Training section:

Stop the tape after each exercise and go over the correct answer.

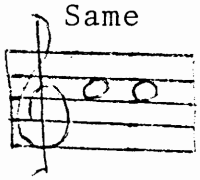
1. Higher



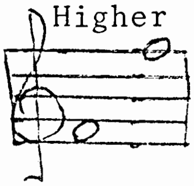
2. Lower



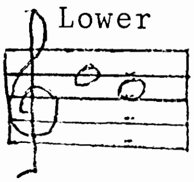
3. Same



4. Higher



5. Lower

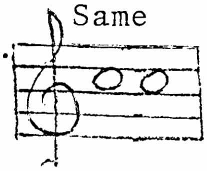


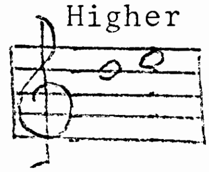
Testing section:

Directions:

Now you will hear more tones from this tape player, and I want you to continue to tell me whether the second note you hear is higher, lower, or the same as the first. You will hear each exercise twice. Circle the correct answer on your paper. There should be no talking during the test.

1. Higher


2. Same


3. Higher


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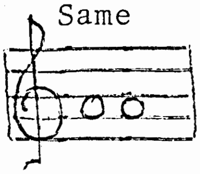
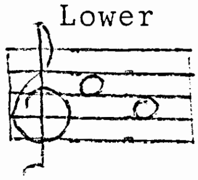
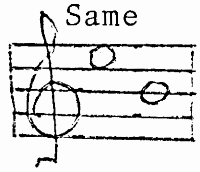
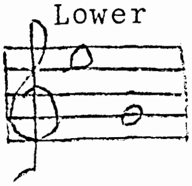
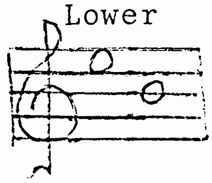


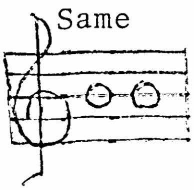
5. Lower


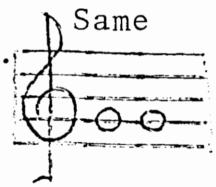
6. Same


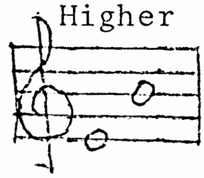
7. Lower


8. Higher

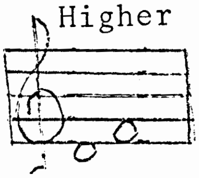

9. Lower


10. Same


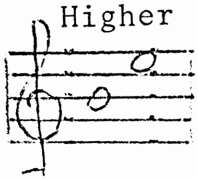
11. Same


12. Higher


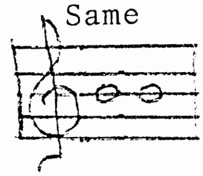
13. Higher



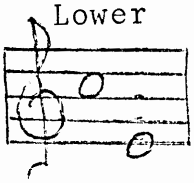
14. Higher



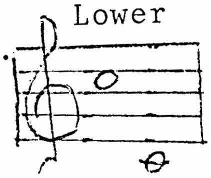
15. Same



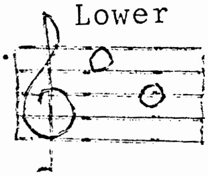
16. Lower



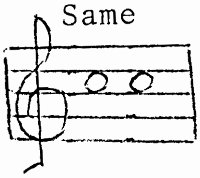
17. Lower



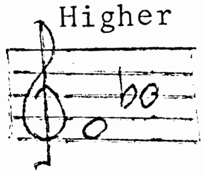
18. Lower



19. Same



20. Higher



Shut tape player off and proceed with rhythmic discrimination.

