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The development of rhythm in young children aged one to four years

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THE DEVELOPMENT OF RHYTHM IN YOUNG
CHILDREN AGED ONE TO FOUR YEARS

by

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Presented to

The Graduate Faculty of
The University of the Pacific

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ABSTRACT

The aim of this study was to assess how young children between the ages of one and four years develop rhythm skills. The project was a pilot study conducted at 11 preschools and day care centers in Stockton, California, and included 60 children. Thirty behaviors comprised the test of various aspects of rhythmic performance. The children were video-taped and the tapes were then analyzed. By examining how many children in a particular age group could perform a particular task, a sequence became apparent. This body of research can now be used as a basis for further studies with the aim of establishing a standardized assessment scale of rhythm development and other musical skills.

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EXPERIENCE

Deborah danced when she was two,
As buttercups and daffodils do;
Spirited, frail, naively bold,
Her hair a ruffled crest of gold.
And whenever she spoke her voice went singing
Like water up from a fountain springing.

But now her step is quiet and slow;
She walks the way primroses go;
Her hair is yellow instead of gilt;
Her voice is losing its lovely lilt;
And in place of her wild delightful ways
A quaint precision rules her days.

For Deborah now is three, and, oh,
She knows so much that she did not know.

Aline Kilmer
From "Candles That Burn".

1919.

TABLE OF CONTENTS

	Page
List of Tables.....	6
CHAPTER	
1. INTRODUCTION.....	7
1.2 Topic of Pilot Study.....	7
1.3 Case studies.....	8
2. LITERATURE REVIEW.....	12
2.1 Child Development.....	12
2.2 Motor Development.....	14
2.3 Cognitive Development.....	16
2.4 Psychological Development.....	18
2.5 Sensory Integration.....	18
2.6 Stages of Development.....	20
2.7 Assessing Development.....	21
2.8 Music Therapy Assessment.....	25
2.9 Development of Musical Concepts.....	28
2.10 Measurement of Musical Aptitude.....	35
2.11 Summary.....	37
3. METHOD.....	39
3.1 Sample and Setting.....	39
3.2 Aim.....	41
3.3 Scope and Parameters.....	41
3.4 Videotaping.....	42

3.5 Expectations.....	43
3.6 Behaviors Targeted for Testing.....	43
4. RESULTS AND DISCUSSION.....	56
4.2 Reliability.....	62
4.3 Discussion.....	62
5. CONCLUSIONS.....	69
5.2 Recommendations.....	70
APPENDICES	
1. Table of Development.....	72
2. Bayley Infant Scales of Development.....	77
3. Early Infant Developmental Profile.....	81
4. Music Perception Assessment of Cognitive Development.....	102
5. Music Therapy Assessment Profile.....	124
6. Letters.....	148
GLOSSARY.....	152
BIBLIOGRAPHY.....	156

TABLES

Table	Page
1. Musical Aptitude Test.....	36
2. Sample and Setting.....	40
3. One Year Age Group.....	56
4. Two Year Age Group.....	57
5. Three Year Age Group.....	58
6. Four Year Age Group.....	59
7. Progression of Passes though Ages.....	60
8. Progression of Percentages through Ages.....	61

1. INTRODUCTION

In preparing for this pilot study, this researcher found that the literature is increasingly stating that standardized assessment devices are needed in the health care professions, especially the newer professions such as Music Therapy. Federal law has mandated the use of assessment tools to identify handicapped children, focus on specific deficits and implement the most appropriate educational and treatment plans. All professionals are called upon at one time or another in the clinical setting to defend treatment regimes or support the continuation of a program. Once again, for this to be effective, good measurement scales are needed.

The purpose of this study is to observe how young children develop rhythm skills while developing other skills, such as motor skills, language skills and personality.

1.2 Topic of Pilot Study

After observing handicapped children at the Courage Center in Golden Valley, Minnesota, this researcher became interested in child development, especially as it related to musical skills. Two cases are cited below to illustrate the use of music in the team's approach to the comprehensive therapeutic program of the children. The question arose that if children have milestones in gross motor, fine motor, social, cognitive, language, visual and auditory

development, does music follow similar developmental patterns? If one area of weakness causes deficits in other areas, and one strong skill can be used to augment other talents, then surely musical skills should be assessed for the maximum benefit of each individual child.

1.3 Case Studies

The children referred to below are identified by the initials of their first names to maintain confidentiality.

In the first case, client A is a five year old girl with Cerebral Palsy and fine and gross motor delays. The physical therapist's goals are the attainment of transitional movement patterns (sitting to standing to kneeling), reciprocal crawling, independent standing, independent step-taking with trunk support, and weight bearing in various sitting positions. In music therapy sessions, A exhibited unusually advanced rhythmic abilities. She could maintain a steady beat at various tempi, beat syncopated rhythms bilaterally and change beat during a song with many complex rhythmic patterns. This rhythmic ability has been used in her treatment program to assist the development of the required skills mentioned above.

Client I is a three and a half year old boy. His extensive diagnosis includes developmental delay, seizure disorder, hydrocephalus with a shunt, cleft palate, Cerebral Palsy with spastic quadriparesis, and speech disorder. His speech therapist had both expressive and receptive goals.

Receptive goals included picture identification, object identification by function and the development of the concept "in" and "out". Expressive language goals were the learning of 10 signs (in American Sign Language) and some vocal approximation of these words. The client had not vocalized with any consistency. In individual and group music therapy sessions, the client started matching pitches of isolated notes and various intervals with a high degree of accuracy. He also sang along with the melodies of familiar music. It is obvious how this assisted his speech goals.

A perusal of the literature revealed very little in the way of specific music milestones. Some researchers noted the difficulty in assessing children whose verbal skills are not concomitant with their music skills. Because the scope of a developmental assessment of all areas of music is so vast - a lifetime's work - for the purpose of this investigation it was decided to concentrate on one area of musical talent - rhythm.

There are some assessment forms designed to assess sensorimotor, cognitive, or social-emotional skills. However, as yet, little supporting data could be found about the assessment of developmental music skills in infants and young children. Music therapy is often defined as "the use of music in the accomplishment of therapeutic aims: the restoration, maintenance and improvement of mental and physical health" (National Association of Music Therapy).

Music Therapists reiterate that their jobs are not to teach musical skills but rather to use music as a non threatening medium in treatment. The question thus arises: why assess any music skills in the first place?

"Most human behaviors develop in a patterned way though largely predictable sequences. All individuals go through these stages at their own pace but the sequence itself remains remarkably predictable" (Ames et al, 1979, Page 4). When working with children it is important to bear in mind the developmental sequence so that, as far as possible, one can channel the child's reactions along the best lines. This is true for the music therapist as well as other professionals and thus it is essential to develop adequate tools for assessment of behavior. In this way the music therapist will have the knowledge on which to base expectations of the children under consideration. Rhythm is as basic a behavior to all children and adults as is breathing and eating (Mathews, 1960). Rhythm is the essence of life (Young, 1984). It is necessary for the child to experience rhythm in every way possible to enable that child to attain such skills as speaking and reading with a flowing rhythm and intonation.

The drive for self realization is clearly apparent as the child strives to meet his/her physical needs (Lee and Lee, 1958). If such needs are not met, the child cannot develop optimally. Creative rhythmic activities are utilized too little by parents and teachers assisting in a child's

development. The body's innate rhythm can be a most effective means of self expression.

Rhythmic activities are as natural as life itself. All body functions - respiration, ventilation, circulation, digestion and excretion - occur in a rhythm as unique as the individual. Walking, eating, talking and countless other functions provide an amount of movement, coordination and repetition which is fundamentally rhythmic. Watching children on a playground makes us aware of how necessary rhythm is in the earliest actions of childhood. Running, hopping, skipping and jumping are only a few in the repertoire of a child's movements. Through these activities, a child finds an outlet for physical energy, expression of a fertile imagination and part of a physical vocabulary.

This research opportunity will be a pilot project. The purpose of the examination is to obtain an idea of the different stages of rhythmic ability in children ages 1, 2, 3 and 4 years. The successes and flaws of this pilot project will enable researchers to move into other areas, eventually resulting in a comprehensive knowledge of the development of musical skills and perceptions in young children and the availability of a standardized assessment tool.

2. LITERATURE REVIEW

The literature review will cover the following areas:

General child development, motor development, cognitive development, psychological development, sensory integration, stages of development, assessing development, music therapy assessment, the development of musical concepts and music aptitude tests.

2.1 Child Development

Development refers to the qualitative changes that occur in an individual. The changes are orderly and coherent; the series of changes is progressive; the progression is directional, leading forward. In other words, new behaviors are built on already learned skills and in the course of normal maturation these skills are not lost once they are learned. There is a definite relationship between a given change and the stage which preceded it. This results in a complex integration of many structures and functions.

Change is continuous throughout an individual's life. In general, all individuals follow the same pattern of development. Babies progress from lifting their heads to sitting up to standing to walking and running. Growth rate is very rapid in early infancy, slows in childhood, increases in adolescence and then decreases, finally halting when the genetically and environmentally determined maximum height is reached (Gesell, 1948). Glandular changes also

follow a pattern that is orderly, although not the same as skeletal development. Motor development exhibits the progression from the use of large muscle groups for gross movements to smaller muscles for finer precise movements. Even teeth are acquired in a sequential manner. In general, normal bodies are built and work alike. It is this similarity that makes us aware of any deviations from the norm, furnishing clues for any difficulties of problems. While each child goes through the same growth pattern, this does not mean that all children of a given age are at the same level of maturity.

Behavior has form and shape. Babies' bodies and minds grow in patterned predictable ways. All growth implies organization. Growth is inseparably bound to the development of the Central Nervous System (CNS). Five months before birth, babies have all the nerve cells they will ever possess, fully formed. All child development proceeds with reference to the future. When the time comes the child is normally ready for what is necessary at that time. The child is never ready unless the nervous system is ready (Gesell et al, 1974).

Knowledge of the pattern of human development helps us to know what to expect of a child, when to expect it and at what ages different patterns of behavior will normally be replaced by more mature forms. Knowing what to expect helps us to establish normal ranges within which we can expect behaviors to occur. Development which deviates significantly

from the norm will indicate to the professional that intervention must occur.

Each stage in development represents a certain level of maturity. A stage is merely a passing moment while development is continually moving. However, this does not preclude us from selecting significant moments in the cycle to mark the steps toward maturity. Individuality is so great that no two children are exactly alike at any given age. But differences cling to a central trend because the sequences of a human growth show relatively stable characteristics (Gesell et al, 1974). Studies of hundreds of infants and children have enabled the Gesell Institute to ascertain average age trends of behavior development. Thus, for a given age it is possible to describe expected typical behaviors. The cycle of human development is elusive unless it can be seen in terms of ages and stages.

2.2 Motor Development

The acquisition of motor skills is achieved through multisensory stimuli. Sight, hearing and touch are key factors. The CNS matures as the child develops, allowing progressively complex activities to take place. The normal child learns to assimilate, modify and adapt behaviors from a particular situation, and to transfer this knowledge to newly learned skills.

The various stages of motor development occur within a predicted age range for most children. Depending on the

skill, the range extends from two to four or six months. The rate of development is closely linked to CNS maturation. Initially, motor responses are involuntary, primitive and purposeless. Muscular maturation occurs in a cephalo-caudal (from head to tail) and proximo-distal (from the center outward) direction. Development is also directional in other ways. It proceeds from positions of minimum activity and maximum support to ones of maximum, activity and minimum support; from primary primitive mass patterns to specialized isolated highly coordinated movements. Thus what are initially observed as flailing motions are the beginnings of purposeful movement. As the infant increasingly explores and experiments, the movements become regulated and restrained. All areas of development are interrelated and connected to one another, and one function cannot be trained to the exclusion of the others. Thus, a delay in one area will usually give rise to deficits in one or more other areas. By the same token, a strength in one area will overlap in assisting the development in other areas (Blacha, 1983).

Gross motor skills refer to skills related to large muscle groups that control balance, equilibrium and posture. One requires a concept of where the body is in space and an ability to master newly learned skills and integrate these at an unconscious level.

Fine motor skills include responses using small muscles of the hand, mouth, eye and their combined relationship. Since motor development is from general to specific, gross motor delays will impede fine motor skill acquisition.

All activities such as writing, reading, dressing, eating and jogging contain one or more motor component/s.

2.3 Cognitive Development - Piaget's Theory

A child must act in his/her environment if cognitive development is to proceed. Development ensues if the child assimilates and accommodates stimuli in the environment. This can only occur if the child's senses are brought to bear on the environment. Acting on the environment includes moving in space, manipulating objects and searching with eyes and ears. In the early years children are essentially dependent on physical and sensory experiences because they do not possess the power of symbolic representation i.e. language. Development proceeds as infants explore their environment via their reflexes. Objects are placed in the mouth and sucked via the sucking reflex.

Piaget does not suggest that children move from discreet stage to discreet stage. Cognitive development flows naturally. Stages are simply useful in conceptualizing developmental processes. Age spans can only be suggested as times during which most children can be expected to display the behavior characteristics of that stage. This does not mean that an individual cannot display the behaviors earlier or later.

Piaget's general concept of development may be enumerated as follows, according to Maier (1969):

1. There is an absolute continuity of all developmental processes.
2. Development proceeds through a continuous process of generalizations and differentiations.
3. Each level of development finds its roots in a previous phase and continues into the following one.
4. Each phase involves repetition of the behaviors from the previous level in different forms of organization.
5. These differences create a hierarchy of experiences and actions.
6. Individuals achieve different levels in the hierarchy.

Piaget defined 5 stages of development:

Sensorimotor	0 - 1 years
Symbolic	1 - 3 years
Pre-operations	3 - 6 years
Concrete operations	6 - 11 years
Formal operations	11 + years

Development from motor and sensory behaviors during the first 2 years of life is the bedrock upon which later cognitive development is built (Wadsworth, 1974). Symbolic presentation develops from reflex activity. Initially, children physically manipulate objects. Later they learn that those objects that cannot be touched can be manipulated perceptually.

2.4 Psychological Development

Freud was the first to put forward a theory of personality development with his oral, anal, phallic, latency and genital stages. Eric Erickson enlarges the scope and elucidates eight stages of development (Maier, 1969):

AGE	CONFLICT	REALIZATION
Infancy	Basic trust vs basic mistrust	Hope
Childhood	Autonomy vs shame and doubt	Will
Play age	Initiative vs guilt	Purpose
School age	Industry vs inferiority	Competence
Adolescence	Identity vs Identity diffusion	Fidelity
Young adult	Intimacy vs isolation	Love
Adulthood	Generativity vs self absorption	Care
Mature age	Integrity vs despair	Wisdom

2.5 Sensory Integration

The nervous system assimilates and organizes sensory input from tactile, proprioceptive, vestibular, olfactory, gustatory, visual and auditory systems. The degree to which an individual reacts with the environment is a direct result of the effectiveness of sensory processing. Integration process is receptive, evaluation and assessment are expressive.

The brain stem and thalamus are the locales for the most significant and comprehensive sensory integration. The

reticular formation receives sensory input from all the modalities. Learning is input, integration and response. Higher functioning levels may only develop when certain prerequisite skills are present and integrated. Perceptions are sensations that have meaning. Sensory integration is a prerequisite skill for perceptual motor development.

The integration of sensory input is essential to normal motor development. When an infant is deprived of sensory stimuli the impact on motor, perceptual and cognitive development is devastating, subsequently handicapping the child in understanding and interacting with the environment.

In early development, the protective system is highly active in detecting pain and temperature. The neonate is acutely aware of hard and firm pressure. Responses to light touch are nonspecific. Gradually the child learns to become less generalized and eventually develops an ability to locate specific areas that have been stimulated. The discriminative system also develops sequentially. The child progresses from oral identification of shapes to manual manipulation to visual recognition. A balance between the protective and discriminative systems is essential for somatosensory events to be transmitted simultaneously and interpreted accurately (Blacha, 1983).

The normal developing infant is exposed to varied tactile, vestibular, visual and auditory input from cuddling, rocking and feeding by parents. High frequency human speech, variety of speed, pitch and rhythm will increase attention span.

