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MUSIC THERAPY AS A TREATMENT TOOL
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MUSIC THERAPY AS A TREATMENT TOOL FOR AUTISTIC CHILDREN

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ABSTRACT

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FOR AUTISTIC CHILDREN

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The study is designed to investigate music therapy as a treatment tool for autistic children. Many reports from clinical observations and experiments with autistic children emphasize their special responsiveness and unusual interest toward musical stimuli. Thus it is suggested in this study to utilize music in a treatment approach with autistic children. The attempt was undertaken to develop a music therapeutic treatment program directed toward specific areas of deficiencies and dysfunctioning in autistic children. A threefold approach is chosen to accomplish this objective:

1. A systematic review and reappraisal of literature and research findings in autism as pertinent for music therapy.
2. The development of a music therapeutic treatment program for autistic children.
3. Two experimental studies investigating responses of autistic children toward musical stimuli.

To 1.: The development of diagnostic concepts in autism since 1943 is summarized and reviewed. The most current status of diagnostic criteria is discussed as well as the development of differential diagnosis distinguishing autism from other childhood disorders. Concepts and research findings concerning the etiology of autism are presented. The special importance of perceptual, motor and cognitive dysfunctions, based on neurophysiopathological processes, and their

pertinence for music therapy are outlined. Special consideration is given to findings in brain-hemispheric functioning of autistic children. A review of treatment concepts points out strongly the efficiency of well-structured educational settings rather than any form of psychiatric treatment. Implications for music therapy are discussed. A number of experimental findings are presented which reveal specific autistic disabilities in the areas of perceptual, motor and cognitive functioning. Possible applications for music therapy are discussed in this connection. Additionally, findings from literature are presented which reveal particular responses of autistic children to musical stimuli. Finally, already existing treatment experiences with autistic children in music therapy are described.

To 2.: Four treatment areas for autistic children in music therapy are identified:

(1) language development;

(2) social development;

(3) cognitive development;

(4) sensorimotor development.

Based on the systematically presented findings in literature as well as the author's own experience music therapeutic techniques are described in their particular application and purpose for each treatment area. The techniques are built upon each other stepwise proceeding from basic to more complex levels.

To 3.: Two experimental studies were carried out:

(1) test of receptor preference of autistic children (auditory vs. visual);

(2) analysis of improvised tone-sequences of autistic children. The first experiment indicated a weak preference of autistic children for the auditory musical stimulus. The autistic children, however, spent significantly more time with the music than the control groups of normal children. Implications for a music therapeutic treatment concept are discussed.

The second experiment indicated that autistic children's tone patterns, analyzed and scored for rhythm, restriction, complexity, rule adherence and, originality, almost reached the scores of normal children. The highest individual total score was achieved by an autistic child. Autistic children scored significantly higher than a control group of mentally retarded individuals.

Thus both experiments support the notion of unusual musical responsiveness and musical skills in autistic children. It is suggested that these particular musical aptitudes of autistic children should be utilized by music therapy in developing a symptom-oriented treatment program for autistic children.

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Research findings, concepts, and observations on autism, as revealed by the literature, are reviewed and reappraised in this part, regarding their pertinence to music therapy. The review and reappraisal concentrate on six main areas, each subsumed in one chapter. Every chapter contains a systematic description of research findings as well as their interpretation in regard to an eventual treatment concept set forth by music therapy.

CHAPTER I

AUTISM: DIAGNOSTIC CONCEPTS AND DEFINITIONS

In 1906, the word "autism" appeared in the psychiatric literature for the first time. The Swiss Psychiatrist Eugene Bleuler used the word "autism" to describe the quality of some of his patients' psychotic ideations in which they referred everything in the world to themselves.

In 1943, Leo Kanner, a child psychiatrist, employed the word "autism" to describe a group of severely disturbed children who shared certain clinical features. In his paper "Autistic Disturbances of Affective Contact" (Kanner, 1943) he listed 12 diagnostic features which he felt to be characteristic for the description of an illness he had labeled as the syndrome of Early Infantile Autism.