Pitch Discrimination (Answer sheet)

Training section:

1.	Higher	Lower	Same
2.	Higher	Lower	Same
3.	Higher	Lower	Same
4.	Higher	Lower	Same
5.	Higher	Lower	Same

Testing section:

1.	Higher	Lower	Same
2.	Higher	Lower	Same
3.	Higher	Lower	Same
4.	Higher	Lower	Same
5.	Higher	Lower	Same
6.	Higher	Lower	Same
7.	Higher	Lower	Same
8.	Higher	Lower	Same

Pitch Discrimination (continued)

9.	Higher	Lower	Same
10.	Higher	Lower	Same
11.	Higher	Lower	Same
12.	Higher	Lower	Same
13.	Higher	Lower	Same
14.	Higher	Lower	Same
15.	Higher	Lower	Same
16.	Higher	Lower	Same
17.	Higher	Lower	Same
18.	Higher	Lower	Same
19.	Higher	Lower	Same
20.	Higher	Lower	Same

Rhythmic Discrimination

Directions:

(All directions will be read aloud.) On your paper this ___ (draw a line on the board) will represent a long sound, such as (♩) (play on wood block with mallet as a demonstration).

On your paper this . . (draw two dots on the board) will represent two short sounds, such as (♫) (play on wood block with mallet as a demonstration).

Training section:

Circle the pattern which you heard on your paper. You will hear each pattern twice from this tape player. Stop and tell them the correct answer.

1. ♩ ♫ ♩

2. ♫ ♩ ♫ ♩

3. ♩ ♩ ♩ ♫

4. ♫ ♩

5. ♩ ♩ ♫

Testing section:

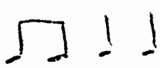
Now you will hear some more rhythmic patterns from this tape player. Be sure to listen carefully, always circle the pattern you hear. You will hear each pattern twice.

1. ♩ ♫

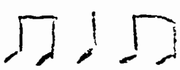
Rhythmic Discrimination (continued)

2. 

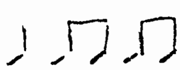
3. 

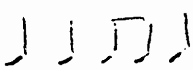
4. 

5. 

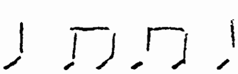
6. 

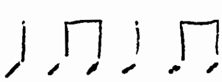
7. 

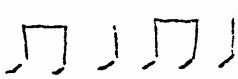
8. 

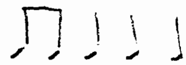
9. 

10. 

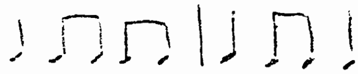
11. 

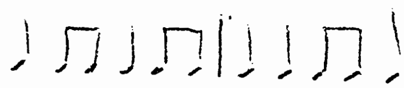
12. 

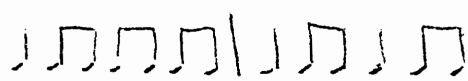
13. 

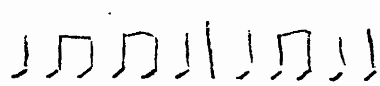
14. 

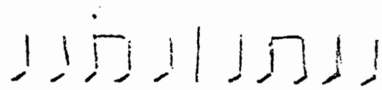
15. 

16. 

17. 

18. 

19. 

20. 

Rhythmic Discrimination (Answer Sheet)

Training section:

1. a) __ .. __

   b) .. __ ..

2. a) .. __ __ ..

   b) .. __ .. __

3. a) __ __ .. __

   b) __ __ __ ..

4. a) -- __

   b) __ ..

5. a) .. __ ..

   b) __ __ ..

Testing section:

1. a) .. __

   b) __ ..

2. a) __ __

   b) .. __

3. a) .. __

   b) __ ..

4. a) __ __ ..

   .. __ __

5. a) __ __ ..

   b) __ .. __

6. a) .. .. __

   b) .. __ ..

Rhythmic Discrimination (continued)

7. a) __ __ ..
   b) __ .. __

8. a) __ .. ..
   b) __ .. --

9. a) __ __ .. __
   b) __ .. .. __

10 a) __ .. __ ..
   b) __ .. __ __

11. a) __ .. .. __
   b) __ .. __ __

12. a) __ .. .. ..
   b) __ .. __ ..