2.6 Stages of Development

The first five years are the most basic. They have a profound effect on all later development. A brief overview of development is presented with the ages and stages laid out by the Gesell Institute (Gesell et al, 1974). A more comprehensive table is available in appendix 1. The authors state in the more recent literature that essentially the original body of research still holds firm thirty years later, although some of the age levels have been revised.

In the first three months of the first year of life the infant gains control of the oculomotor muscles, the muscles which control the movement of the eyes.

Between sixteen and twenty eight weeks the infant gains control of the muscles supporting the heads and moving the arms, thus allowing reaching for objects.

By forty weeks - eight months - the infant gains command of the trunk and hands. An observer will see the baby sitting, grasping, transferring and manipulating objects.

Towards the end of the first year of life, control has extended to the legs and feet, the forefingers and thumbs. The infant pokes and plucks. Babies will sit well with good balance. They will come from sitting to lying using their arms. They have some sort of locomotion such as crawling, bear walking or cruising. They may stand alone and walk with one hand held.

By the end of the second year of life the child is walking and running. Speech shows articulation of words and phrases. The infant is beginning to acquire bowel and bladder control. One sees the rudimentary sense of personal identity and the use of the personal pronoun. They have good control of how to begin and end movement.

At the three year age level, speech has expanded to the use of sentences with words being used as a tool of thought. The child shows an understanding of the environment and complies with cultural demands. The child runs and is beginning to be able to stand on one foot. It is at this age that the child begins to ride a bicycle.

A four year old child asks innumerable questions especially "why?". The child perceives analogies and displays a tendency to conceptualize and generalize. These children are self dependent in home routines. They can run, climb, hop and balance on one foot for about five seconds.

At five, children show well matured motor development. Hopping and skipping are easily done. Talking shows no infantile articulation. They can narrate a long tale. Associative play is preferred. Pride is felt in clothes and accomplishment. These children are self assured, conforming to social norms.

2.7 Assessing Development

There are many reasons for assessing developmental milestones. Educational plans can be based on the child's

early intellectual aptitude. At every stage of development, the child can be prepared for the next stage. Vocational guidance can be given on the basis of the child's early physical, cognitive and personality development. Since successful development requires guidance, teachers, parents and therapists will become more adept in guiding the child at the appropriate time. Knowing what is likely to happen, according to Hurlock (1972), will assist the parent, teacher or therapist in preparing the child for what is possibly to come, and thus help minimize the tensions and stresses the child will encounter. Treatment of handicapped babies should be started as early as possible. At birth the CNS is not completely myelinated. Until this process is completed, mature functioning is impossible. Maturation of the CNS depends on myelination. As the CNS matures, some reflex pathways become dominant for a certain period of time before becoming modified and integrated into more mature movement patterns. Thus, beginning treatment as early as possible allows the therapist to have a deep effect on the maturing nervous system. A thorough knowledge of the developmental sequence ensures that no gaps in the process occur leading to extrinsic abnormalities. Because a young child's CNS is still maturing, it is extremely adaptable and susceptible to positive influences (Cash, 1979).

Recent legislation has stimulated a greater use of screening surveys. The Educational for All Handicapped Children Act, PL 94-142, requires the identification of all

handicapped children via screening instruments, further evaluation by a team of specialists to determine specific problems and exact educational needs, and the development and implementation of an individualized educational plan (IEP) for each handicapped child.

"(17) The term 'related services' means....such developmental services....as may be required to assist a handicapped child to benefit from special education and includes the early identification and assessment of handicapping conditions in children."

from Title 20,

PL 94-142

Early identification of developmental disabilities or of children at risk, remind Goodwin and Driscoll (1980), will allow early preventative treatments or programs to ameliorate or reverse such conditions.

Behavioral observations are especially important in interpreting measures of infant development, since temperament, affect, relationship with the examiner, attention span and other behavioral activities may influence test performance. The Bayley Scales of Infant Development, one of the most widely used tests and also one of the best standardized tests, includes such a behavioral assessment (Wolf & Lozoff, 1985). Thirty items characterize the infant's behavior. The items can be divided into 3 main groups:

- 1) general interpersonal affective and motivational items
- 2) sensory experience and interest
- 3) clinical impressions

The general items are specifically linked to a behavioral description while the sensory component is rated as one of two extremes. The manual alerts the examiner to expect typical behavior to change with age. (See appendix 2 for the test)

Another assessment form in use is the Early Intervention Developmental Profile by Rogers et al (1981). This is commonly called the Michigan Scale. Unlike the Bayley, it is one test that is comprehensive and allows the examiner to record the child's progress in a consecutive manner (See appendix 3)

Clinicians and researchers often need to compare the behaviors of babies for various reasons. One may want to assess the effectiveness of an intervention strategy. One may desire the relationship of behavior to other factors such as developmental test performance. It may be necessary to identify unusual or deviant behavior. The examiner may simply want to characterize the behavior of an individual baby. According to Bijou (1976), the only justification for dividing human life span into stages is to simplify the analysis of extraordinarily complex relationships that are involved in development. A workable theory of human

psychological development is beginning to emerge. Bijou further emphasizes that much research is needed to demonstrate functional relationships between events and behaviors.

Age norms are not absolute standards. They are merely references to which a child can be compared. Although the norms represent an average trend we can expect most children to exceed or fall short of the expectations at some point. When the profiles are read as a consecutive series they give a map of how a child matures. It is the path of growth that is important to study, not exact moments when behaviors occur. This is stressed by researchers at the Gesell Institute and must be borne in mind by anyone attempting developmental assessments of children.

2.8 Music Therapy Assessment

James (1986) recognizes that one of the most critical topics in the music therapy profession today is accountability of services. Therapists have the need to evaluate objectively both direct services within a session and procedures for assessment in the setting. The law acknowledges the need for accurate assessment of handicapped children in order to identify their needs. Because of this, the music therapist must be familiar with the standardized tests used by other professionals working in either therapeutic or educational settings. However, with the current emphasis on standardized documentation, the music

therapist using such a device, can offer support and justification for music therapy in a variety of settings. The future growth and acceptance of such services depends on clear documentation of therapeutic effectiveness.

When reviewing Rider's Music Perception Assessment, Jones (1986) states that developing valid, reliable and practical music therapy assessment tools is a major concern for the clinical music therapist. Informal assessment tools are abundantly available to the music therapist but few reliable formal assessment tools exist. Jones also states that the literature is sparse in relating that cognitive perception of basic music concepts occurs in a relatively invariant order.

2.8.1 Musical-Perception Assessment of Cognitive Development (M-PACD). The M-PACD was developed by Mark Rider (See appendix 4). It contains a series of tasks designed for individual diagnosis of mental age between 0 and 12 years. It is based on Piagetian theory. Rider (1981) remarks that if invariant developmental learning sequences exist in music, these logically may occur as cognitive components of the general musical concepts of rhythm, melody, harmony and form.

This test is only suitable for testing mental age if the child has no other compounding deficits. As has already been stated, a delay in one area usually results in deficits in other areas. Rider acknowledges that in most of the tests, the child with a physical or visual handicap, or with

an attention deficit, will be unable to pass the task. This researcher attempted part of the test with a group of children who have Cerebral Palsy. They all scored at lower levels than their true mental age when compared to standardized tests already performed on the children in the course of their therapies, because they were physically unable to perform the task. Therefore, this tool is unsatisfactory with many children who have multiple handicaps.

2.8.2 Music Therapy Assessment Profile (MTAP). The MTAP (Research Draft III) was developed by Donald Michel and Michael Rohrbacher. It is intended for use with infants who are developmentally delayed or handicapped. It covers gross, fine and perceptual motor skills, cognitive skills, social-emotional skills and communication skills (See appendix 5). The tool attempts to assess these non music skills through the use of musical instruments. It is obvious that the authors of the assessment medium used the Michigan Scale (Rogers et al, 1981) as the model for their test (Refer to appendix 3). The difference is that in the MTAP musical instruments are used for the performance of the tasks.

Music provides an effective way of facilitating mastery of milestones, through experiences which can be pleasurable and positive, and can encourage the active participation of each child. Almost all children master certain developmental milestones which are universal in nature. Music activities can be planned to meet almost all of the developmental milestones.

2.9 Development of Musical Concepts

Studies have shown that children under the age of five do develop concepts such as fast and slow, staccato and legato, and many others. However, they do not have the ability to express these concepts. Young's dissertation (1984) investigated non-verbal means of expression by a group of four year old children. Included among the findings were the following items:

1. It is possible to design a test of musical concepts for four year old children.
2. Four year olds have a basic understanding of musical concepts which they can express non-verbally.
3. Suitable vocabulary is a problem.

Young observed that movement and visual stimuli were more successful than tactile stimuli. Children are not apt to hear changes such as rallentando or crescendo. They listen to one aspect of music at a time and they have difficulty classifying sounds. Questions that are visually oriented are more successful than those which are aurally oriented. Multiple choice questions work better than open ended questions.

Alford (1971) relates that by 22 months the response to several types of music stimuli is fairly consistent. The subjects in this study were twins and singletons. The characteristics these children exhibited were all or some of the following:

1. The use of music for self expression.
2. Aesthetic awareness of a response to music with an ability to listen and respond accordingly.
3. Use and development of sensorimotor ability to perform and respond rhythmically and melodically to music.
4. An ability to imitate music stimuli vocally.
5. An ability to sing songs with some evidence of musicality.

The general physical, mental and emotional growth in preschool children is somewhat paralleled by musical growth and development of musical responses.

For a given conceptual area, the sequences of stages might be the same for all children while the particular sequence within each stage may vary. Jones' study (1976) dealt with the development of the child's ability to understand and identify meter in music. According to Piaget, on whose concepts this test was developed, the measurement of physical time results from a synthesis of ordering and inclusion operations and that the development of these concepts proceeds through three invariant stages. The measurement of inner or psychological time is an extension of the third stage. Measurement of physical time involves coordinating the motions of external objects moving at different speeds.

In Klanderma's dissertation (1979), three, four and five year old children were required to recognize and

respond to similarities and differences in an auditory presentation of rhythm, pitch and melodic elements, and to imitate such an auditory presentation. The pitch range was Middle C to A above. Rhythm patterns included half notes, quarter notes and eighth notes, and dotted notes. Melodic patterns consisted of four quarter notes with intervals of a second apart. Problems occurred with these children understanding the concept of same and different. Performance decreased with decreasing age.

Babies encounter music from birth. They are lulled to sleep by lullabies. They hear the radio and television from their cribs. Researchers have even attempted to put their cries into musical notation. It has been suggested that one of the attractions of "beat" music is the emotional link to the security of the mother's womb. Spiegler found that babies as young as forty eight hours old can distinguish between rhythmic and dysrhythmic heartbeats (Shuter-Dyson & Gabriel, 1981). A baby at four to six months turns to the source of music. About one or two months later the infant begins to move when hearing music, in clear repetitive movements.

All babies, even deaf ones, babble before speech is produced. Musical babbling only occurs if the baby is exposed to musical stimuli. The earliest vocalizations to music occur at six months. At this age infants are more attracted to melodic intonation than to rhythm. At nine months an infant turns away from some rhythms and noise (Zimmerman, 1971).

Initially a child's interest in making music is in producing effects of self activity rather than in filling the ear with sound. Children's first spontaneous composition attempts reflect the lack of motor control of gestures.

Shuter-Dyson and Gabriel (1981) report that it is believed that the development of music and movement are inseparable. Some time between the ages of eighteen months and two years, about 10% of children begin to match their movements to music for short periods of time. It is easier for the children to match their movements to their own singing than to an external source. At about two and a half year, the children begin to match the movements of another person. When young children are asked to move in a way suggested by the music, they find the task difficult to complete. Children who can keep time seem only to be able to do so for short periods of time.

The simplest rhythmic movements are those which are performed to the individual's own organization of time and space. Next are those which require movement to an externally produced beat. This is according to Weikert, (1982). Weikert further states that language must be the bridge between the teacher and the student. She feels that visual demonstration leads to imitation instead of true understanding. However, in very young children who do not have well developed vocabularies, language is insufficient and visual cues must accompany the instructions.

Some researchers have found that children aged three to five found rhythm tasks involving speech easier than those requiring the maintenance of a steady beat with rhythm sticks and clapping. In general, tasks requiring large muscle movements are more difficult for three and four year olds. When asking a child to repeat a rhythmic pattern, the pattern must be short. The number of taps and complexity of pattern affects successful task completion.

In their assessment of children, Andress, Heiman, Rinehart and Talbert (1973) have recorded the following observations.

A three year old child can

assimilate and accomodate pitched and non
pitched sounds
manipulate sound indiscriminately
use sound source to accompany movement
develop language through simple songs
move to a drum beat accompaniment
maintain fast tempi beats better than slow
improvise movements to recorded music
shake, tap, strum, beat, and play piano.

A four year old child can

match and classify sounds that are the same
or different
discriminate between high-low, loud-soft,
long-short
play one or two repeated tones while singing

sing with others
maintain a tonal center
imitate melodies
improvise vocally and instrumentally
have large ranges of movement capabilities
respond to music with movement
remember sequences of movement
respond to a basic beat
imitate rhythmic patterns with limited
accuracy
clap to express a rhythmic idea.

Music is more than the total combination of tones and rhythms: musical talent is more than the total of sensory perception. Osborn (1966) warns that any isolated investigation adds little to an overall understanding of a child's ability to learn unless it is related to other areas of development.

A sensitivity to pitch is equally valued in a violinist when tuning the instrument, and a Naval specialist when using highly sophisticated radar. Highly developed rhythmic coordination is as necessary to being successful as a musician, as a telegraph operator, ballet dancer and typist (Lehman, 1961). Thus, it is the combination of characteristics in certain ways which provides the clues to predicting successful behaviors in various fields.

A particular observed behavior in music may be considered to be a function of the way in which an individual's cognitive, perceptual and motor processes operate. It may also have attributes which may be considered to be aspects of one's personality, such as motivators and inhibitors, and the way in which an individual regards him/herself.

Rhythm in music gives order and structure. It also provides security. Clark and Chadwick (1979) noted that handicapped children often respond at a higher level in a musical setting than in other settings. Part of the reason for this may be the degree of emotional expression that is facilitated. Once the freedom and satisfaction of creative expression is satisfied, the client is often more ready and able to learn. A child's rhythmic perception depends on an ability to focus on a dominating rhythmic unit or grouping. Zimmerman (1971) relates that a real difficulty is encountered by researchers in conceptual development. This is the differentiation between the existence of the concept and the possessions of vocabulary with which to express this concept. Thus, when assessing rhythmic skills one must be wary of the language involved in eliciting a response from young children who are still developing their vocabularies.

The use of music and musical activities can be generalized to many areas. A child can improve body concept through singing. A "normal" child experiences the crossing of an imaginary midline through crawling, jumping and

reaching, etc. This is important for the later development of academic skills - reading, writing and mathematics - as well as daily living skills - dressing, eating and cooking etc. Music can assist in the development of these skills by activities such as swaying, tracking scarves and bubbles, and reading music. Andress et al (1973) agree that an intimate relationship exists between movement and sound. To the young child there is not a clear differentiation between the senses. They overlap one another. Because of this, senses work in concert. High movements are related to high pitches. The concepts of loud, high and fast are indistinguishable. Children are surrounded by a variety of pitches and rhythms. These sounds give shape and order to their worlds. This rich environment provides the foundation for language development, shaping the pattern of vocabulary growth.

Music experiences are natural ways of facilitating intellectual and language development. Movement combined with rhythm, and words with rhyme, in a playful atmosphere, makes growth possible without undue pressures. Children are extremely creative in their methods of self expression as they evolve personality and social character. Music can capitalize on this natural propensity toward self assertion.

2.10 Measurement of Musical Aptitude

Aptitude tests are measures of achievement. However, they are aimed at testing informal learning and potentiality

rather than formal training. Most of the music aptitude tests are aimed at school learning. They try to measure how well certain musical abilities have been taught. Table 1 lists some of the more well known tests as well as the grades or ages for which they are appropriate.