1. The autistic child is always aloof (as opposed to a withdrawal from established contact).
2. The autistic child looks normal, alert, and expressive.
3. Motor coordination seems normal with quick, skillful movements.
4. The child avoids eye-contact and lacks visual or auditory responses to others; thus, the child appears to be deaf and blind to people.
5. There is no physical reaching out from infancy.
6. The child does not initiate sounds or gestures.
7. There is a failure to use speech for purposes of communication.
8. The child has a marked facility with objects.
9. Psychometric performance indicates that cognitive potentialities are masked by the basic disorder. The appeal of form boards

and peg boards yielded evidence of normal or superior performance.

10. There is an obsessive desire to maintain sameness.
11. Bedwetting, thumbsucking, nailbiting and masturbation are rarely associated with early infantile autism.
12. The rate of occurrence is less than one percent of the general population.

Since Kanner's initial labeling there has been a widespread spectrum of opinions about necessary criteria for establishing a diagnosis. Much research and clinical interest has been stimulated by the autistic syndrome, but little agreement could have been achieved about the nature of the illness, how to diagnose and how to treat it. Different researchers emphasized different aspects of the pathologic symptomatology according to their theoretical explanation of the illness.

This chapter, nevertheless, tries to describe the development of diagnostic concepts in the last three decades in order to show consistencies and disagreements among the different concepts. Especially, recent research findings of the last decade show some new directions in understanding autism and give reason for hope in finding more appropriate treatment concepts for this still puzzling illness. Music therapy, in investigating its own resources for an eventual treatment of autistic children, therefore, has to be concerned about diagnostic problems as well as differentiation between autism and various other conditions such as mental retardation, childhood schizophrenia, and language disorders.

In 1956, Kanner and Eisenberg reduced the original diagnostic concept of 1943 to two major diagnostic features which they thought to be essential and unequivocal in comparison to other types of childhood psychopathology:

1. The lack of object relations.
2. The maintenance of sameness via stereotypical behavior.

Mahler (1952, 1968), using the term autistic psychosis, developed three distinctive diagnostic features:

1. An obsessive desire for the maintenance of sameness.
2. Lack of the use of speech for communication.
3. A stereotyped preoccupation with a few inanimate objects or action patterns towards which the autistic child shows the only signs of emotional attachment.

Rimland's (1964) diagnostic concept for autistic children consisted of six characteristics:

1. Presence of the syndrome from the beginning of life.
2. The lack of physical responsiveness.
3. Autistic aloneness.
4. Preservation of sameness.
5. Unusual capabilities in memory, music and mechanical performance.
6. Good physical health and motor performance.

All three diagnostic concepts contain the maintenance of sameness and autistic aloneness, the lack of personal relating, as common diagnostic features. Lack of communicative speech (Mahler) and absence of physical disorder (Rimland) were part of Kanner's original diagnostic list. Kanner (1956) had extended the age of pathological onset up to the first year of life; whereas, Rimland insisted on the presence of pathological symptoms from birth. This difference proved to be of highly theoretical value in light of later research (Rutter, 1978; Ritvo, 1976) as the observation of pathological signs in that early stage of life mainly relies on subjective observations. Pathological signs can be virtually overlooked in the first weeks or months of a child's life; thus, it is

generally accepted today that the limits for age of onset extend up to 30 months (Rutter, 1978).

Anthony (1958) tried to differentiate two different patterns of development of autistic behavior. The first pattern is characterized by an early onset without a period of observable upheaval in behavior. This pattern was labeled by Anthony as primary autism, congruent with the syndrome of early infantile autism as described by Kanner (1943). The second pattern is seen as profound regression after a period of normal development, usually accompanied by a major involvement of gross cerebral disease. This pattern was labeled as secondary autism. Anthony did not add new diagnostic criteria other than acknowledging the fact that autistic behavior could also be observed in children who had shown normal development for a period of time or where organic factors could have been traced back as part of the pathological feature.