13. a) .. __ .. __
   b) .. .. .. __

14. a) .. __ __ ..
   b) .. __ __ __

15. a) __ .. __
   b) .. __ __

16. a) __ .. .. __ .. __
   b) __ .. __ .. __ __

17. a) __ .. __ __ __ __ .. __
   b) __ .. __ .. __ __ .. __

18. a) __ .. .. .. __ .. __ ..
   b) .. __ __ .. __ .. __ ..

19. a) __ .. .. __ __ .. __ __
   b) __ .. .. __ __ .. __ __

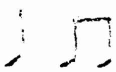
20. a) __ __ .. __ __ .. __ __
   b) __ __ .. __ __ __ .. __

Rhythmic Sequential Memory

This test must be given individually.

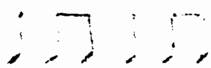
Training session:

I am going to play a few rhythms on this drum, and I want you to play them back to me. First they will be short, and then they will get longer. During the training session, you will be allowed more than three trials to practice. (Place a one on the line for correct answers, and a 0 on the line for mistakes.)

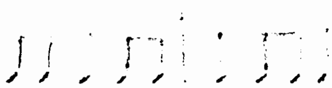
1. 

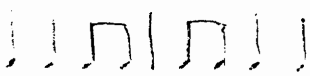
2. 

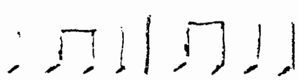
3. 

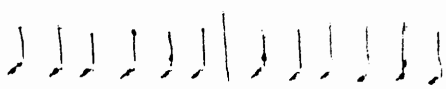
4. 

5. 

6. 

7. 

8. 

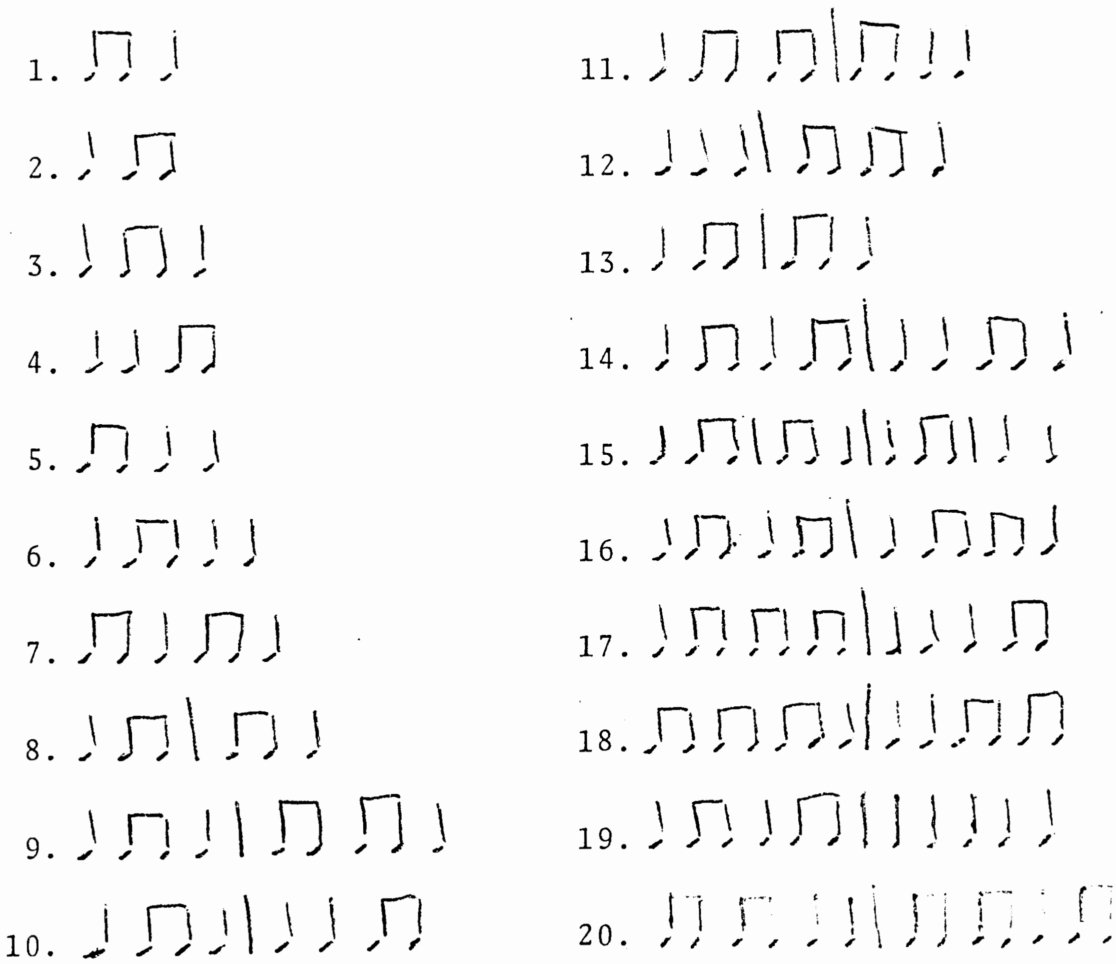
9. 