Table 1. Musical Aptitude Tests

Seashore Measures of Musical Talent	grd 5-8
Kwalwasser-Dykema Musical Test	grd 4-6
Wing Standardized Test of Musical Intelligence	age 8-adult
Conrad Instrument Talent Test	age 6-adult
Tibson-Gretch Musical Ability	grd 4-12
Gatson Test of Musical Ability	grd 4-12
Drake Musical Aptitude Test	age 8-adult
Bentley Measures of Musical Ability	age 7-12
Gordon Musical Aptitude Profile	high school

In essence, these tests look at various aspects of musical talent such as pitch discrimination, sense of time, sense of rhythm and other areas of musicality. The first tests were designed in the early 1930s with the aim of predicting who would most benefit from music lessons. However, researchers have changed their emphasis when designing aptitude tests. It seems unfair to children who would like to study music to be excluded from programs because they do not appear to have the inborn talent. Now

the move is toward testing to see which children will benefit the most from music lessons by virtue of their desire and commitment rather than solely on inherited ability. The identification of developmental stages provides a framework within which to plan musical experiences that will build upon a child's conceptual abilities and therefore will provide a match between curriculum and the level of potential of the child (Zimmerman, 1971).

2.11 Summary

As a child's Central Nervous System matures, all areas for the child's development follows a defined pattern of sequential development. The differences between a "normal" child and a handicapped child is in the rate of skill acquisition, level of performance and quality of performance. It is important to ensure that sensory input on all senses takes place while the child grows, so that as the CNS matures, all this input can be integrated for the maximum benefit of the child. Most other health care professions have effective standardized assessment scales to evaluate a child's development. These assessment scales are not only necessary for the profession itself but are mandated by law. Music Therapy is still in the process of standardizing measures of the way in which a child develops musical concepts and skills. A good standardized measure will be reliable, valid and suitable for all children regardless of whether the child is "normal" or handicapped.

The scales should also not be limited by a particular disability. Rhythm skills are generalized to other areas in the child's repertoire of behaviors. The investigation of the pattern of rhythmic development in the infant and young child is the first step on the road to the establishment of norms of development in all areas of music.

3. METHOD

3.1 Sample and Setting

Normal non-handicapped children were used in this pilot study. Four discreet ages were targeted: one year, two year, three years and four years. There were to be 15 children in each age group. The children were randomly drawn from nursery schools and day care centers in Stockton, California. Random sampling is a method of drawing a portion of the population so that each member in the sample has an equal chance of being drawn. In this way the sample represents a larger population as much as possible. The sample is unbiased. In this study a table of random numbers was used to select the participants off the registration rosters of the various schools (Kerlinger 1973).

Originally 27 schools were contacted with a letter of introduction about the proposed topic. See Appendix 6 for a sample letter. Of that original number, 11 schools were included in the final sample. Those schools that were not used either did not respond to the researchers follow up phone calls (9) or refused permission for participation (7). Among the reasons given for refusal were no children at the school at this time (1), an overload of university students already (1), and an unwillingness to have the researcher work with the children on an individual basis because of the fear of child abuse accusations (5). In order to maintain a

random sample, an attempt was made to select a maximum of 2 children of similar age from any one school. However, this was not always possible, especially in the younger ages where more children were needed from fewer available sources. Table 2 shows a breakdown of the children according to age, sex and site.

Table 2. Sample and Setting

<u>School</u>	<u>1 Year</u>		<u>2 Year</u>		<u>3 Year</u>		<u>4 Year</u>	
	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>
Busy Day	0	0	0	0	1	1	1	1
A Child's Smile	0	0	0	0	2	1	2	1
Jack and Jill	0	1	0	1	1	2	1	1
Do Re Mi	0	0	0	0	0	0	2	1
Lincoln Little Learners	0	0	0	0	1	1	0	0
Lincoln Presbyterian	0	0	0	0	0	1	1	1
New World Montessori	0	0	1	2	1	0	1	1
Tots R Us	0	0	0	0	2	1	1	0
Delta Day Care	3	2	0	1	0	0	0	0
Kindercare (Hammer Lane)	2	3	3	2	0	0	0	0
Kindercare (Tam O'Shanter)	3	1	2	3	0	0	0	0
<u>Total</u>	<u>8</u>	<u>7</u>	<u>6</u>	<u>9</u>	<u>8</u>	<u>7</u>	<u>9</u>	<u>6</u>
<u>Grand Total</u>	<u>15</u>		<u>15</u>		<u>15</u>		<u>15.</u>	

The original sample had 60 children. Of these 11 parents withheld permission for their child's inclusion in the project. No reason was given for this refusal.

The tests were carried out on the school premises with the exception of three children from Jack and Jill school who were tested in their homes. In all cases except one, a room was set aside for the completion of this project. This was a room with a minimum of decorations of the walls and floors, and the request was made that no one enter the room while the test was in progress. In the case of the exception, the director of A Child's Smile insisted that the researcher work in the classroom, but in this case an area was set apart from the rest of the children and a divider was erected to ensure this separation. In most cases the rooms had one way mirrors or windows so that the staff could observe and thus protect themselves from any liability.

3.2 Aim of the Study

The aim was to set up parameters for the expectation of certain rhythmic skills at certain age levels. It must be borne in mind that this pilot study was the means to an end and not an end in itself. It was the beginning of the identification of milestones in music.

3.3 Scope and Parameters

The scope of this study was a pilot project leading to the establishment of the developmental sequence of rhythmic tasks. The scope did not extend to comparison with standardized scales, nor did it lend itself to statistical evaluation. However, inherent in any worthwhile project is

reliability. Inter-rater reliability was ensured by having at least 1 independent observer look at one child while that child performed the tasks. Allen and Goetz (1982) say that in order for behavioral observations to have any standing, the characterizations must be both consistent and valid. Inter-observer reliability provides an estimation of the extent to which differences in the data collected are attributable to differences in behavior and not variations in scoring criteria. It measures the adequacy of the observational system, calculated as a percent. A reliability of more than 85% was deemed adequate. Reliability was calculated as the difference between the total scores and the scores in error divided by the total number of scores. Of the total number, twelve children were observed by two reliability witnesses.

3.4 Videotaping

Gesell (1948) identified the motion picture camera as the ideal instrument for the investigation of behavior patterns. Because it captures the behavior in the totality, it sees the whole field with equally distributed vision. It remembers infallibly. Today we have sophisticated video equipment. The children in this study were video-taped for the intense study of the behavior as well as the assurance of inter-rater reliability, referred to above. Each child was taped individually for about 30 minutes while the child had the opportunity to respond to various musical stimuli.

In the younger ages especially, it was unusual for the child to be participating for that length of time. Usually the child did not attend for more than fifteen minutes. However, it was preferable to overestimate the time than to underestimate it.

3.5 Expectations

All children were to be tested for all behaviors. There are basic trends in all developmental processes (Maier, 1969). Development proceeds from organic to volitional; from simple to complex; from the concrete to the abstract. Therefore it was expected that the youngest children would perform the easiest tasks and the older ones the more complex. Yet, it is undesirable to have a preconceived order of behaviors. So it was assumed that the behaviors that occurred in the younger children were the easiest and developed first. The behaviors that occurred the fewest times were the most complex and developed later.

3.6 Behaviors Targeted for Testing

The following list of behaviors was in some logical order loosely based on those presented in a paper by Dr Roy Grant at the National Association of Music Therapy Conference, Chicago, November, 1986. The final analysis of data would provide an order that is more developmentally accurate. To reiterate, the aim of this research was the

determination of rhythm development in young children. The establishment of the developmental sequence of rhythmic tasks would be based on the performance of children aged one to four years.

PLAYING THE DRUM

1. Playing randomly and indiscriminately

The drum is placed in front of the child on the floor. After a verbal and visual prompt the child begins to beat on the drum with hands or mallets in an irregular manner.

2. Continuously but not rhythmically

The drum is placed in front of the child on the floor. After a verbal and visual prompt the child begins playing with hands or mallets without stopping to look around or investigate the instrument.

3. Continuously and rhythmically

The drum is placed in front of the child on the floor. After a verbal and visual prompt the child begins to play with a regular beat on the drum with hands or mallets.

4. Synchronized to a musical stimulus

The child responds to the verbal and visual prompt by playing in time to the singing of the examiner. The song is "Ritsa Titsa" (See before the scoring sheet for the music).

5. Uses one hand only

The child plays the drum with only one hand, either the left or the right.

6. Plays bilaterally and parallel

The child uses both hands or mallets and plays at the same time in unison.

7. Plays bilaterally and alternately

The child uses hands or mallets and plays with both hands alternating on the drum.

8. Uses mallets

The child grasps the handles of the mallets when presented and strikes the heads on the drum.

9. Synchronized with the metronome

The metronome is set at 100. The child responds to a verbal and visual prompt by synchronizing the beating on the drum with the movement of the metronome.

CLAPPING HANDS

1. Randomly and indiscriminately

The child hears the music "Good Morning" (see before the scoring sheet for the music). After a verbal and visual prompt the child will clap to the music in a non-specific way.

2. Continuously but not rhythmically

The child hears the music "Good Morning". The child begins clapping and continues until the examiner stops the music.

3. Synchronized with the music

The child hears the music "Good Morning". After a verbal and visual prompt the child will clap in time to the beat of the music.

4. Differentiates between music and silence

The child hears the music "Pause" (see before the scoring sheet for the music). After a verbal and visual prompt the child claps when there is music on the tape and stops clapping when the music pauses.

5. Claps the rhythm of familiar words and songs

After a verbal and visual prompt the child will clap while saying 'mommy', 'daddy', 'own name', and 'Mary had a Little Lamb'. The clapping is synchronized with the syllables of the words.

PLAYING THE MARACAS

1. Strikes the instrument

The child is presented with the maracas. After a verbal and visual prompt the child grasps the maracas and strikes it on the floor, carpet or drum.

2. Plays randomly and indiscriminately

The child is presented with the maracas. After a verbal and visual prompt the child grasps a maraca in either hand and shakes it in an indiscriminate manner.

3. Uses two hands

The child is presented with the maracas. The child grasps an instrument in each hand and plays both simultaneously.

4. Synchronized with the music

The child is presented with the maracas and hears the music "Sing a Happy Song" (see before the scoring sheet for the music). After a verbal and visual prompt the child plays the instrument in time to the beat of the music.

PLAYING THE CLAVES

1. Strikes the instrument

The child is presented with the claves. After a verbal and visual prompt the child grasps the claves and strikes them on the floor, carpet or drum.

2. Plays randomly and indiscriminately

The child is presented with the claves. After a verbal and visual prompt the child grasps the claves and plays them in an irregular manner.

3. Plays continuously but not rhythmically

The child is presented with the claves. After a verbal and visual prompt when the child hears the music "Friends" (see before the scoring sheet for the music) the child plays until the examiner stops the music.

4. Synchronized with the music

The child is presented with the claves. After a verbal and visual prompt the child plays the claves in time to the singing of the examiner of "Play the Claves" (see before the scoring sheet for the music).

GROSS MOTOR

1. Walks to the beat of a march

The examiner plays four quarter notes repeated of the drum. After a verbal and visual prompt the child walks so that the steps match the rhythm of the drum beat.

2. Skips to a dotted rhythm

The examiner plays a dotted quarter note followed by an eighth note repeated on the drum. After a verbal and visual prompt the child will skip or gallop so that the steps match the rhythm of the drum.

3. Differentiates between long and short beats

The examiner plays half notes, quarter notes and eighth notes on the drum. After a verbal prompt the child walks with longer slower steps for the longer notes and shorter quicker steps for the shorter notes.

4. Differentiates between a march and a waltz

The examiner plays "Friendship March" and "Goodbye" (see before the scoring sheet for the music). After a verbal prompt the child marches to the former and moves more lyrically to the latter.

IMITATION

The examiner plays the following rhythms on the drum and asks the child to copy what the examiner is doing:

1. Rhythm Pattern 1.

Four quarter notes in a steady beat.



2. Rhythm Pattern 2.

One quarter note and two eighth notes repeated in a steady beat.



3. Rhythm Pattern 3.

One quarter note, two eighth notes and a half note repeated.



4. Rhythm Pattern 4.

Two bars with different patterns repeated. The first bar has one quarter note, two eighth

notes and a half note. The second bar has a dotted quarter note, an eighth note and two quarter notes.



MUSIC USED

The music from records was taped and played as the external musical stimulus. The two songs with music below were sung by the examiner as the stimulus.

"Good Morning" from We all Live Together, Vol 2 by Greg and Steve. Youngheart Records.

"Pause" from Movin' by Hap Palmer. Education Plan Co. AC 546

"Sing a Happy Song" from We all Live Together, Vol 3 by Greg and Steve. Youngheart Records.

"Friends" from We all Live Together, Vol 3 by Greg and Steve. Youngheart Records.

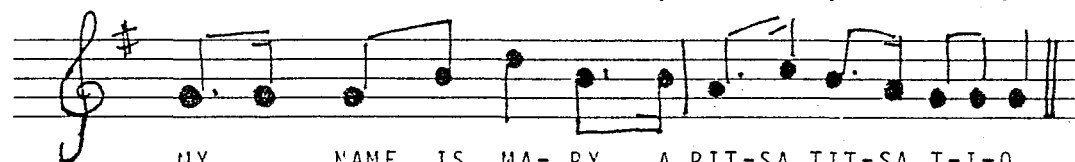
"Friendship March" from We all Live Together, Vol 1 by Greg and Steve. Youngheart Records.

"Goodbye" from We all Live Together, Vol 1 by Greg and Steve. Youngheart Records.

"Ritsa Titsa"

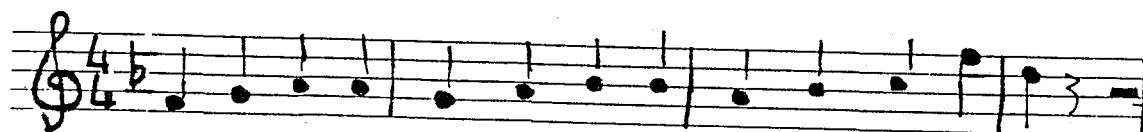


MY NAME IS MA- RY, MA- RY, MA-RY,
I CAN PLAY THE BIG DRUM, BIG DRUM, BIG DRUM,

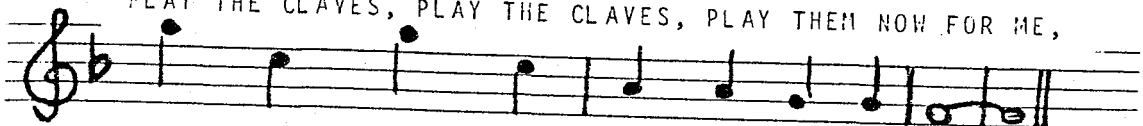


MY NAME IS MA- RY A RIT-SA TIT-SA T-I-O
I CAN PLAY THE BIG DRUM A RIT-SA TIT-SA T-I-O

"Play the Claves"



PLAY THE CLAVES, PLAY THE CLAVES, PLAY THEM NOW FOR ME,



KNOCK, KNOCK. KNOCK, KNOCK, PLAY THEM NOW FOR ME.

SCORING

The behaviors are scored in the following manner:

P - If the child passes the test fulfilling the requirements

F - If the child fails the test unable to complete the task

R - If the child refuses to complete the task or test

O - If the task is omitted for any reason

U - If the child's response is uncertain or tentative

Name _____ Date _____ Time _____

1. Plays the drum randomly and indiscriminately
2. Plays the drum continuously but not rhythmically
3. Plays the drum continuously and rhythmically
4. Plays the drum synchronized with a musical stimulus
5. Plays the drum with one hand
6. Plays the drum bilaterally and parallel
7. Plays the drum bilaterally and alternating hands
8. Plays the drum with one or two mallets
9. Plays the drum synchronized to the metronome
10. Claps hands randomly and indiscriminately
11. Claps hands continuously but not rhythmically
12. Claps hands synchronized with a musical stimulus
13. Claps when music is heard and stops when it stops
14. Claps the rhythms of familiar words and phrases

15. Strikes the maracas on the floor, carpet or drum
16. Shakes maraca with one hand indiscriminately
17. Shakes the maracas with two hands
18. Shakes maracas synchronized with musical stimulus
19. Strikes claves on the floor, carpet or drum
20. Plays claves randomly and indiscriminately
21. Plays claves continuously but not rhythmically
22. Plays claves synchronized with musical stimulus
23. Walks to the beat of a march
24. Skips or gallops to a dotted rhythm
25. Differentiates between long and short notes
26. Differentiates between march and waltz
27. Imitates rhythm pattern 1
28. Imitates rhythm pattern 2
29. Imitates rhythm pattern 3
30. Imitates rhythm pattern 4

4. RESULTS AND DISCUSSION

The results are presented below in table form. The behavior numbers refer to the list in the scoring sheet. The numbers in each column are numbers of children. Tables 3 through 6 show the results of ages one through four. Table 7 demonstrates a summary of the number of children who passed each item and their ages. Table 8 demonstrates the percentage of children who passed each item in each age group.