A similar position has been taken by Ward (1970) who found by his own research as well as review of other diagnostic concepts that at least two basic diagnostic types of autistic children exist: One group, with the presence of the syndrome from birth, was labeled by him as psychogenic autistic children. The following diagnostic criteria were given as description of these autistic types:

1. Lack of object relations from birth.
2. Lack of use of speech for communication.
3. Maintenance of sameness via stereotypical behavior.
4. Lack of neurological or developmental dysfunction.

The second group of children was labeled by him as organic autistic, exhibiting developmental and perceptual problems as part of severe regression after a period of normal development. Ward, therefore, was pursuing the same diagnostic direction as Anthony, dividing autism into

organic and psychogenic types. The psychogenic type seems to be defined basically by the same diagnostic criteria as already summarized for Kanner, Rimland and Mahler. Again the distortion of language and the absence of neuropathological conditions are added to Kanner's and Eisenberg's (1956) two major diagnostic features.

Polan and Spencer (1959) devised a diagnostic checklist for describing the primary symptoms of early infantile autism. The diagnostic categories are:

1. Language distortion.
2. Lack of social responsiveness.
3. Lack of integration in all behaviors and activities of organism.
4. Obsessiveness and nervousness (lack of adaptability to environmental change).
5. Family history.

Nothing is explicitly stated about time of onset of pathology.

The British Working Party (BWP), headed by Creak (1964) developed the diagnostic concept of the "schizophrenic syndrome of childhood" in which they believe the characteristics of infantile autism are imbedded. The BWP-system, as discussed by O'Gorman (1967), can be divided into six aspects of autistic behavior:

1. Withdrawal from reality. Failure to form relationships with people.
2. Serious intellectual retardation with islets of normal or exceptional intellectual skills.
3. Failure to acquire speech or use it for communication.
4. Abnormal response to sensory stimuli.
5. Sustained mannerisms or peculiarities of movement.
6. Pathological attachment to maintenance of sameness.

Lotter's (1966) checklist for diagnosing autistic behavior contains five diagnostic features:

1. Language distortion.
2. Social withdrawal, aloofness.
3. Movement peculiarities (self-spinning, jumping, toe-walking, etc.).
4. Abnormal response to auditory stimulation.
5. Repetitive ritualistic behavior to maintain sameness.

The DeMyer-Churchill diagnostic system (1971) contains four criteria for identifying infantile autism:

1. Emotional withdrawal from people before the age of three.
2. Lack of speech for communication.
3. Nonfunctional, repetitive use of objects.
4. Failure to engage in role play alone or with other children.

Based on findings in the perceptual-motor performance the children were furthermore classified as having primary (higher functioning) or secondary (lower functioning) autism. Unfortunately we find here the same notions as used by Anthony (1958) although primary and secondary autism meant something essentially different in his diagnostic concept.

The last four described diagnostic systems, Polan and Spencer, Lotter, BWP, DeMyer-Churchill, show some marked consistencies as well as differences with the aforementioned concepts of Kanner, Kanner and Eisenberg, Mahler, Rimland, Anthony, and Ward.

Regardless of etiological considerations there are three diagnostic features which reoccur in all concepts:

1. <u>Impaired social relationships:</u> expressed by autistic aloofness, lack of physical responsiveness, lack of object relations, lack of emotional attachment to other people, and avoidance of

eye-contact.

2. Pathological attachment to maintenance of sameness: expressed by stereotyped behavior patterns, often of a repetitive nature, disturbances by environmental change, rituals, and obsessive preoccupation with meaningless manipulation of objects.
3. Language distortion: expressed as ranging from total muteness to echolalia or speech without use for communication.

Marked inconsistencies between the different concepts can be found in two diagnostic features:

1. Age of onset.

   The first group of diagnostic models (Kanner, Kanner and Eisenberg, Mahler, Rimland, Anthony, Ward) insists on an early pathological onset, without an observable regression period, either present from birth or within the first year of life. The second group (Polan and Spencer, Lotter, BWP, DeMyer-Churchill) does not elaborate on the question of time of onset except DeMyer-Churchill who extend the onset time up to three years of age.