10. 

Rhythmic Sequential Memory (continued)

Testing section:

Now I am going to play twenty more rhythms, but this time you will only have three opportunities to answer correctly.



Rhythmic Sequential Memory (Answer Sheet)

Training session:

	Trial 1	2	3
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____
6.	_____	_____	_____
7.	_____	_____	_____
8.	_____	_____	_____
9.	_____	_____	_____
10.	_____	_____	_____

Testing section:

1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____
6.	_____	_____	_____

Rhythmic Sequential Memory (Answer Sheet continued)

7. _____ _____ _____

8. _____ _____ _____

9. _____ _____ _____

10. _____ _____ _____

11. _____ _____ _____

12. _____ _____ _____

13. _____ _____ _____

14. _____ _____ _____

15. _____ _____ _____

16. _____ _____ _____

17. _____ _____ _____

18. _____ _____ _____

19. _____ _____ _____

20. _____ _____ _____

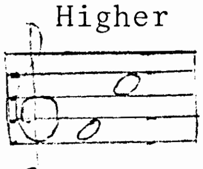
Treatment Program

Lowest group - Week VI - Day I

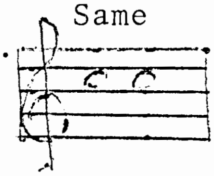
Pitch Discrimination:

You must tell me whether the second tone you hear is higher, lower, or the same as the first. You will hear each exercise twice. Circle the correct answer on your paper. (This was all tape recorded.)

1. Higher

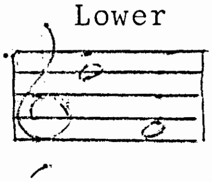


2. Same



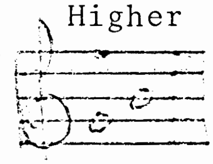
3. Higher

4. Lower

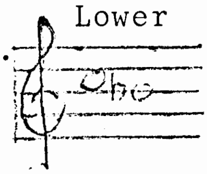


5. Higher

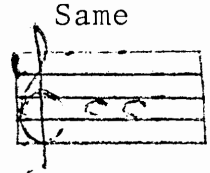
6. Higher



7. Lower

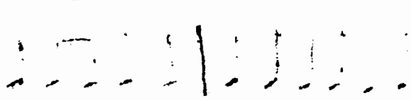


8. Same



Rhythmic Discrimination:

You will hear a rhythmic pattern and will see two rhythmic patterns. You must circle whether you hear rhythm pattern a or b. You will hear each exercise twice.

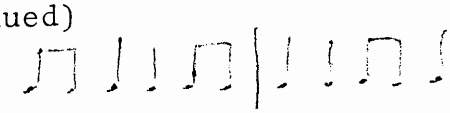
1. 