Table 3. One Year Age Group

Behavior	Pass	Fail	Refuse	Omit	Uncertain
1.	10	1			1
2.		12			
3.	1	11			
4.	1	11			
5.	11	1			
6.	2	7			3
7.	1	11			
8.	10	1			1
9.	2	6		3	1
10.	4	2		5	1
11.		6	1	5	
12.		6	1	5	
13.		6		6	
14.		3		9	
15.	3	8	1		
16.	9	2	1		
17.	7	3	1		1
18.		11	1		
19.	7	3	2		
20.	8	1	3		
21.	2	7	3		
22.		9	3		
23.		4		8	
24.				12	
25.				12	
26.				12	
27.		2		10	
28.		1		11	
29.		1		11	
30.		1		11	

Table 4. Two Year Age Group

<u>Behavior</u>	<u>Pass</u>	<u>Fail</u>	<u>Refuse</u>	<u>Omit</u>	<u>Uncertain</u>
1.	5	1	5		
2.	1	5	5		
3.		6	5		
4.		5	6		
5.	5	1	5		
6.	4	2	5		
7.	1	4	5		1
8.	6		5		
9.		5	5	1	
10.	2	1	5	2	1
11.	3	1	5	2	
12.		3	6	2	
13.		2	6	2	1
14.		2	6	3	
15.	3	1	7		
16.	4		6		1
17.	3	1	7		
18.		4	7		
19.	2	2	7		
20.	3	1	7		
21.	2	2	6	1	
22.		4	7		
23.		1	6	4	
24.		1	4	4	
25.		1	4	6	
26.		1	4	6	
27.	1	2	5	3	
28.		3	5	3	
29.		1	5	5	
30.		1	5	5	

Table 5. Three Year Age Group

<u>Behavior</u>	<u>Pass</u>	<u>Fail</u>	<u>Refuse</u>	<u>Omit</u>	<u>Uncertain</u>
1.	5	4	3		
2.	5	4	3		
3.	3	5	4		
4.	3	5	4		
5.	6	2	3		1
6.	6	2	4		
7.	4	4	4		
8.	7	1	3		1
9.		7	3	1	1
10.	1	6	4	1	
11.	6	1	3	1	1
12.		8	3	1	
13.	5	2	3	2	
14.	1	2	5	4	
15.		8	1	1	2
16.	10	1	1		
17.	7	4	1		
18.	2	7	2		1
19.	2	7	2		1
20.	4	6	2		
21.	7	2	2		1
22.	3	6	3		
23.	1	3	3	4	1
24.		4	2	5	1
25.		2	2	8	
26.		1	2	9	
27.	5	2	3	1	1
28.		8	2	2	
29.		8	2	2	
30.		3	2	7	

Table 6. Four Year Age Group

<u>Behavior</u>	<u>Pass</u>	<u>Fail</u>	<u>Refuse</u>	<u>Omit</u>	<u>Uncertain</u>
1.		11	1		
2.	5	6	1		
3.	8	3	1		
4.	6	5	1		
5.	8	3	1		
6.	8	3	1		
7.	9	2	1		
8.	11		1		
9.	3	6	1		2
10.		10	2		
11.	10		2		
12.	8	1	2		1
13.	10		2		
14.	8	1	2		1
15.	2	9	1		
16.	9	2	1		
17.	7	4	1		
18.	6	4	1		1
19.	2	9	1		
20.	2	9	1		
21.	10		1		1
22.	6	5	1		
23.	3	4	1	3	1
24.	1	8	1	1	1
25.		4	1	7	
26.		2	1	7	2
27.	10	1	1		
28.	9	2	1		
29.	3	4	1	2	2
30.		6	1	3	2

Table 7. Number of Passes in Each Age Group

<u>Behavior</u>	<u>1 Year</u>	<u>2 Year</u>	<u>3 Year</u>	<u>4 Year</u>
Plays drum randomly	10	5	5	0
Plays drum continuously	0	1	5	5
Plays drum rhythmically	1	0	3	8
Plays drum synchronized	1	0	3	6
Uses one hand	11	5	6	8
Uses two hands parallel	2	4	6	8
Alternates two hands	1	1	4	9
Uses mallets	10	6	7	11
Synchronized - metronome	2	0	0	3
Claps randomly	4	2	1	0
Claps continuously	0	3	6	10
Claps synchronized	0	0	0	8
Music vs Silence	0	0	5	10
Claps with speech	0	0	1	8
Strikes maracas	3	3	0	2
Maracas - 1 hand	9	4	10	9
Maracas - 2 hands	7	3	7	7
Maracas - synchronized	0	0	2	6
Strikes claves	7	2	2	2
Claves - randomly	8	3	4	2
Claves - continuously	2	2	7	10
Claves - synchronized	0	0	3	6
Walks to march	0	0	1	3
Skips to dotted notes	0	0	0	1
Long vs short notes	0	0	0	0
Waltz vs March	0	0	0	0
Imitates rhythm 1	0	1	5	10
Imitates rhythm 2	0	0	0	9
Imitates rhythm 3	0	0	0	3
Imitates rhythm 4	0	0	0	0

Table 8. Percentage of Passes in Each Age Group

Behavior	1 Year	2 Years	3 Years	4 Years
Plays drum randomly	83%	44%	41%	0%
Plays drum continuously	0%	8%	41%	41%
Plays drum rhythmically	8%	0%	25%	67%
Plays drum synchronized	8%	0%	25%	50%
Uses one hand	91%	44%	50%	67%
Uses two hands parallel	17%	33%	50%	67%
Alternates two hands	8%	8%	33%	76%
Uses mallets	83%	56%	60%	91%
Synchronized-metronome	17%	0%	0%	25%
Claps randomly	33%	17%	8%	0%
Claps continuously	0%	28%	50%	83%
Claps synchronized	0%	0%	0%	60%
Music vs silence	0%	0%	41%	83%
Claps with speech	0%	0%	8%	67%
Strikes maracas	25%	28%	0%	17%
Maracas - 1 hand	76%	33%	83%	76%
Maracas - 2 hands	60%	28%	60%	57%
Maracas - synchronized	0%	0%	17%	50%
Strikes claves	60%	17%	17%	17%
Claves - randomly	66%	28%	33%	17%
Claves - continuously	16%	33%	60%	83%
Claves - synchronized	0%	0%	25%	50%
Walks to march	0%	0%	8%	25%
Skips to dotted notes	0%	0%	0%	8%
Long vs short notes	0%	0%	0%	0%
Waltz vs March	0%	0%	0%	0%
Imitates pattern 1	0%	8%	41%	83%
Imitates pattern 2	0%	0%	0%	76%
Imitates pattern 3	0%	0%	0%	25%
Imitates pattern 4	0%	0%	0%	0%

4.2 Reliability

Two independent observers viewed a sample of the children. The selection of examples which they saw was varied according to age, school of origin and sex. Of the final sample of 48 children used in the study they examined a random selection of twelve children - six each. The lowest score for reliability was 0.73 and the highest was 1.00. The average reliability calculated overall was 0.89. This is above the set figure of 0.85 originally determined. This means that the test was 89% reliable for testing rhythm skills in the children.

4.3 Discussion

From the preceding tables, certain trends seem to be evident. Although the numbers of children are small, certain assumptions can be made. It would appear that those behaviors that most children of a particular age achieved, could be expected in other children of a similar age.

Before analysing each age group it is appropriate to discuss these trends. They are best demonstrated in Table 8. If one looks at this table it becomes evident that as the more basic behaviors decrease in percentage occurrence across the ages, more complex behaviors increase in percentage. Thus, 83% of the one year olds played the drums randomly and indiscriminately, and this decreased to 0% in the four year olds. However, the abilities to play continuously, then continuously and rhythmically, and then synchronized to an

external beat all increased from between 0% and 8% in one year olds to between 41% and 67% in four year olds.

Similarly, 91% of one year olds played the drums with one hand compared to 67% of the four year olds. Yet, 76% of the four year olds played with two hands alternating, compared to 33% of the three year olds, 8% of the two year olds and 8% of the one year olds.

Clapping shows the same trends. The ability to clap randomly decreased from 33% to 0% while the ability to clap to an external source increased from 0% to 67%, from age one to age four. Striking the maracas or the claves on the floor was more prevalent in the one year olds, and this diminished as continuous, synchronized playing emerged.

The next discussion concerns an analysis of the behaviors within each age group.

Children around the age of one year played randomly and indiscriminately. They struck the instruments on the floor or carpet before playing them as demonstrated by the therapist. They preferred to use one hand but when using two hands their arms moved in a parallel motion. Because they were only beginning to walk, they were unable to perform the gross motor section of the test. Their receptive language skills were not sufficient to understand the request to imitate the examiner. A reference to Appendix 1 will highlight that usually only by eighteen months are children beginning to understand simple commands.

Other observations were made during the examination of the tapes. The children at this age had difficulty in holding the mallets correctly. They usually had an ulnar grip, which develops before a radial grip. An ulnar grip means that they present the side of the hand with the fifth finger first, rather than the side of the hand with the thumb - the radial grip. This is a more immature grip and develops first. This results in their inability to coordinate between the head of the mallets and the head of the drum. In some instances the instruments were too heavy for the children. These children are still exploring their worlds through oral manipulation and so often the instruments were placed in the mouth. In most cases, the mallets needed to be shorter and the handles needed to be built up to facilitate grasping them. The children often moved spontaneously when the tape recorder was played. A number of them (8) were also intrigued by the tape recorder and the metronome. These children are just beginning to learn the relationship between cause and effect and were easily distracted by both pieces of equipment.

The children aged two years were extremely difficult to assess. They seemed to be afraid of the examiner, the instruments and the different environment. More (5) children in this age group refused to participate than in any other age group. As a result the final data are rather inconclusive. One might suggest that these children play continuously but not rhythmically in some instances. They are equally comfortable using one hand or two hands but

parallel movement is still preferred over alternating hands. They cannot yet easily match their performance to an external source. A few of these children were fascinated by the metronome and tape recorder, as were the one year olds. Most of the children seemed to have the necessary skills to complete both the gross motor and imitation sections of the test but they were unwilling to make the attempt. Most of the children cried causing the examiner to omit tasks or even terminate the test. Although this is unfortunate, it is an important finding for further planning of research. Future examiners would need to plan to become familiar with children of this age before carrying out any assessment. A reference to Appendix 1 will corroborate that at this age, children are rigid and ritualistic (Ames et al, 1979). It is at this age that children are well aware of who is familiar and who is a stranger. They do not accommodate well to transitions and changes in routine.

Some (3) of the three year old children still displayed elements of fear of the unknown and refused to comply with the tasks. However, these children have superior language skills and could, in most instances, be convinced to try the tasks. The examiner used candy, with the permission of the staff, to overcome the initial nervousness of the children. Three year olds are beginning to play with alternating hand movements. This demonstrates the move from generalized mass patterns of development to more sophisticated specialized movements. Some (3) of the children could match the external

musical source for short periods of time. Not only could they discriminate between music and silence but they enjoyed the game of trying to anticipate when the music would start again. Many (5) of the children could imitate the examiner playing rhythm pattern 1 with four quarter notes, but could not do so when the complexity was increased. They seemed unable to accomplish the gross motor section successfully. There are two possible explanations for this. Some (3) of the children did not understand the directions, even after the examiner demonstrated what was required. Also, as has been previously stated, the children are more likely to match their movements to fast tempi. It is possible that the tempo of the musical stimuli was too slow and the children did not have the motor control to match the beat. Appendix 1 supports how children at this age assert their own authority (Ames et al, 1979). This was evident in a number of the children who wanted to direct the tasks and take control over which instruments were played at what times. The increase in verbal ability is evident with a few children talking to the examiner while the test was in progress about irrelevant matters. Many of the children were extremely curious about the various instruments, investigating to discover where the sound came from and how the machines worked.

The four year olds demonstrated their advanced language skills as well as the personal and social skills tabulated in Appendix 1. They were enthusiastic about the test,

willing to participate and had a positive attitude. They displayed motor skills that were more advanced than the other groups. These children could play rhythmically and match their performance to an external musical source for longer periods of time. They preferred to use both hands and the hands moved parallel or alternating depending on the desire of the child. They could understand the directions for some of the gross motor components of the test. They still had difficulty with the concepts same and different and thus tasks 25 and 26 could not be successfully accomplished. They could easily imitate rhythm patterns one and two, and some (3) even managed rhythm pattern three. Many (8) of the children verbally expressed their enjoyment of the activities and their disappointment when the test was completed and they had to return to the rest of the group.

In reviewing the data the behaviors can be re-listed in the following order, based on at least half the children passing:

One year olds

play the drum with one hand	91%
play the drum randomly and indiscriminately	83%
play the drum with mallet/s	83%
shake the maraca with one hand	76%
play the claves randomly and indiscriminately	67%
shake the maracas with two hands	60%
strike the claves on the floor	60%

Two year olds

play the drum using mallet/s	55%
------------------------------	-----

Three year olds

shake the maraca with one hand	83%
--------------------------------	-----

play the drum with mallet/s	60%
-----------------------------	-----

shake the maracas with two hands	60%
----------------------------------	-----

play the claves continuously, not rhythmically	60%
--	-----

play the drum with one hand	50%
-----------------------------	-----

play the drum with two hands parallel	50%
---------------------------------------	-----

clap hands continuously but not rhythmically	50%
--	-----

Four year olds

play the drum with mallet/s	91%
-----------------------------	-----

clap continuously	83%
-------------------	-----

differentiate between music and silence	83%
---	-----

play the claves continuously and rhythmically	83%
---	-----

imitate a steady beat of quarter notes	83%
--	-----

play the drum with two hands alternately	76%
--	-----

shake the maracas with one hand	76%
---------------------------------	-----

imitate a steady beat of quarter and eighth notes	76%
--	-----

play the drum continuously and rhythmically	67%
---	-----

play the drum with one hand	67%
-----------------------------	-----

play the drum with two hands parallel	67%
---------------------------------------	-----

clap synchronized to an external music source	67%
---	-----

clap synchronized to their own speech	67%
---------------------------------------	-----

shake the maracas with two hands	57%
----------------------------------	-----

5. CONCLUSION

Clinicians are becoming increasingly cognizant of the necessity of good standardized assessment forms. This is validated in the literature (Goodwin & Driscoll, 1980, Hurlock, 1972). It is also mandated in Federal Law (PL 94-142, Title 20). Music therapists working with young children are in the process of developing the necessary tools (Rider, 1981, Zimmerman, 1972, Michel & Rohrbacher, 1986). When working with young children it is imperative for the therapist to know the sequence of behaviors that evolve as children's nervous systems mature (Ames, et al, 1979, Gesell, 1948). All children pass through a predictable pattern of growth. This pattern was the focus of this pilot study. Sixty children aged one to four were observed for their rhythmic abilities. Thirty behaviors were targeted for investigation. Certain trends were observed. Children play randomly before they can play rhythmically. They use two hands in a parallel fashion before they can alternate hands. Children tap their knees and bang their instruments before the clap or play as demonstrated. Visual prompts are preferable to verbal instructions. Gross motor tasks cannot be evaluated until the child is walking. Tasks requiring imitation are not feasible until the child has the prerequisite language skills.