   This inconsistency seems to be resolved by the general agreement (according to the World Health Organization draft glossary) to accept 30 months as the upper time-limit for the onset of autism. Two reasons support this agreement:

   1) The difficulty in deciding if the child's development at such an early age has been trouble-free in all respects. No valid objective observational technique exists to cover all children with suspected autistic symptoms from birth.
   2) As some disintegrative childhood psychoses begin at about the age of three, it seems to be reasonable to set the onset age limit for autism slightly lower in order to emphasize the

child's failure to develop relationships rather than a child's withdrawal from relationships in terms of a regressive upheaval (Rutter, 1978).

It seems, therefore, that the onset time limit of 30 months is a reasonable compromise taking into account, as well, the inaccuracy of diagnostic techniques as some differentiating aspects of the autistic symptomatology.

2. Absence of neurological or developmental dysfunction.

This criterion, as mentioned mostly by the first group of diagnostic systems for differentiation between psychogenic and organic types of pathogeneses, does not appear in the second group's diagnostic features. This becomes understandable in light of long-term follow-up studies of autistic children (Rutter, 1970; Creak, 1963; Lotter, 1974) which clearly show that a considerable portion of these children without evidence of neurological disorder in early childhood develop epileptic fits in adolescence. It could be argued that these dysfunctions which remained unidentified in initial diagnosis could have played an important role in the child's illness. The evidence that neurological assessment is not necessarily able to detect "soft" or "minimal" brain dysfunctions which later turn out to have been present in autistic children, suggests that a diagnostic criterion "absence of neurological dysfunction" would have little validity. However, the presence of diagnosable brain damage certainly would influence an autistic diagnosis. Thus the absence or presence of neurological disorder could rather be used as an indirect diagnostic criterion.

New diagnostic features are added by Lotter, BWP, and Polan and Spencer: Lack of integration in all behaviors and activities of the organism which Polan and Spencer (1959) illustrate, for example, by mentioning preoccupation with isolated sensory impressions; abnormal response to sensory stimuli, with special mentioning of auditory stimulation; sustained mannerisms or pecularities of movement (self-spinning, jumping, hand-flapping, toe-walking, spinning objects, rhythmical movements of body).

The diagnostic importance of these last mentioned areas, namely sensory perception and body-motility is most prominently emphasized by the work of Orintz and Ritvo (1976). Their major diagnostic characteristics for autism are:

1. Disturbances of perception.
2. Disturbances of developmental rate.
3. Disturbances of relating.
4. Disturbances of speech and language.
5. Disturbances of motility.

The pathological onset is flexibly set at up to 24-36 months of age. Again the distortion of social relationships and language distortion are two diagnostic criteria which can be found in all other diagnostic concepts. Disturbances of developmental rate can be partly subsumed under these two features as deviation from normal sequential motor, language and social development.

The most decisive difference in Ornitz's and Ritvo's concept is the emphasis on perceptual dysfunctions as criteria fundamental to all other diagnostic characteristics. Perceptual dysfunctions, described as faulty perception and modulation of external sensory input (Ornitz and Ritvo, 1968) result behaviorally in frequently abrupt alternating

states of hyper or hyporesponsivity. This perceptual inconstency is viewed as being related to the usually mentioned feature of maintenance of sameness in autistic children. The insistence on sameness as shown by stereotyped motility or play patterns, abnormal preoccupations with objects, or resistance to change would be a direct result of the perceptual impairment in so far as these perceptual dysfunctions make it impossible to process meaningfully the normal amount of sensory input. Such perceptual impairment might result in restricted perceptual focus on only parts of the external environment. Furthermore, the feature "maintenance of sameness" is often mentioned in regard to such aspects as stereotyped behavior patterns and repetitive body movements. It seems likely that some of these repetitive, ritualistic motility patterns, mostly of the hands and arms, can be related to the observed stereotyped behavior within the feature of maintenance of sameness. Hence a relationship between motility disturbances and perceptual dysfunctions could be assumed to be as suggested by Ornitz and Ritvo (1976).