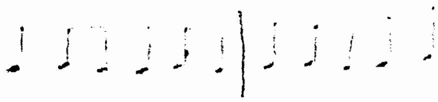
2. 

Lowest group - Week VI - Day I (continued)

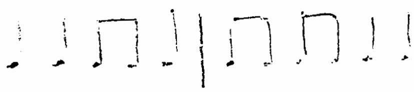
Rhythmic Discrimination (continued)

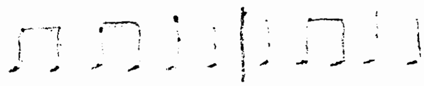
3. 

4. 

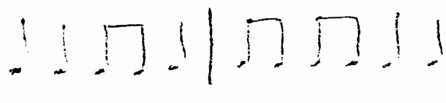
5. 

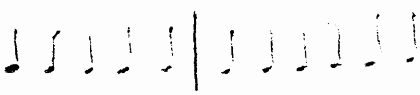
Rhythmic Sequential Memory. Repeat the following patterns after me.

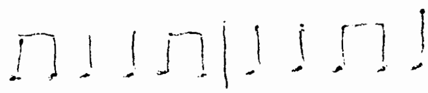
1. 

2. 

3. 

4. 

5. 

6. 

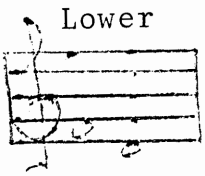
7. 

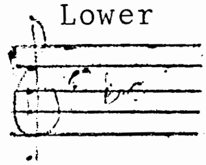
8. 

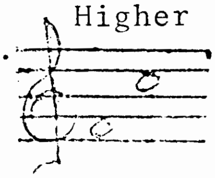
Song used was "Theodore" by K. Bayless. It was used daily.

Day II

Pitch Discrimination:

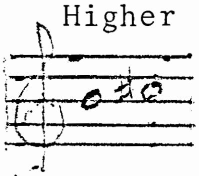
1. Lower 

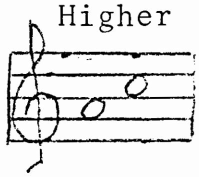
2. Lower 

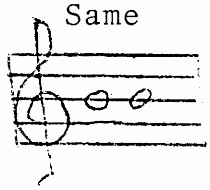
3. Higher 

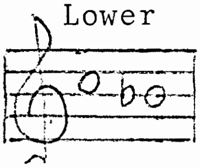
Lowest Group - Week VI - Day II (continued)

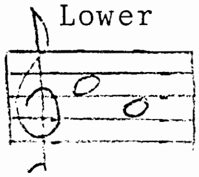
Pitch Discrimination (continued)

4. Higher


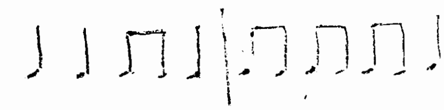
5. Higher


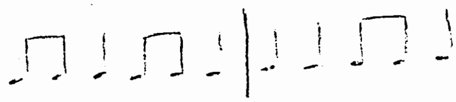
6. Same


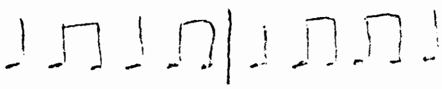
7. Lower


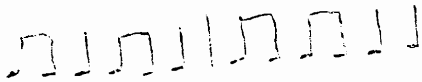
8. Lower


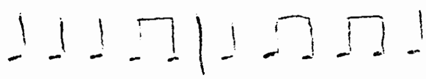
Rhythmic Discrimination:

1. 

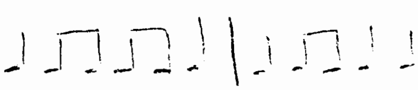
2. 

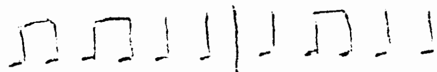
3. 