5.2 Recommendations

At the outset it was stated that one of the purposes of this undertaking was to expose the successes and flaws of the project in order to help future researchers. Some valuable lessons were learned. One of these was that time is needed to become acquainted with children, especially the two year olds. This familiarity will enable the researcher to carry out the test without having to make allowances for the fears of the child. Secondly, one must be extremely careful when giving instructions that they are short and as explicit as possible. It is better to demonstrate what is required whenever the test allows.

Perhaps the researcher should meet with the parents when securing permission to work with the children. This might help overcome their unwillingness to include their children in such a study. It should be noted that the letter of introduction (Appendix 6) served to facilitate the acceptance of the project on the part of the schools because they already knew what the researcher was talking about on the telephone. The children should also be given time to become familiar with the novel equipment so they are not as distracted by the machines.

There are two paths that can now be taken, using this study as a foundation. The first is to break down the ages into even smaller increments. In the first four years of life children develop so quickly, that to have stages only

year by year is insufficient. The second is to continue the investigation in other areas of music to make a comprehensive test.

APPENDIX 1
TABLE OF DEVELOPMENT

The following table is based on the ages and stages defined by the Gesell Institute as discussed by Ames et al (1979) and Gesell et al (1974). Additional information was supplied by the researchers own notes

	ONE YEAR OLD	EIGHTEEN MONTH OLD
WHOLE BODY	Creeping a favorite activity Can stand alone Cruises May walk with 1 hand held	Walks, runs, manages stairs, Pushes and pulls toys Seats self in chair Attempts to kick a ball
ADAPTIVE BEHAVIOR	Advances in manipula- tive play Tries to pile bricks Puts pellets into jars Picks up small objects	Hands used effectively Towers 3 blocks Piles round, triangular and square blocks Turns pages of a book Scribbles spontaneously Imitates strokes
LANGUAGE AND SOCIAL ACTIVITY	Enjoys hugging, talking laughing Plays games Enjoys rhymes Loves to chase things Throws things Gives toys on request Cooperates with dressing	Has as many as 10 words Can follow 2 directions Names 3 familiar objects Responds best to sparse language Best word is NO Comprehension exceeds expression Obeys simple commands
PERSONAL / SOCIAL	Extremely varied Looks, touches, grasps, handles, manipulates Moves in space Vocalizes Socializes Responsive to others	Claims own possession Content in self absorbed play Resistant to change Strong demands coupled with inability to express them May attempt self feeding

	<u>TWO - 2½ YEARS</u>	<u>THREE - 3½ YEARS</u>
WHOLE BODY	Walks and runs well Climbs independently Kicks a ball Stiff constrained gait Walks on tiptoes Jumps with both feet Throws and catches ball 2½ can balance on 1 foot	Good Balance Alternates feet when climbing 3½ often stumbles and falls
ADAPTIVE BEHAVIOR	Skillfully turns pages Imitates strokes Manages simple puzzles Builds tower of 10 blocks Fingers increasingly in- dependents of hand and one another	Builds sturdy towers Becomes insecure about ability
LANGUAGE AND SOCIAL ACTIVITY	Vocabulary of several 100 words Uses 3 word sentences Loves to be read to Language becomes re- sponsive Conversation initially with adults - begins to talk to peers Gives information freely	More words but stutters Uses prepositions easily Longer sentences Good social language Uses I instead of me Correct grammar usage Very responsive to voice inflection Sharing evident in vocabulary
PERSONAL/ SOCIAL	Becomes increasingly rigid and ritualistic Very demanding Increasing self feeding Achieving bladder and bowel control Enjoys other children's company Sharing still difficult	Food preferences clearly stated Good dressing skills Selects own clothes Routines upset as child asserts own identity Most are toilet by now 3½ - becomes resistant to social activities

FOUR YEAR OLD

WHOLE BODY	Balances on one foot May skip Cannot hop Can catch a bean bag Rides a bicycle Enjoys experimenting
ADAPTIVE BEHAVIOR	Willing to try anything Building very complex Drawing skills improved Understands "How many" Colors, paints, cuts, glues Enjoys dressing up Loves to be read to
LANGUAGE AND SOCIAL ACTIVITY	Boasts and prevaricates Uses swear words Uses affective language Enjoys playing with language Estimated vocab over 1550 words Sentence structure correct Asks many question especially "why" Articulation no longer infantile
PERSONAL / SOCIAL	Enthusiastic, willing to try Compromises Positive attitude Uses and appreciates humor Enjoys boundaries established Very involved with other children Independent with feeding, grooming, personal hygiene.

APPENDIX 2

BAYLEY SCALES OF INFANT DEVELOPMENT

The Bayley Scales of Infant Development are copyrighted. However the Psychological Corporation permits the use of one page of each test for reproduction in a thesis. The test is designed for the assessment of early mental and psychomotor development of infants and young children up to 2 years of age. The first page describes motor develop and the second page describes mental development.

To score: Check P (Pass) or F (Fail). If "Other," mark O (Omit), R (Refused), or RPT (Reported by mother).

Item No.	Age Placement and Range (Months)	Situation	Item Title	Score			Notes
				P	F	Other	
1	0.1	A	Lifts head when held at shoulder				
2	0.1	A	Postural adjustment when held at shoulder				
3	0.1	B	Lateral head movements				
4	0.4 (.1-3)	B	Crawling movements				
5	0.8 (.3-3)	C	† Retains red ring				
6	0.8 (.3-2)	C	* Arm thrusts in play				
7	0.8 (.3-2)	C	* Leg thrusts in play				
8	0.8 (.3-3)	A	Head erect: vertical				
9	1.6 (.7-4)	A	Head erect and steady				
10	1.7 (.7-4)	C	Lifts head: dorsal suspension				
11	1.8 (.7-5)	C ¹	Turns from side to back				
12	2.1 (.7-5)	B	Elevates self by arms: prone				
13	2.3 (1-5)	D	Sits with support				
14	2.5 (1-5)	A	Holds head steady				
15	2.7 (.7-6)		* Hands predominantly open				
16	3.7 (2-7)	E	† Cube: ulnar-palmar prehension				
17	3.8 (2-6)	D	Sits with slight support				
18	4.2 (2-6)	A	Head balanced				
19	4.4 (2-7)	C ¹	* Turns from back to side				
20	4.8 (3-8)	F	Effort to sit				
21	4.9 (4-8)	E	† Cube: partial thumb opposition (radial-palmar)				
22	5.3 (4-8)	F	Pulls to sitting position				
23	5.3 (4-8)	D	Sits alone momentarily				
24	5.4 (4-8)	G	* Unilateral reaching				
25	5.6 (4-8)	H	† Attempts to secure pellet				
26	5.7 (4-8)	G	* Rotates wrist				
27	6.0 (5-8)	D	Sits alone 30 seconds or more				

To score: Check P (Pass) or F (Fail). If "Other," mark O (Omit), R (Refused), or RPT (Reported by mother).

Item No.	Age Placement and Range (Months)	Situation	Item Title	Score			Notes
				P	F	Other	
1	0.1	A	Responds to sound of bell				
2	0.1	B	Quiets when picked up				
3	0.1 (.1-3)	C	Responds to sound of rattle				
4	0.1 (.1-4)		Responds to sharp sound: click of light switch				
5	0.1 (.1-1)	D	Momentary regard of red ring				
6	0.2 (.1-1)	E	Regards person momentarily				
7	0.4 (.1-2)	D	Prolonged regard of red ring				
8	0.5 (.1-2)	D	Horizontal eye coordination: red ring				
9	0.7 (.3-3)	F	Horizontal eye coordination: light				
10	0.7 (.3-2)	E	Eyes follow moving person				
11	0.7 (.3-2)	E	Responds to voice				
12	0.8 (.3-3)	F	Vertical eye coordination: light				
13	0.9 (.5-3)	G	* Vocalizes once or twice				
14	1.0 (.5-3)	D	Vertical eye coordination: red ring				
15	1.2 (.5-3)	F	Circular eye coordination: light				
16	1.2 (.5-3)	D	Circular eye coordination: red ring				
17	1.3 (.5-3)	G ¹	* Free inspection of surroundings				
18	1.5 (.5-4)	E	Social smile: E talks and smiles				
19	1.6 (.7-4)	D	Turns eyes to red ring				
20	1.6 (.5-4)	F	Turns eyes to light				
21	1.6 (.5-5)	G	* Vocalizes at least 4 times				
22	1.7 (1-4)	B	Anticipatory excitement				
23	1.7 (.5-5)		Reacts to paper on face				
24	1.9 (1-4)		Blinks at shadow of hand				

APPENDIX 3
EARLY DEVELOPMENTAL PROFILE
MICHIGAN SCALES

The Early Developmental Profile, also known as the Michigan Scale, is a compilation of major developmental milestones for children whose skills fall in the 0 to 36 month developmental level. The profile provides a systematic means of evaluating a child's cognitive, motor, social, self care and language skills. The child's performance is plotted on a graph providing a visual representation of strengths and weaknesses.

Developmental Programming for Infants and Young Children

D. Sue Schafer and Martha S. Moersch, Editors

5 Volumes



REVISED EDITION

Early Intervention Developmental Profile

by Sally J. Rogers, Carol M. Donovan, Diane B. D'Eugenio, Sara L. Brown, Eleanor Whiteside Lynch, Martha S. Moersch, and D. Sue Schafer

Chronological Age	1	2	3	4
Evaluation Dates				

Name _____

Birthdate _____

Referring Problem(s) _____

Test by

1. _____

2. _____

3. _____

4. _____

NAME _____

Perceptual/Fine Motor

ITEM NUMBER	DEVELOPMENTAL LEVELS AND ITEMS	DATE	DATE	DATE	DATE
-------------	--------------------------------	------	------	------	------

0-2 months

*1	Responds to different light intensities				
2	Focuses momentarily on face or soft light				
3	Follows moving object horizontally and vertically				
4	Follows moving object through most of a circular path				

3-5 months

*5	Integration of grasp reflex				
6	Reaches for dangling object				
7	Moves head to track moving object				
8	Fingers own hands in play at midline				
9	Uses ulnar palmar prehension				
10	Reaches for cube and touches it				
11	Uses radial palmar prehension (uses thumb and two fingers)				
12	Transfers toy from hand to hand				

6-8 months

13	Pulls one peg out of pegboard				
14	Rakes or scoops up raisin and attains it				
15	Has complete thumb opposition on cube				
16	Uses inferior pincer grasp with raisin				

9-11 months

17	Pokes with isolated index finger				
18	Drops a block with voluntary release				
19	Uses neat pincer grasp with raisin				
20	Attempts to imitate scribble (holds crayon to paper)				
21	Holds crayon adaptively				

* = reflex, righting reaction, protective response, or equilibrium reaction

Perceptual/Fine Motor

ITEM NUMBER	DEVELOPMENTAL LEVELS AND ITEMS	DATE	DATE	DATE	DATE
-------------	--------------------------------	------	------	------	------

12-15 months

22	Turns page of cardboard book				
23	Removes cover from small square box				
24	Places one or two pegs in pegboard				
25	Builds two-cube tower				
26	Scribbles spontaneously (no demonstration)				
27	Releases raisin into small bottle				

16-19 months

28	Places six pegs in pegboard without help				
29	Builds three-cube tower				
30	Places round form in formboard (three forms presented)				
31	Imitates crayon stroke				

20-23 months

32	Places six pegs in pegboard in 34 seconds				
33	Makes vertical and circular scribble after demonstration				
34	Completes three-piece formboard				
35	Builds six-cube tower				
36	Holds crayon with fingers				
37	Attempts to fold paper imitatively				

24-27 months

38	Draws vertical and horizontal strokes imitatively				
39	Completes reversed formboard				
40	Aligns two or more cubes for train, no smokestack				
41	Unscrews jar lid				
42	Scribbles with circular motion				

Perceptual/Fine Motor

ITEM NUMBER	<i>DEVELOPMENTAL LEVELS AND ITEMS</i>	DATE	DATE	DATE	DATE
----------------	---------------------------------------	------	------	------	------

28-31 months

43	Builds eight-cube tower				
44	Aligns three cubes for train with smokestack				
45	Imitates paper folding				

32-35 months

46	Copies a circle already drawn				
47	Cuts with scissors				
48	Strings five 1/2-inch beads				

NAME _____

Cognition

ITEM NUMBER	DEVELOPMENTAL LEVELS AND ITEMS	DATE	DATE	DATE	DATE
-------------	--------------------------------	------	------	------	------

0-2 months

49	Uses adaptive movements rather than reflexive reactions				
50	Brings hand to mouth				
51	Repeats random movements				

3-5 months

52	Mouths object				
53	Shakes rattle				
54	Looks at object s/he is holding				
55	Tracks rolling ball momentarily screened				

6-8 months

56	Attains partially hidden object				
57	Looks to the floor when something falls				
58	Uncovers face				
59	Bangs object				
60	Rotates a bottle inverted less than 180° to drink				
61	Imitates hand movements already in his/her repertoire				

9-11 months

62	Attains completely hidden object				
63	Pulls string to secure ring and succeeds				
64	Shows knowledge of toy hidden behind a screen				
65	Imitates facial movements inexactly				
66	Imperfectly imitates movements never performed before				
67	Rotates a bottle inverted 180° to drink				
68	Reacts to novel features of an object				

ITEM NUMBER	DEVELOPMENTAL LEVELS AND ITEMS	DATE	DATE	DATE	DATE
-------------	--------------------------------	------	------	------	------

12-15 months

69	Imitates body action on a doll				
70	Repeatedly finds toy when hidden under one of several covers				
71	Lifts a ½-inch cube off a 1-inch cube				
72	Balances nine 1-inch cubes in a coffee cup				

16-19 months

73	Repeatedly finds toy when hidden under multiple covers				
74	Uses a stick to try to attain an object out of reach				
75	Retrieves raisin by inverting small vial				
76	Corrects imitations of new movements				
77	Deduces location of hidden object, single displacement				
78	Pulls cloth to reach object				

20-23 months

79	Imitates unseen body movements immediately and exactly				
80	Attempts to activate flashlight				
81	Deduces location of hidden object, multiple displacements				
82	Anticipates path of rolling ball by detouring around object				
83	Matches two sets of objects by item				

24-27 months

84	Imitates a model from memory				
85	Matches two sets of objects by color				
86	Assembles three-piece body puzzle correctly				
87	Recognizes four pictures from reduced cues				

Cognition

ITEM NUMBER	<i>DEVELOPMENTAL LEVELS AND ITEMS</i>	DATE	DATE	DATE	DATE
----------------	---------------------------------------	------	------	------	------

28-31 months

88	Matches colored cubes (red, yellow, blue, green, black)				
89	Understands concept of one				
90	Identifies three objects by their use (car, penny, bottle)				

32-35 months

91	Repeats two digits				
92	Matches four shapes (circle, square, star, cross)				
93	Inverts a picture				
94	Names a missing object				

NAME _____

Language

ITEM NUMBER	DEVELOPMENTAL LEVELS AND ITEMS	DATE	DATE	DATE	DATE
-------------	--------------------------------	------	------	------	------

Notation in parentheses following each test item indicates that the response is either receptive language (R), expressive language (E), or imitative behavior (I).