Schopler (1966), Weber (1973) and Ritvo and Provence (1953) refer in their diagnostic findings to specific perceptual problems of autistic children. Severe visual impairment and high dependence on tactile and kinesthetic feedback in sensory exploration are pointed out. These reports would support the diagnostic criteria of Ornitz and Ritvo as well as their emphasis of perceptual disturbances as a primary factor. As a last diagnostic model Rutter (1978) will be mentioned, who gives four diagnostic criteria for identifying infantile autism. His concept also summarizes one stream of the development of diagnostic concepts:

1. Onset before the age of 30 months.
2. Impaired social development.
3. Delayed and deviant language development.

4. Insistence on sameness.

These four criteria certainly represent a maximal consent between all former diagnostic concepts and can be accepted as an extract of all the concepts reviewed. Regardless of etiological considerations these four criteria seemed to be the most valid ones in the development of diagnosing autism.

The concept of Ornitz and Ritvo differs essentially on one point: Insistence of sameness is substituted by perceptual disturbances and motility disturbances. These new criteria seem to be strongly related to etiological considerations and, thus, present a different view on autism. Both diagnostic concepts agree on three criteria and differ on one criterion whereby this difference might consist of a different interpretation of the same observed phenomena. In this respect both concepts are not necessarily contradicting each other but rather describing different aspects of etiological implications.

In concluding this chapter some last remarks will be made concerning differential diagnosis. Consideration has to be given as well to diseases which are known to occur in association with autism, such as congenital rubella, mental retardation, and to diseases with overlapping symptomatology.

Autistic and mentally retarded children have been compared in many studies. There seems to be general agreement that both conditions can be differentiated meaningfully and with some degree of validity. Autistic children, unlike mentally retarded children, exhibit a cognitive deficit involving language and memory processes, central coding and categorizing of information input (Rutter, 1978). The differential diagnosis appears to be more complicated when autism and mental retardation co-exist. There seems to be a difference in character of the

cognitive defects as well as of the social impairment between high and low functioning autistic children.

Another area of differential diagnosis exists between autism and developmental language disorders. Although some overlapping in symptomatology exists (e.g., abnormal response to sound, delayed acquisition of language, and secondary disturbances in social relating), systematic investigations have shown clear differences between both conditions. For instance autistic children's defects in usage and understanding of language include gestures, written language, abstract concepts, and perception of nonverbal expressions of others.

A much more complicated problem for differential diagnosis exists in differentiating between autism and other psychotic conditions such as autism and schizophrenia. Autism and childhood schizophrenia often have been used interchangeably in clinical observation and diagnosis of autistic children. This use has elevated a considerable amount of confusion about viewing autism and childhood schizophrenia as distinct syndromes or parts of a continuum of one disease. Basically two different positions exist on this issue:

One hypothesis, strongly represented by Rutter (1972), regards autism and childhood schizophrenia as distinct syndromes. Rutter suggests the main differences are as follows:

1. Time of onset -- Autism manifested during first three years of life. Schizophrenia manifested between three years of age and adolescence.
2. Familial factors of schizophrenia -- None in autism, present in schizophrenia.
3. Symptomatology -- No development of delusions and hallucinations in autistic individuals in contrast to schizophrenics.

4. Course of disease -- Episodic course with remissions and relapses as characteristic for schizophrenia in contrast to autism.

Ornitz (1971) supports the position that there is a continuum of one disease process including autism and schizophrenia. In support of this he reports clinical data which show that autistic children after the age of eight to twelve often begin to exhibit symptoms which fit in the clinical picture of schizophrenia. These data have been disputed by Rutter (1978) due to the failure of making systematic comparison by the age of onset.