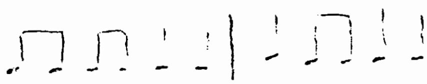
4. 

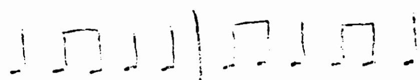
5. 

Rhythmic Sequential Memory:

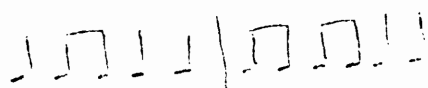
1. 

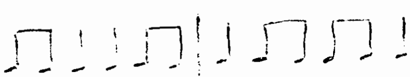
2. 

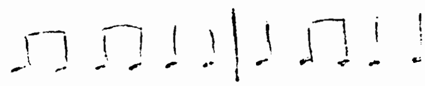
3. 

4. 

5. 

6. 

7. 

8. 

This is a sample answer sheet for the lowest group.

Pitch Discrimination:

1.	Higher	Lower	Same
2.	Higher	Lower	Same
3.	Higher	Lower	Same
4.	Higher	Lower	Same
5.	Higher	Lower	Same
6.	Higher	Lower	Same
7.	Higher	Lower	Same
8.	Higher	Lower	Same

Rhythmic Discrimination:

Day I

1. a) ___ .. ___ .. ___ .. .. ___

   b) ___ .. ___ ___ ___ .. .. ___

2. a) .. ___ .. ___ ___ ___ .. ___

   b) .. ___ .. .. ___ ___ ___ ___

3. a) ___ .. ___ ___ ___ .. .. ___

   b) ___ .. ___ .. ___ .. .. ___

Rhythmic Discrimination (continued)

4. a) .. ___ ___ .. ___ ___ .. ___

   b) .. ___ ___ .. ___ .. .. ___

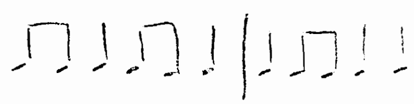
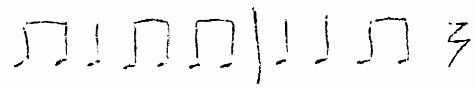
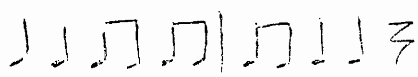
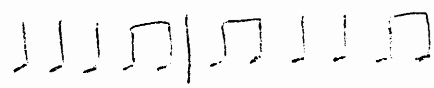
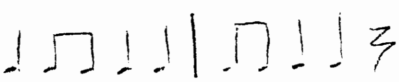
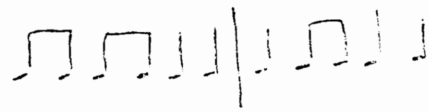
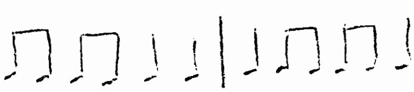
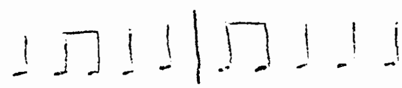
5. a) ___ .. ___ .. ___ .. .. ___

   b) ___ .. ___ .. ___ .. ___ ___

Treatment Program

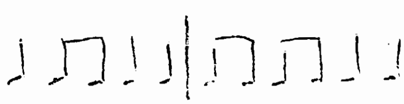
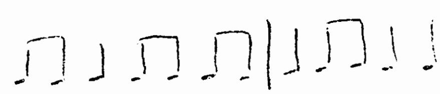
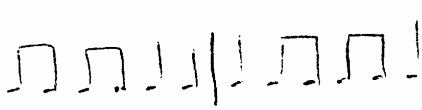
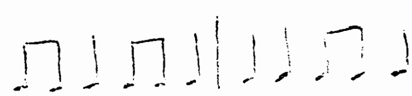
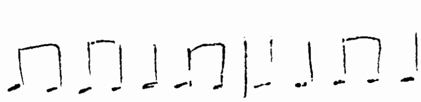
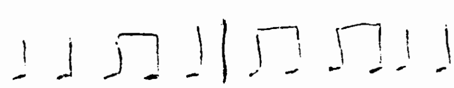
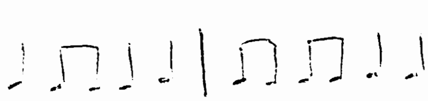
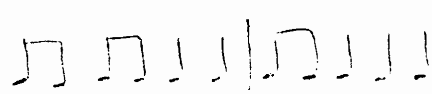
Middle group - Week VI - Day I

Rhythmic Sequential Memory. Repeat the following patterns after me.