0-2 months

95	Moves limbs, head, eyes in response to voice, noise (R)				
96	Vocalizes randomly (E)				

3-5 months

97	Vocalizes when talked to or sung to (E)				
98	Turns eyes or head in direction of voices and sounds (R)				
99	Exhibits differentiated crying (E)				
100	Vocalizes emotions, intonation patterns (E)				

6-8 months

101	Vocalizes consonant sounds (E)				
102	Localizes sound source (R)				
103	Forms bisyllabic repetitions (ma-ma, ba-ba)(E)				
104	Imitates sounds already in repertoire (I)				

9-11 months

105	Orients to spoken name (R)				
106	Imitates consonant-vowel combinations (I)				
107	Performs on verbal cue alone (R)				
108	Imitates nonspeech sounds (click, cough)(I)				
109	Inhibits activity in response to no (R)				
110	Looks at familiar objects or persons when named (R)				

12-15 months

111	Uses appropriate intonation patterns in jargon speech (E)				
-----	---	--	--	--	--

Language

ITEM NUMBER	DEVELOPMENTAL LEVELS AND ITEMS	DATE	DATE	DATE	DATE
112	Imitates words inexactly (I)				
113	Uses two words meaningfully (E)				
114	Uses gestures and other movements to communicate (E)				
115	Follows a simple direction (R)				
116	Shows a body part, clothing item, or toy on verbal request (R)				

16-19 months

117	Names one object on request (E)				
118	Follows two familiar directions (R)				
119	Points to one black and white picture on request (R)				
120	Uses more than two single words to express wants (E)				
121	Points to three body parts on self or doll (R)				
122	Names one black and white picture (E)				
123	Selects two of three familiar objects (R)				

20-23 months

124	Points to four pictures (R)				
125	Uses two-word sentences (E)				
126	Names at least three familiar objects or pictures (E)				
127	Imitates new sounds and simple words immediately (I)				
128	Follows a new instruction exactly (R)				

24-27 months

129	Uses own name when referring to self (E)				
130	Uses three-word sentences (E)				
131	Uses four different semantic functions (E)				

28-31 months

132	Responds appropriately to two requests regarding location (R)				
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Language

ITEM NUMBER	<i>DEVELOPMENTAL LEVELS AND ITEMS</i>	DATE	DATE	DATE	DATE
133	Uses three different sentence types (E)				
134	Answers questions regarding body part functions (E)				

32-35 months

135	Uses four different grammatic constructions appropriately (E)				
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NAME _____

Social/Emotional

ITEM NUMBER	DEVELOPMENTAL LEVELS AND ITEMS	DATE	DATE	DATE	DATE
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0-2 months

136	Quiets when picked up				
137	Quiets to face or voice				
138	Maintains brief periods of eye contact during feeding				
139	Smiles or vocalizes to talk and touch				

3-5 months

140	Watches adult walk across room				
141	Reflects silent adult's smile				
142	Smiles or reaches to familiar people				
143	Smiles or laughs during physical play				
144	Smiles spontaneously				
145	Smiles at image in mirror				

6-8 months

146	Prefers to be with people				
147	Laughs and smiles at pat-a-cake and peek-a-boo games				
148	Reaches for image of self in mirror				
149	Explores features of a familiar person				

9-11 months

150	Leaves physical contact with familiar person momentarily				
151	Participates in pat-a-cake and peek-a-boo games				
152	Performs for social attention				
153	Offers toy				

12-15 months

154	Responds differentially to young children				
155	Gives toy to adult				

Social/Emotional

ITEM NUMBER	DEVELOPMENTAL LEVELS AND ITEMS	DATE	DATE	DATE	DATE
156	Initiates ball play or social games				
157	Leaves contact with familiar person repeatedly				

16-19 months

158	Plays apart from familiar person for 5 minutes				
159	Varies play with one toy				
160	Approaches a young child				

20-23 months

161	Occasionally plays near other children				
162	Shows periods of strong independence				
163	Picks up and puts away toys on request				
164	Imitates domestic activities				

24-27 months

165	Independently chooses toy and begins to play				
166	Pretends to be engaged in familiar activities (being asleep, telephoning)				
167	Prefers to play near, but not with, other children				

28-31 months

168	Discriminates between boys and girls				
169	Identifies self in mirror				
170	Plays with other children				

32-35 months

171	Separates from familiar person in strange environment for 5 minutes				
172	Identifies own sex				
173	Shares toy with adult prompts				

NAME _____

Self-care

ITEM NUMBER	DEVELOPMENTAL LEVELS AND ITEMS	DATE	DATE	DATE	DATE
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Feeding Skills 0-2 months

*174	Sucks well from bottle or breast				
175	Coordinates sucking, swallowing, and breathing				

3-5 months

176	Sucks and swallows pureed foods from spoon				
*177	Integration of rooting reflex				
178	Gums or mouths pureed food				
*179	Integration of bite reflex				

6-8 months

180	Gums and swallows cracker				
181	Closes lips on spoon to remove food				
182	Drinks from cup with help				
183	Picks up spoon				
184	Chews with lateral tongue motion				

9-11 months

185	Finger feeds small pieces of food				
186	Bites cracker				
187	Chews cracker				
188	Licks food off spoon				
189	Eats mashed table foods				
190	Ceases drooling				
191	Swallows with closed mouth				

12-15 months

192	Feeds self with spoon (many spills)				
193	Picks up and drinks from cup (some spilling)				
194	Chews well				

Self-care

ITEM NUMBER	DEVELOPMENTAL LEVELS AND ITEMS	DATE	DATE	DATE	DATE
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16-19 months

195	Drinks from cup without assistance				
196	Eats with spoon independently (entire meal)				
197	Discriminates edibles				

20-23 months

198	Unwraps candy; peels or pits fruit				
199	Sucks through a straw				

24-35 months

200	Begins to use fork				
201	Gets drink without help				
202	Spoon feeds (no spilling)				

Toileting Skills

12-15 months

203	Remains dry for 1 to 2 hour periods				
204	Fusses to be changed				

16-23 months

205	Has regular bowel movements				
206	Begins toilet training				

24-35 months

207	Remains dry between regular toileting				
208	Uses gestures or words to indicate need to use toilet				
209	Toilets independently except for wiping				
210	Has infrequent bowel accidents				

Dressing/Hygiene Skills

12-15 months

211	Pulls off hat, socks, or mittens on request				
212	Cooperates in diapering and dressing by moving limbs				

Self-care

ITEM NUMBER	DEVELOPMENTAL LEVELS AND ITEMS	DATE	DATE	DATE	DATE
213	Attempts to brush hair				

16-19 months

214	Attempts to wash face or hands				
215	Cooperates with toothbrushing				

20-23 months

216	Undresses completely except for fastenings				
217	Attempts to put shoes on				
218	Unzips and zips large zipper				

24-31 months

219	Puts on simple clothes without assistance (e.g., hat, pants, shoes)				
220	Washes and dries hands with assistance				

32-35 months

221	Dries hands independently				
222	Puts on coat, dress, T-shirt except for buttoning				
223	Undoes large buttons, snaps, shoelaces deliberately				

NAME _____

Gross Motor

ITEM NUMBER	DEVELOPMENTAL LEVELS AND ITEMS	DATE	DATE	DATE	DATE
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0-2 months

224	Prone: turns head to both sides				
*225	Neck righting				
226	Upright: head bobs but stays erect				
*227	Prone: optical righting				
228	Prone: raises and maintains head at 45°				
229	Supine: kicks feet alternately				

3-5 months

*230	Integration of Moro reflex				
231	Prone: head and chest are raised to 90° with forearm support				
232	Upright: bears small fraction of weight on feet				
233	Prone: props with extended arms				
234	Aligns head with trunk when pulled to sitting				
235	Pulls self to sitting				
236	Prone: rolls to supine				
*237	Prone: integration of tonic labyrinthine reflex (TLR)				
*238	Supine: integration of tonic labyrinthine reflex (TLR)				
*239	Prone: integration of symmetrical tonic neck reflex (STNR)				
*240	Supine: integration of asymmetrical tonic neck reflex (ATNR)				

6-8 months

241	Sitting: trunk erect in chair				
242	Upright: extends legs and takes large fraction of weight				
243	Prone: reaches				
244	Prone: assumes quadruped				

Gross Motor

ITEM NUMBER	DEVELOPMENTAL LEVELS AND ITEMS	DATE	DATE	DATE	DATE
*245	Body on body righting begins				
246	Sits unsupported for 30 seconds				
*247	Supine: optical righting				
*248	Prone: Landau response				
*249	Sitting: protective extension to the front				
*250	Parachute reaction				
*251	Sitting: optical righting when tipped to sides				
252	Supine: rolls to prone				
253	Prone: pivots				
254	Prone: crawls				
*255	Sitting: protective extension to the sides				
256	Standing: moves body up and down				
257	Sitting: assists in pulling to standing				
258	Supine: rotates to sitting and quadruped				

9-11 months

259	Standing: takes one step when supported				
260	Quadruped: creeps				
*261	Sitting: protective extension to the rear				
262	Sitting: pulls to standing using furniture				
263	Standing: lowers self to floor				
264	Standing: cruises by holding on to furniture				
265	Walks with one hand held				
*266	Sitting: equilibrium reactions				
267	Stands alone				
*268	Quadruped: equilibrium reactions				

12-15 months

269	Walks by him/herself				
270	Creeps up stairs				

Gross Motor

ITEM NUMBER	DEVELOPMENTAL LEVELS AND ITEMS	DATE	DATE	DATE	DATE
271	Standing: throws ball with some cast				
272	Walks well (stops, starts, turns)				
273	Supine: raises self to standing position independently				
274	Walks backward				
275	Squats in play, resumes standing position				

16-19 months

276	"Runs" stiffly				
277	Walks sideways				
278	Walks up stairs held by one hand				
279	Creeps backward down stairs				
280	Standing: seats self in small chair				
281	Climbs into adult-sized chair				
282	Standing: balances on one foot with help				
*283	Standing: equilibrium reactions				

20-23 months

284	Walks down stairs with one hand held				
285	Jumps in place				

24-27 months

286	Goes up and down stairs alone, nonreciprocally				
287	Stands on balance beam with both feet; attempts to step				
288	Kicks ball				
289	Jumps from bottom step (feet together)				

28-31 months

290	Walks on tiptoes				
291	Throws ball 5 to 7 feet in a vertical pattern				
292	Takes a few alternate steps on balance beam				
293	Supine: rises to standing with mature pattern				

Gross Motor

ITEM NUMBER	DEVELOPMENTAL LEVELS AND ITEMS	DATE	DATE	DATE	DATE
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32-35 months

294	Rides tricycle using pedals				
295	Goes up stairs alternating feet				
296	Stands on one foot and balances				
297	Walks with heel-toe gait				
298	Walks with reciprocal arm swing				
299	Runs				

*Developmental Programming for Infants and Young Children
Volume 2: Early Intervention Developmental Profile*

APPENDIX 4

MUSIC PERCEPTION OF COGNITIVE DEVELOPMENT

The Musical Perception Assessment of Cognitive Development is an assessment of mental age based on Piaget's theory of development. Each task has 5 sub-headings.

"A" is the approximate mental age of development

"B" lists the materials needed for the task

"C" describes the procedure for administering the task

"D" elucidates the method of scoring

"E" is where the author makes relevant comments

In the description of the actual tasks, "A" refers to the administrator and "S" refers to the subject.

Sensori motor - 1

M-PACD Task 1: Auditory Localization

- A. Age: 1 - 3 months
- B. Materials Needed: One resonator bell , drum with mallet, and one tambourine

C. Procedure:

Each of the instruments is to be played individually for a duration not exceeding one second. The instruments, removed from the visual field, are to be played alternately on both sides of the S. The preferred response constituting a "+" is a head movement in the direction of the sound stimulus.

D. Scoring:

A 50% response level is adequate for a "+". This task might also reflect hearing loss which should be considered separately from this task.

E. Remarks:

Motor handicapped children should be observed for localizing eye movements and other responses associated with an orienting response if the head cannot be moved.

M-PACD Task 2: Primary Circular Reactions

- A. Age: 1 - 4 months
- B. Materials Needed: none
- C. Procedure:

This task represents the stage at which children engage in what Piaget called "mutual imitation." The A tries to engage the S in vocal (or motor) imitation by making sounds which are (or should be) in the S's repertoire. Common sounds to prompt the S include the vowel sounds a, e, and i (both long and short) presented in repeated ("ah-ah-ah"), sustained fixed pitch ("ah-h-h") and sustained transient pitch (siren effect) formats; labial sounds such as a sucking sound or a blowing sound (which children use to imitate motorboats); or clicking sounds with the tongue. If the S is an infant the mother can be of assistance in procuring this response.

Imitative body movements are not as easily obtained at this stage for infants but older low-functioning S's may exhibit motoric self-stimulatory behavior which is itself a primary circular reaction.

- D. Scoring:

S's who successfully imitate sounds or movements (which must already be in their repertoire) would receive a "+". Also S's exhibiting self-stimulatory behavior would receive a "+".

- E. Remarks:

The phenomenon of "mutual imitation" is characteristic of the work of Nordoff and Robbins in which certain responses already in the repertoire of the S are imitated musically by the therapists to establish a basic communication response. Once established, the repertoire of the S can be expanded more effectively, thus leading to higher stages of cognitive development.

M-PACD Task 3: Secondary Circular Reactions

- A. Age: 4 - 8 months
- B. Materials Needed: a small rattle or wrist bells
- C. Procedure:

The rattle or wrist bells should be placed in the grasp of the S. The A then prompts the S to make a sound on the instrument by shaking the S's hand (or foot). If the S cannot effectively grasp the instrument, then the S should be physically prompted to strike the instrument.

- D. Scoring:

If after several prompts the S still does not seem to be aware of the causal relationship between body movement and desired response (the sound), then the S would receive a "-".

- E. Remarks:

Some S's may be reluctant to cooperate due to an attention disorder, withdrawal or an aversion (auditory defensiveness) to the particular instrument being used. If this occurs, additional instruments can be tried, as long as the S causes the sound directly, i.e., not through an intermediate device such as a mallet (See M-PACD Task 5.) Other instruments would include tambourines, autoharps, musical mobiles, etc.

Sensori motor - 4

M-PACD Task 4: Two-Beat Cadence

- A. Age: 8 - 12 months
- B. Materials Needed: Songs "The Drum Caught Cold" (Levin, Levin and Safer, 1975) or "If You're Happy and You Know It" and hand drum (optional)

C. Procedure:

The required response is a two-beat cadence which generally is produced vocally and later motorically. Through mutual imitation (See M-PACD 2) the A vocally prompts the S with common two-beat phrases such as "ma-ma", "da-da", "pa-pa", "ah-ah", "no-no", "ee-ee", etc. Note that imitation of the syllables any number of * times more than two does not constitute a "+". A good song to prompt the vocal response is "The Drum Caught Cold" which requires the S to imitate (vocally or motorically) the sound of a sneeze -- "ah-choo", which is definitely in the repertoire of the S, even though as possibly just a reflex.

If the vocal response isn't present the A should physically prompt the S with a two-beat tap of the hand on the hand drum (to either song). In the song "If You're Happy...." the phrase should be adapted to say "... hit the drum ...X ...X", where the S hits the drum twice after the phrase.

D. Scoring:

If the S makes no two-beat response (either vocal or motoric) after ample prompting then the S would receive a "-".

E. Remarks:

If the S makes no imitative responses at all, there may be some interfering problems having a perceptual or affective basis.

Sensori motor - 5

M-PACD Task 5: Tertiary Circular Reactions

- A. Age: 12 - 18 months
- B. Materials Needed: mallet, resonator bell, wood block
- C. Procedure:

The S in this task must cause sound to occur indirectly. Therefore the instrument must be one which can only be sounded with an intermediate device, in this case a mallet. The mallet should be placed in the S's grasp and the S physically prompted to hit the wood-block or resonator bell. The bell is generally more interesting to the S but more difficult to strike effectively.

- D. Scoring:

The S has only to strike either instrument with the mallet, producing the desired sound, to receive a "+" for this task.

- E. Remarks:

If the S is prevented by disability from grasping the mallet then the mallet can be attached to a band brace or put on a velcro wrist strap thus requiring only gross motor movements to produce the sound.

Symbolic - 1

M-PACD Task 6: Loudness Discrimination

- A. Age: 18 - 24 months
- B. Materials Needed: two resonator bells, two mallets and two blinds (two bookends with paper taped to each)
- C. Procedure:

The A presents the S with one resonator bell behind each of two blinds. One bell is played once loudly and the other played once softly. The S is asked to choose which one is played loudly by pointing to the correct blind. The task is administered twice, keeping the order of presentation the same but changing the order of dynamics from loud-soft to soft-loud. This controls for order of presentation and visual and directional cues.

If the S has trouble with the questioning format "this one or that one" (which is common for toddlers) then an alternate procedure can be used. A takes one bell and mallet, places it between the S and blinds, and instructs the S to grasp the mallet and play the bell the way the A does. The A then plays the hidden bell loudly for 10 seconds, then softly for 10 seconds (constant tempo), each time instructing the S to "play this way". If after at least four alternations the S doesn't respond correctly discontinue this procedure.