In summarizing the preceding review the following main points can be delineated in regard to diagnosis of the syndrome of infantile autism:

1. Autistic children may have neurological disorders which remain undiagnosable by neurological assessment. Nonspecific evidence of brain damage (fits) may not develop before early adolescence; nevertheless, neurological assessment should be used to determine cases where autism is secondary to a diagnosable disease (indirect, excluding diagnostic tool).
2. Rutter's (1978) four diagnostic criteria integrate most of the diagnostic models elevated since Kanner's (1943) initial labeling of the syndrome.
3. Two other diagnostic criteria are additionally presented by Ornitz and Ritvo (1976), namely "disturbances in perception" (considered as a primary diagnostic feature) and "disturbances in motility". Both categories appear already in the diagnostic concepts of Polan and Spencer (1959), BWP (1964), and Lotter (1966) in different formulations.
4. Agreement about differential diagnosis exists in regard to autism and developmental language disorders and mental retardation

respectively. Markedly different positions are represented in regard to differential diagnosis between autism and childhood schizophrenia.

CHAPTER 2

ETIOLOGY

Many different attempts have been undertaken in the last 30 years to explain the nature of autism. The initial etiological concept by Kanner (1943) viewed autism as a result of genetic factors interacting with emotional deprivation. Kanner always emphasized that almost all the parents of autistic children he came into contact with showed significant lack of warmth, emotionality, and obsession with meticulousness and intellectualization. It is difficult to decide which factors (genetic or psychological) were stressed more by Kanner's etiological concept. In coining the term "total psychobiological disorder" (Kanner and Eisenberg, 1956) they emphasized the interpenetrating influence of both factors, but nevertheless strongly drawing attention to the psychodynamic factors represented by a high percentage of frigidity in the family with autistic children.

Similar positions, interpreting autism from viewpoints involving psychogenic concepts were put forward by Mahler (1952), Despert (1951), Rank (1955) and Bettelheim (1967) who attempted to explain autism exclusively from a psychoanalytical point of view.

Polan and Spencer (1959) pointed out the relevance of both psychogenic factors and functioning of the perceptual apparatus. A similar position was taken by Anthony (1958) although he related perceptual problems more to his diagnostic category of secondary autism.

In reviewing the research literature it seems as if etiological concepts involving psychogenic theories have lost their original importance.

Three main factors may account for their development:

1. A general failure in research to reveal consistent psychosocial variables which can cause autism. Deeper investigation of family factors have strongly disputed Kanner's original description of the typical autistic family background.
2. A general failure of psychogenically based treatment concepts, such as psychiatric interventions and psychotherapy, to influence positively the course of the illness.
3. An increasing amount of advanced research from neurophysiological and psychological standpoints which begins to reveal in more detail the particular deficiencies and disabilities of autistic children.

Schopler (1965, 1966) developed an etiological concept which is based on investigations of receptor preferences in autistic and schizophrenic children (Goldfarb, 1956, 1964). He postulated that autistic children are fixated at a stage of tactile sensory perception in contrast to normal children who usually proceed to distant (auditory, visual) receptor preference after early childhood. Findings of Hermelin and O'Connor (1966, 1970) and Frith and Hermelin (1969) show the strong dependence of autistic children on their own sensorimotor (kinesthetic) feedback in order to make perceptual discriminations. Schopler, thus, suggests that autism involves sensory deprivation by fixation on near-receptor usage. Assuming some constitutional deficiency in the child inhibiting certain reticular arousal functions, and the mothering tendency to understimulation, the child would exhibit symptoms of sensory deprivation caused by insufficient near-receptor stimulation (Schopler, 1966). Schopler's etiological model takes into account physiological aspects in more detail, suggesting perceptual deficits, although he also considers

psychological factors (Kanner's "cold mothers") to be of etiological importance. The findings about receptor preference in autistic children gained new importance in light of further research which will be discussed later.

A number of new hypotheses have been put forward in the last twelve years to explain the etiology of infantile autism. Three main categories can be delineated, according to Tanguay (1976):

1. Theory of defect in cross-modal association.

   This theory is based on the observation that autistic children seem to have great difficulties in perceiving sensory input in one modality and respond to it in another modality; e.g., response to visual stimulus with a motor response. Studies of Lovaas, et al. (1971), Koegel, et al. (1973) and Bryson (1970) have most prominently supported this theory. The brain functions which underly these processes of translating sensory information from one sense modality into another are not yet very well known. The observations underlying this theory, however, reveal in more detail another aspect of the perceptual disturbances in autistic children which might turn out to be of crucial importance. A dysfunctioning interconnection between different sensory channels would essentially affect learning, perceiving environment, and the grasping of concrete and abstract concepts.