1. 
2. 
3. 
4. 
5. 
6. 
7. 
8. 

Song used for two days was "Shiny New Shoes."

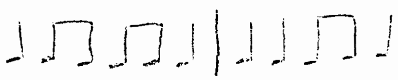
Rhythmic Sequential Memory - Day II

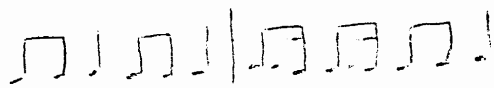
1. 
2. 
3. 
4. 
5. 
6. 
7. 
8. 

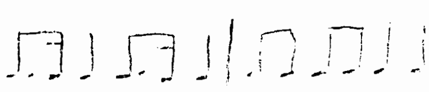
Treatment Program

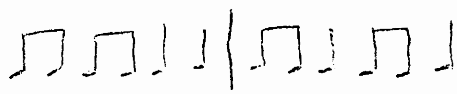
Highest group - Week VI - Day I

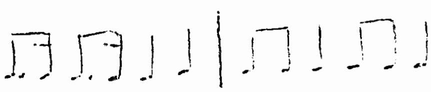
Rhythmic Sequential Memory. Repeat the following patterns after me.

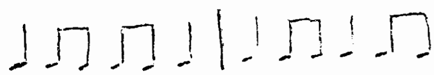
1. 

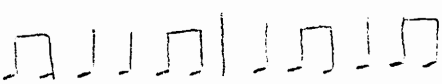
2. 

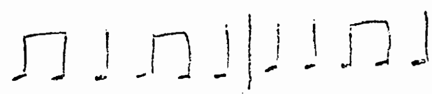
3. 

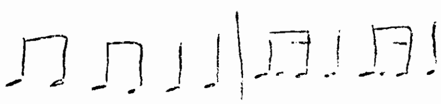
4. 

5. 

6. 

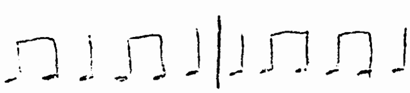
7. 

8. 

9. 

Song used for the week was "Just the Way You Are."

Rhythmic Sequential Memory - Day II

1. 

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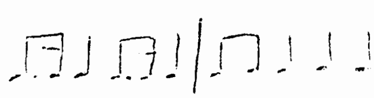
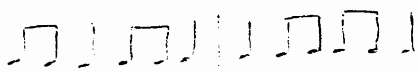
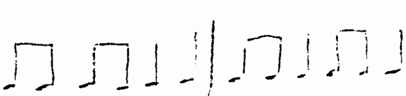
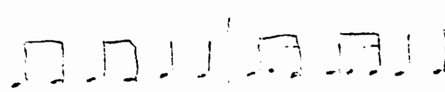
3. 

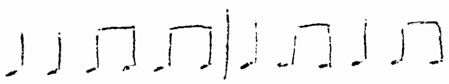
4. 

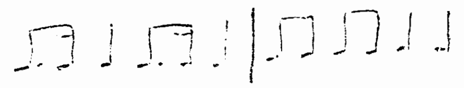
5. 

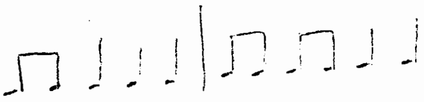
6. 

Highest group - Week VI - Day II (continued)

Rhythmic Sequential Memory (continued)

7. 

8. 

9. 

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