- D. Scoring:

In the first procedure, both trials must be correctly answered for a "+". In the second procedure, any noticeable dynamic change in the desired direction would yield a "+".

- E. Remarks:

Certain physical-handicapping conditions would prevent the S from engaging in the second procedure as outlined. One adaptation would be to obtain either gross motor movements or vocalizations which exhibited dynamic changes in imitation of the A.

M-PACD Task 7: Matching (Timbre Discrimination)

- A. Age: 2 - 2½ years
- B. Materials Needed: two tambourines, two resonator bells, two mallets, two blinds, two small empty boxes (approx. 12" x 12" x 12")
- C. Procedure:

The A has a tambourine and a resonator bell with a mallet hidden from the S's view in each of two boxes. The remaining tambourine and bell (with mallet) are placed in front of the S and the S is instructed to play each instrument to discover its sound. The A then plays (with instruments still hidden) the instrument in each box and tells the S to put his/her instruments away in the correct boxes.

An alternate procedure has been devised for S's who have trouble with the questioning format in the above procedure. The A hides a tambourine and a bell behind each of two blinds (See M-PACD Task 6). With the same warm-up procedure as above the A plays one instrument and instructs the S to "play the instrument which sounds like this...". Then, moving on to the next instrument the S in turn does likewise.

- D. Scoring:

In the first procedure both instruments must be placed in the correct boxes for a "+". In the second procedure, each instrument the S plays must be the correctly matched instrument for a "+".

- E. Remarks:

The second procedure seems to be less confusing to S's with language comprehension problems but would pose some difficulties for motorically handicapped S's. Both procedures should be attempted if a "-" is initially encountered.

M-PACD Task 8: Imitative Imagery

- A. Age: 2½ - 3 years
- B. Materials Needed: autoharp, set of fixed resonator bells (or small xylophone) with mallet, toy dog, toy bird
- C. Procedure:

The A demonstrates the movement of a dog and a bird, accompanied respectively by single-note striking on the xylophone and a glissando on the autoharp. Next the A asks the S in like manner to make the dog walk (by striking the xylophone) and the bird fly (by strumming the autoharp). The A should cause the motion of each animal depending on the instrument which the S chooses to play. For example, if the S strikes the xylophone in order to make the bird fly then the A should "make" the bird walk, because striking represents walking and strumming represents flying. No prompting should occur in this task, only the one demonstration initially.

- D. Scoring:

For a "+" the S must play the corresponding instruments for both animals. The S may play the wrong instrument but must use the right action, i.e., striking the bells or plucking the autoharp strings for walking and a glissando on the bells or a strum on the autoharp for flying (See Remarks, this task). The S is allowed to change his/her response through visual feedback of animal movements. For example, if S is playing the wrong instrument and sees either the bird walking or the dog flying, the S is allowed to change instruments and still receive a "+". If there is no change the task is scored a "-".

- E. Remarks:

The generalizing of striking and strumming rather than instrument association is the primary concept involved in M-PACD Task 12, Creative Mental Imagery. If the S demonstrates this generalization then Task 12 should also be scored a "+", and the A should continue to Task 13.

Motor handicapped S's can point to rather than play the correct instruments for a "+". For visually impaired S's, the animals should move while maintaining physical contact with the S's arm or leg to provide a tactile frame of reference.

Symbolic - 4

M-PACD Task 9: Deferred Imitative Imagery

- A. Age: 3 - 3½ years
- B. Materials Needed: same materials as M-PACD Task 8 with the addition of a novel walking toy animal (preferably some animal which the S has seen or had some contact, e.g., a cat or cow)
- C. Procedure:
- After M-PACD Task 8 has been administered, the A presents S with the novel toy. With no demonstration (as in Task 8) the S is asked to make the new animal move by playing the appropriate instrument. The A should move the animal accordingly, giving the S feedback to change his/her response if necessary.
- D. Scoring:
- For a "+" the S should strike the xylophone (or pluck the autoharp).
- E. Remarks:
- As in Task 8, pointing to the xylophone is sufficient for motor handicapped S's.

M-PACD Task 10: Tempo Discrimination

- A. Age: 3 - 4 years
- B. Materials Needed: two resonator bells with mallets, two blinds (paper screens)
- C. Procedure:

The A has a resonator bell hidden behind each blind. One bell is played at approximately 60 beats per minute (from 5 - 10 beats), then the remaining bell is played at a much faster tempo (at least 3 times as fast) for approximately the same number of beats. The S is asked which one was played faster and points to one of the blinds. The A then readministers the task moving again from slow to fast but starting on a different bell.

A second procedure has been designed for some S's who possess this concept but fail to understand the language used in the questioning. As in the second procedures for Tasks 6 and 7, the S demonstrates tempo discrimination by imitating the A in playing fast and slow. The S has one bell and the A's bell is hidden from view to control for visual cues. The A should start playing slowly, then speed up, then slow back down.

- D. Scoring:

In the first procedure the S must be correct on both trials in pointing to the faster bell. In the second procedure, the S must demonstrate a speeding-up and slowing-down on the bells (although not in a steady acceleration as is required for M-PACD Task 14) for a "+". S's who do not have this concept will typically demonstrate loudness discrimination by playing loud for fast and soft for slow.

- E. Remarks:

Motor handicapped S's will have some problems on the second procedure. Vocalizing or even breathing fast and slow would serve as adequate substitutes for the demonstration of this concept.

M-PACD Task 11: Duration Discrimination

- A. Age: $3\frac{1}{2}$ - $4\frac{1}{2}$ years
- B. Materials Needed: two resonator bells with mallets, two blinds and piece of cloth to damp one of the bells

C. Procedure:

Place the cloth between the bell and bell-holder to significantly reduce the ringing time of the bell. Hide a bell behind each screen and play each bell once letting it resound until the sound has fully decayed. The S is then asked to point to the bell "lasting longer" or "taking more time". This procedure is repeated by playing the bells in reversed order and asking the same questions.

Another procedure for demonstrating this concept requires the S to vocalize in imitation of the A one long and one short syllable (where the A vocalizes and then the S repeats).

D. Scoring:

For the first procedure, the S must point correctly on both trials for a "+". Satisfactory imitation of the A is required under the second procedure. The S may need to be timed to determine if there is understanding of this concept. A difference of at least one second should be used as deciding criteria.

E. Remarks:

The understanding of the concept of time is difficult to ascertain due to language barriers. "Longer" has visual connotations and "takes more time" is confused with other variables such as "amount of work done," "tempo," etc. Since this task occurs at roughly the same time as M-PACD Task 10, certain handicapping conditions may make it desirable to forego the administration of this task and continue to Task 12.

M-PACD Task 12: Creative Mental Imagery

- A. Age: 4 - 5 years
- B. Materials Needed: two toy animals (bird and dog), set of fixed resonator bells or xylophone with mallet
- C. Procedure:

The three imagery tasks (M-PACD Tasks 8, 9 and 12) are usually administered as a group. After completing Tasks 8 and 9, the A asks the S how to make the bird fly using only the xylophone, the correct answer being to assimilate the strumming motion to the xylophone, creating a glissando. Prompting is allowed on this task. However, if prompting is used, i.e., suggesting a strumming motion to the S, then the A should repeat Task 8 (with both xylophone and autoharp) and then attempt Task 12 again, this time without prompting.

- D. Scoring:

If the S makes a glissando on the xylophone the first time without prompting or the second time without prompting after being administered Task 8, then the S receives a "+".

- E. Remarks:

This task may present problems for some motor handicapped S's, particularly in cases of cerebral palsy of the upper extremities. Some of these children exhibit only "clasp knife" spasticity which would enable an awkward strumming response but an even more difficult striking response. In such cases, two xylophones might be called for, one placed vertically, the other horizontally. The clasp knife motion on the vertical xylophone would resemble striking and on the horizontal, strumming. The S would then have to decide which of the two instruments to play rather than which motion to use.

Pre-Optional - 1

M-PACD Task 13: Seriation of Tempo

- A. Age: 5 - 6 years
- B. Materials Needed: one set unfixed resonator bells with mallet and toy dog
- C. Procedure:

The A moves the toy dog, with a mallet held to the dog's paw, past the group of widely spaced (6 inches) bells. The A tells the S that, "the dog plays each bell once as it passes by. However, because of a broken leg the dog can only go this fast (one bell per 2 seconds). Without playing the bells more than once each, how can we make the bells play faster." If the S does not discover that the only solution is to move the bells closer together, then the A can suggest to the S, "What if we move the bells around?" Without giving away the solution, the A allows the S to think the the correct solution through. Once the S moves the bells however, there can be no feedback from the toy dog (via A) or second chance to rearrange the bells. When the S makes a change the A asks, "Are you sure?" If the S affirms then the A scores accordingly.

- D. Scoring:

The S must move the bells closer together for a "+". Moving the bells wider apart, on top of each other, or in any other configuration constitutes a "-".

- E. Remarks:

"Seriation" refers to an organization of objects along a graduated continuum of some variable, e.g., size, length, tempo, or duration. For the visual tasks there remains the possibility of seeing and comparing all the objects at once. However, the auditory equivalent (having five metronomes ticking at different speeds, for example) does not avail itself to such an overall comparison, primarily due to the resulting confusion which would prevail. Therefore, the concept has to be tested in such a way that minimizes the confusion yet still presents the same problem. Therefore, the "ordering" that is present in any seriation task is acted out in the mind rather than on a series of objects. Perhaps the seriation can be illustrated better by imagining the S moving the bells gradually closer and closer together so that the "object" or the resulting scale produced by striking the bells becomes faster and faster.

M-PACD Task 14: Seriation of Duration

- A. Age: 5½ - 6½ years
- B. Materials Needed: hand drum
- C. Procedure:

The S must play (in imitation of A) on the hand drum a series of five or more beats which get progressively faster (from approximately 60 to 180 bpm). If the A is doubtful whether there is any acceleration, i.e., demonstrating only two tempos -- slow then fast, the task can be repeated by starting at the fast tempo and then decelerating.

If motor handicap prevents the S from effectively carrying out this procedure, the S can vocalize on any syllable the same response (still in imitation of A).

- D. Scoring:

There must be some sense of progression to the speeding-up or slowing-down of the tempo. Simply slow, then fast does not constitute a "+". There must be present at least three tempos and in the correct seriated order. A tape recording might be needed if no determination can be accurately made.

- E. Remarks:

As in the discrimination tasks for tempo and duration, these two tasks occur so close developmentally that if the S is prevented from accomplishing this task due to motor handicap then the A may choose to forego this task and proceed to M-PACD Task 15.

M-PACD Task 15: Class Inclusion

- A. Age: 6 - 7 years
- B. Materials Needed: five resonator bells, one piece of cloth
- C. Procedure:

The piece of cloth is used to dampen one of the five bells (See M-PACD Task 11). The S is asked to play each bell and separate them into two piles of loud (N=4) and soft (N=1) bells. (If the S cannot do this pre-task, continue no further.) Next, the S is asked two questions: 1) "Are there more loud bells than soft bells" (Answer: yes) and, 2) "Are there more loud bells or bells" (Answer: more bells).

- D. Scoring:

Both questions must be answered correctly for the S to receive a "+".

- E. Remarks:

The second question can sometimes take the S off-guard, so it is a good idea to repeat the question, changing the order of "loud bells" and "bells" to make sure the S isn't using the first or last phrase as an inflectional cue.

Concrete Operational - 1

M-PACD Task 16: Conservation of Rhythmic Pulse

- A. Age: 6½ - 8 years
- B. Materials Needed: one fixed set resonator bells (or xylophone) with two mallets, bongo drum (or hand drum)
- C. Procedure:

A constant drumbeat (using one mallet on drum) is established at approximately 60 bpm. The S is then told that there will be one song, "London Bridge is Falling Down" played twice at different speeds to accompany the drum. The S is also told that the drumbeat will play at one steady speed and will not stop between songs. The A then plays the two renditions on the bells in the key of C (through "... my fair lady") so that in the first rendition there are 16 drumbeats and in the second, 8 drumbeats, i.e., the first two drumbeats in the first playing are on the words "London" and "Bridge" whereas in the second, they are on the words "London" and "Falling". (The first rendition is twice as slow as the second.) The S is then asked two questions: 1) "Is the first song faster, slower or the same speed as the second?" and, 2) "Knowing that the drum plays at the same speed, are there more drumbeats in the first or second song?"

D. Scoring:

The S must answer both questions correctly and justify the second question's answer, i.e., the second song is faster and the first song has more drumbeats because the drum is playing at the same speed and has more time to fill in the first or slower song.

E. Remarks:

A justification is required to control for the S's guessing. If the S has delayed or impaired speech, several examples (using several songs) can be used where the S has only to answer the two questions without justifying. In this alternate procedure, a minimum performance level of 75% correct is used as criterion for a "+".

Most conservation tasks devised by Piaget required the S to maintain that some quantitative variable, e.g., volume, weight, length, mass, and number did not change regardless of uncorrelated transformations in other dimensions, e.g., size, space allocation, amount of work done, etc. In the present task, however, the correct judgement is for an unequal or changed number of drumbeats. Still, the S has to separate two variables -- tempo of song and drumbeat -- and think about them independently and concurrently. This aspect, thinking of two or more variables at the same time, is the crux of the idea of "conservation".

The typical non-conservation response of pre-concrete operational S's is that there are either 1) the same number of drumbeats because the drum plays at the same speed or, 2) more drumbeats for the faster song because there is more work done, i.e., "faster" equals "more".

Concrete Operational - 2

M-PACD Task 17: Conservation of Auditory Number

- A. Age: $7\frac{1}{2}$ - 9 years
- B. Materials Needed: one set fixed resonator bells (or xylophone) with mallet
- C. Procedure:

The A plays the first 7-note phrase "London Bridge is Falling Down" at two speeds, 60 and 120 bpm (See M-PACD Task 16). During these renditions the S is asked to clap with the words. The S is then asked two questions, 1) Was one of the songs faster than the other? If so, which one? and, 2) Were there the same number of notes or hand claps in the two songs or were there more in one of them? Up to three hearings are permitted.

- D. Scoring:

The S must answer that the second song is faster and that there are the same number of notes or hand claps in both songs because it is the same song and tempo does not affect the number of notes.

- E. Remarks:

Motor handicapped S's are allowed to vocalize (on any syllable) the 7-note phrases if they cannot clap hands. The questioning would then read, "are there more 'la's!...". Handclaps and/or vocalized syllables are used because the word "notes" is confusing to some S's.

Typical non-conservation responses are that the slow song has more notes because it takes more time or the fast song has more notes because it goes faster, i.e., more work done.

If the S does not know the song "London Bridge is Falling Down," then a familiar song should be used which has a 5- to 8-note opening phrase.

Concrete Operational - 3

M-PACD Task 18: Conservation of Tempo

- A. Age: 9 - 11 years
- B. Materials Needed: bongo or hand drum and one resonator bell with two mallets
- C. Procedure:

The A tells the S that the drum and bell are the sounds of a moving horse and cow, respectively. (The A plays drum with one hand and bell with the other.) Both instruments are played in unison at a slow constant beat (60 bpm). The S is asked if they are moving at the same speed. This fact should be established before proceeding. Next the A should pause one of the instruments, (i.e. animals) for a couple of seconds and then proceed with both instruments at the same speed as before, however this time syncopated. For example, counting to 4 at 2 counts per second, one instrument would be played on beats 1 and 3 and the other on 2 and 4. The conservation question is "Are both animals still moving at the same speed or is one moving faster than the other? Why?"

- D. Scoring:

To receive a "+" the S must answer the conservation question something as follows: "the animals are still moving at the same speed because every time one takes a step the other does also, although one is in front of the other. In other words the justification should employ the understanding that speed is independent of position."

- E. Remarks:

Typical non-conservation responses reveal the misjudgement that because one animal is in front, it is also moving faster or because one animal is behind it is moving faster to catch up.

M-PACD Task 19: Conservation of Duration

- A. Age: 10 - 12 years
- B. Materials Needed: same as M-PACD Task 18
- C. Procedure:

The A plays the following pattern on the instruments:

(d = 180)

R. Bell	
Drum	

The S is then asked if one of the instruments was played faster than the other. Once this fact has been established, the child is asked the conservation question, "Do the instruments take the same amount of time to play all their notes or, does one take longer or more time?"

If the S is concerned about the decay time of the resonator bell, then an instrument with a similar decay time as the drum, e.g., woodblock, toneblock, etc., should be used instead of the bell.

- D. Scoring:

The conservation question must be answered "same" and justified in a manner indicating that the instruments start and stop together and that the total time is independent of the speed of the instruments.

- E. Remarks:

Typical non-conservation responses center around the misconception that one instrument takes more time because of the speed (or lack of).

Formal operations - 1

M-PACD Task 20: Logical Proportions

- A. Age: 11 - 14 years
- B. Materials Needed: Same as M-PACD Task 16
- C. Procedure:

Present M-PACD Task 16, telling the S that the slow song went half as fast as the fast song. Then ask the S how many more drumbeats were there in the slow song than in the fast song. (The S should already have passed the conservation part of the task.) The S should also justify his/her answer.

- D. Scoring:

The S must say "twice as many in the slow song" (or "half as many in the fast song") for a "+". The justification should be "because the fast song went twice as fast" or "...the slow song went half as slow".

- E. Remarks:

The nature of Formal operational thinking is that abstract and deductive reasoning must be used. All of the puzzle parts are not immediately available as they were in the previous tasks. The S must test a hypothesis in his/her mind and develop the understanding that speed and number of drumbeats are inverse proportions.

APPENDIX 5

MUSIC THERAPY ASSESSMENT FORM

The Music Therapy Assessment Form provides information of developmental norms in motor skills, communication skills, cognitive skills and social/emotional skills. One scores with P for pass, when the response meets a basic criterion, F for fail, when it does not, P-F for pass-fail, when the response is uncertain, and O for omit, when it is necessary to omit the item.

MUSIC THERAPY ASSESSMENT FORM

RESEARCH DRAFT III
OSE/NAWT Project
D. E. Michel and
M. Rohrbacher,
Editors.

	0-2 Months	Date	Date	Date	Date	Date	Notes
1. Primitive reflexes present (Strike drum or related instrument loudly. Designate whether Moro, ATNR, STNR, Startle, or other reflex observed.)							
2. Turns head to both sides.							
3. Neck							
4. Upright: head bobs but stays erect							
5. Supine: Kicks feet alternately							
6. Integration of primitive reflexes (Moro, ATNR, STNR, etc.)							

3-5 Months

Date Date Date Date Date Date Date Date Date Date

7. Prone: props head with extended arms

8. Aligns head with trunk when pulled to sitting

9. Pulls self to sitting

10. Prone: rolls to supine

6-8 Months

11. Sitting: trunk erect in chair

12. Prone: reaches

13. Prone: assumes quadruped

14. Sits unsupported for 30 seconds

15. Sitting: optical righting when tipped to sides

Date Date Date Date Date Date Notes

16. Supine: rolls to prone

17. Prone: pivots

18. Prone: crawls

19. Standing: moves body up and down

20. Sitting: assists in pulling to standing

21. Supine: rotates to sitting and quadruped

22. Standing: takes one step when supported

23. Quadruped: creeps

24. Sitting: protective extension to the rear

25. Sitting: pulls to standing using furniture

Date Date Date Date Date Date Date Date Notes

26. Standing: lowers self to floor

27. Standing: cruises by holding on to furniture

28. Walks with one hand held

29. Stands alone

12-15 Months

30. Walks by him/herself

31. Walks well (stops, starts, turns)

32. Supine: raises self to standing position independently

33. Walks backward

34. Squats in play, resumes standing position

Date Date

35. "Runs" stiffly

36. Standing: seats self in small chair

37. Standing: balances on one foot with help
(equilibrium reactions)

20-27 Months

38. Jumps in place

28-31 Months

39. Walks on tiptoes

32-35 Months

40. Walks with heel-toe gait

41. Walks with reciprocal arm swing

42. Runs

Date Date Date Date Date Notes

FINE/PERCEPTUAL MOTOR SKILLS

0-2 Months

- 43. Focuses momentarily on face
- 44. Follows moving object horizontally
- 45. Follows moving object through most of a circular path
- 3-5 Months
- 46. Integration of grasp reflex
- 47. Reaches for dangling object
- 48. Fingers own hands in play at midline
- 49. Uses ulnar palmer prehension
- 50. Reaches for cube and touches it
- 51. Uses radial palmer prehension (uses thumb and two fingers)

Date Date Date Date Date Date Date Date Date Date

52. Transfers toy from hand to hand

53. Shakes bell or other small musical instrument

54. Has complete thumb opposition when grasping

55. Uses inferior pincer grasp with small rhythm instrument

9-11 Months

56. Pokes with isolated index finger

57. Drops a small musical instrument with voluntary release

58. Uses neat pincer grasp with a small musical instrument

Date Date Date Date Date Date Date Date Date Date Date Date

67. Scribbles with background music (circular, other ways)

COMMUNICATION
0-2 Months

68. Moves a part of body—head, limbs, eyes—in response to voice, noise, or music (sung/played)

69. Vocalizes, moving pitch up and down, randomly

70. Responds vocally when sung to

71. Specifically turns head or eyes toward singing voice

72. Expresses different needs with different crying sounds

73. Expresses self vocally using different sounds for different feelings

Date Date Date Date Date Date Date Date Date Date

6-8 Months

74. Vocalizes consonant sounds in a musical environment

75. Localizes sound source (Moves head, limbs, eyes, etc.)

76. Forms bisyllabic repetitions (ma-ma, ba-ba) with music/song stimulation

77. Imitates sound already in repertoire with music

9-11 Months

78. Orients to spoken or sung name

79. Imitates consonant-vowel combinations, imitates song patterns

80. Performs on musical cue (song)

	Date	Date	Date	Date	Notes
81.					Imitates nonspeech sounds in musical context
82.					Looks at familiar objects or persons when named in music
					<u>12-15 Months</u>
83.					Imitates intonation patterns in music
84.					Imitates words inexactly
85.					Consistently uses one short syllable to designate an object in musical context
86.					Uses gestures and other movements to communicate
87.					Follows a simple direction
88.					Shows a body part, clothing, item, or toy upon verbal request

	Date	Date	Date	Date	Date	Notes
	<u>16-19 Months</u>					
89.	Names one object on request					
90.	Follows two familiar directions					
91.	Points to one black and white musical picture on request					
92.	Points to three body parts on self or doll in musical context					
93.	Selects two of three familiar musical toys					
	<u>20-23 Months</u>					
94.	Uses two-word sentences in song to communicate idea					
95.	Names at least three familiar objects or pictures in musical context					

Date Date Date Date Date Date Date Date Date Date

96. Imitates new sounds and simple words immediately in musical context

97. Follows a new instruction exactly in a musical context

98. Uses own name when referring to self

99. Uses three-word sentences

100. Uses four different semantic functions

COGNITIVE SKILLS

0-2 Months

101. Uses adaptive movements rather than reflexive reactions in a musical environment

102. Brings hands to mouth in a musical environment

103. Repeats random movements in a musical environment

	Date	Date	Date	Date	Date	Notes
	<u>3-5 Months</u>					
104.	Mouths objects					
105.	Shakes rattle					
106.	Looks at object he/she is holding					
107.	Tracks a moving and sounding musical instrument, momentarily screened					
	<u>6-8 Months</u>					
108.	Attains partially hidden musical instrument					
109.	Looks to where musical instrument falls (floor, etc.)					
110.	Uncovers face (when drum or other musical instrument is placed over/in front of)					
111.	Bangs musical objects					

	Date	Date	Date	Date	Notes
112.					Rotates maraca less than 180° to correct playing position
113.					Imitates hand movements used in previous music activities
114.					Attains completely hidden musical instrument <u>9-11 Months</u>
115.					Pulls string to make bell sound and succeeds
116.					Closely imitates facial movements of therapist singing
117.					Closely imitates movements never before performed in music activities
118.					Rotates a maraca 180° or more to correct playing position
119.					Moves to obtain musical instrument just out of reach

		Date	Date	Date	Date	Notes
120.	Moves to inspect music (toy) box					
121.	Reacts to novel features of musical instruments					
		<u>12-15 Months</u>				
122.	Imitates puppet/marionettes dancing					
123.	Repeatedly finds musical instrument when hidden in one of several bongo drums					
124.	Gives to adult several common, familiar musical instruments on request					
125.	Attempts to get adult to repeat an action with a musical instrument					
		<u>16-19 Months</u>				
126.	Uses record player arm to play record					

Date Date Date Date Date Date Date Date Date Date

127. Points to pictures in a book (of musical stories) upon request

128. Points to at least two parts of body upon request

129. Uses more than one rhythm instrument appropriately

130. Uses "pretend" rhythm instruments upon request

131. Attends to rhythmic speech (chants, jingles, rhymes)

20-27 Months

132. Imitates unseen body movements (of music behaviors) immediately and exactly

133. Attempts to activate cassette tape recorder

134. Imitates a music model from memory

	Date	Date	Date	Date	Notes
135.					Matches two sets of musical instruments by color
136.					Names 5 of 10 pictures of common rhythm instruments
137.					Quiets when picked up
138.					Quiets to friendly face or voice
139.					Quiets to singing or music
140.					Smiles or vocalizes to talk or touch
141.					Maintains brief periods of eye contact (while rocking)
142.					Smiles at or vocalizes to mirror image of self
143.					Recognizes and responds to familiar people

Date Date Date Date Date Notes

144. Discriminates strangers in room

145. Smiles or vocalizes to personal attention/
music

146. Smiles spontaneously

6-8 Months

147. Seeks personal attention and holds out arms
to be picked up

148. Prefers to be with people

149. Explores features of a familiar person

150. Cries of hearing intense sounds (noises)

151. Smiles or vocalizes to toys that make
noise/music

152. Reacts favorably to singing--smiles, voca-
lizes or is otherwise attentive.

Date Date Date Date Date Date Date Date Date Date Notes

- 153. Cries/screams when music is withdrawn

- 154. Cries/screams to attract attention

- 155. Accepts unfamiliar people or situations momentarily

- 156. Points to indicate desired music stimulus

- 157. Performs for social attention

- 158. Offers musical instrument

- 159. Greets nonverbally (waves hand)

- 160. Accepts unfamiliar musical instruments momentarily

- 161. Greets verbally (SAYS "hello" or "good-bye")

- 162. Responds differentially to young children

	Date	Date	Date	Date	Notes
163.					Leaves contact with familiar people repeatedly
164.					Initiates musical play
					<u>16-19 Months</u>
165.					Plays with musical instruments apart from familiar person for five minutes
166.					Approaches an unknown peer during music activity
167.					Occasionally plays near other children during music
168.					Shows periods of strong independence
169.					Picks up and puts away musical instruments on request
					<u>24-27 Months</u>
170.					Independently chooses musical instrument and begins to play

Date Date Date Date Date Date Notes

171. Prefers to play near but not with other children

172. Clings to familiar adult under conditions of stress/affection

APPENDIX 6

LETTERS

2325 Dwight Way
Stockton, CA 95204

February 20 1987

Hopeland Preschool and Day Care
5965 N Pershing Avenue
Stockton

Dear Dr Suleimani

I am a music therapy graduate student at the University of the Pacific, working on my thesis research. The research topic is to observe the development of rhythm skills in young children aged one year, two years, three years and four years.

I would be most appreciative if you would allow me to include some of the children in your facility in my project. Of course I understand that I would need the permission of the parents who will be approached only after your own permission is granted. Each child will be observed for an hour on an individual basis. They will also be videotaped.

I fully appreciate that you have a very busy schedule, Therefore I will be following up this letter with a phone call to discuss this further at your convenience. I hope that you will find this a very interesting project.

Yours sincerely

DAVIDAH KOSEFF

Dear Parent

My name is Davidah Koseff and I am a music therapy graduate student at the University of the Pacific. I am conducting my thesis, observing the development of rhythm in young children.

I would appreciate it if you would consent to your child's inclusion in my project. This inclusion will involve simply observing your child's interaction with various rhythm instruments, asking your child to imitate or respond to some music, and videotaping the responses.

If you agree to this please complete the attached form and return it to the center as soon as possible.

Thank you for your participation

I _____ agree to the inclusion of my child
(name of parent)

_____ in the research of Davidah Koseff.
(name of child)

I also agree to the videotaping of my child. I understand that
the tapes will be kept confidential and will only be used to
observe my child's response.

(signature of parent)

(date)

GLOSSARY

Assessment - the estimation of behaviors present in the child

Bear Walking - walking with both hands and feet on the floor and with the knees kept straight

Brain stem - consists of the mid brain, pons and medulla. It forms the connection between the brain and spinal cord

Central Nervous System - consists of the brain and spinal cord and controls all the neurological function of the human body

Cephalo-caudal - movement from the head to the feet

Cognitive - involves thinking, memory, recall and reasoning skills

Claves - a musical instrument consisting of 2 rhythm sticks that are struck together to produce sound

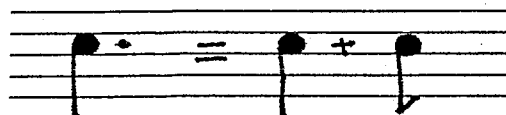
Crescendo - a musical term denoting that the music gets gradually louder

Cruising - the ability of the child to move sideways while holding on to furniture, rails or walls

Delays - in achieving normal developmental milestones such as walking, talking, etc

Development - the natural evolution of behavior

Dotted notes - a dot next to a note increase the length of that note by half its original value eg



Expressive Language - is the verbal or talking part of language including grammar

Hydrocephalus - results from interference in the circulation of the cerebro-spinal fluid causing fluid retention and often brain damage

Hydrocephalus with a Shunt - a shunt is a surgical procedure performed to redirect the fluid away from the brain and maintain adequate flow of the fluid. It decreases the intra-cranial pressure minimizing neurological damage

Inclusion - assimilating the information that the senses take in

Inter-rater/Inter-observer - between two observers who are observing the same behavior there should be consistency of results

Invariant - the order of behavior acquisition is usually unchanging

Myelinated - a myelin sheath is a tissue type that develops around certain spinal nerves facilitating transmission of impulses from one nerve to another

Oculomotor - concerning the muscles that control the movement of the eye and are innervated by the third cranial nerve

Ordering - describes the taking in of information and sequencing that information in the nervous system

Parameters - are the variables under consideration

Proprioceptive - refers to the unconscious sensation of movement, weight and position in space

Protective Reflexes - are reflexes that are present from birth and are designed to ensure the survival of the infant. Some examples include sucking, swallowing and turning the head so that the infant can breath

Proximo-distal - in a direction from the center of the body to the peripheral fingers and toes

Rallentando - a musical term denoting that the sound is gradually becoming slower

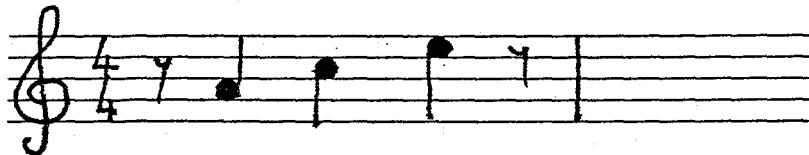
Receptive Language - that part of language involving understanding and comprehension

Reticular Formation - is a large number of ill-defined groups of neurons found between the brain stem and spinal cord. They give rise to cortical arousal and wakefulness and also affect spinal motor activity governing posture

Somatosensory - relating to the sensory component of the body

Spastic Quadripareisis - a form of Cerebral Palsy where all the limbs are involved by increased resistance to movement and decreased joint range

Syncopated Rhythms - this is best explained by an example



Thalamus - is a part of the forebrain. It is a relay station for all sensory tracts and some forms of crude sensation

Vestibular - the neurological system controlling balance. It incorporates the inner ear, the 8th cranial nerve and the vestibular nuclei in the brain

Volitional - actions that occur due to the free will of the person.

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