2. Theory of perceptual inconstancy.

   This theory was introduced to the research literature in 1968 by two articles of Ornitz and Ritvo. Based on neurophysiological studies, they suggest that the autistic child suffers from a neuropathophysiological defect which results in faulty modulation or integration of sensory input within the brain. The faulty

modulation of sensory input may be manifested as the disability to gain a stable inner representation of the environment. In recent studies, Ornitz (1974) suggested a possible pathophysiological connection between the perceptual disturbances and the motility disturbances often observed in autistic children (see Chapter 1). He extended the notion of faulty modulation of sensory input to faulty modulation of motor output as well. Sensory input and motor output are both related by the same pathophysiological mechanisms and may be manifested in either a state of hyposensitivity or hypersensitivity in reaction to sensory stimulation.

Two observations in regard to perceptual processes regained new importance in this theory: Schopler's (1966) and Goldfarb's (1956, 1964) findings about receptor preference (tactile modality) and the reliance on motor (kinesthetic) feedback to make perceptual discriminations (Hermelin and O'Connor, 1966, 1970; Frith and Hermelin, 1969).

Ornitz suggested that the strange motility patterns of autistic children, which involve motor feedback and tactile sensation, are compensatory activities helping the child to make sense out of his fluctuating sensory experience. Sensory input and motor output would affect each other, tied together by a common neurophysiological mechanism. The faulty regulation of both factors led Ornitz to suggest the etiological concept of autism as a disorder of sensorimotor integration. The notion of perceptual inconstancy could be more accurately labeled as sensorimotor inconstancy.

The neurophysiological research of Ornitz and Ritvo centers

around the hypothesis that a dysfunction of the central connections of the vestibular system with the cerebellum and the brain stem may be responsible for the sensorimotor disturbances observed in autistic children (Ornitz, 1974).

3. Theory of a central cognitive defect.

Rutter (1978) has postulated that autism involves severe cognitive defects which probably have their origin in some form of organic brain dysfunction. Rutter particularly focused on language impairment in investigating the nature of cognitive deficits. Some of the major characteristics of these deficits are:

1) Difficulties in decoding and encoding in auditory and visual modes.
2) Difficulties in understanding information in temporal, sequential or linear patterns.
3) Little use of meaning in memory and thought processes.
4) Impairment in verbal understanding and abstraction.
5) Inability to use signs and symbols.

Deficits of cognitive processes were also investigated by Hermelin and O'Connor (1970). Their main interest was focused on the mechanisms integrating perceptual processes. In investigations of cross-modal and within-modal problems they tested, e.g., the capacity of integrating immediate sense data in one sense modality with past data stored in other sense modalities. The tremendous difficulties autistic children exhibited in these tests suggest that difficulties in cross-modal association, extended by the dimension of memory-storage, may be just as responsible for cognitive deficits as other deficiencies which can be traced back to perceptual problems. Thus all three etiological concepts

just presented seem to point in a similar direction by emphasizing different aspects. Various perceptual problems are considered to be of etiological importance for the syndrome of infantile autism:

1. Near receptor preference (tactile).
2. Reliance on motor (kinesthetic) feedback for perceptual discrimination.
3. Faulty modulation of sensory input and motor output, manifested respectively by hypo- and hypersensitivity.
4. Lack of cross-modal association between different sensory modalities in regard to stimulus perception and response.
5. Dysfunction of sensory integrative mechanisms.
6. Various defects in decoding and encoding information, mainly in auditory and visual modalities.

Previously reviewed research evidence suggests that one should view autism as a nonspecific syndrome of biological impairment whereby the causation is considered to be some type of organic brain disease. Research about the location of abnormality focuses on the reticular formation and vestibular system.

These findings, in contrast to any etiological concept involving psychogenic theories, gain pertinence for music therapy as a treatment tool for autistic children. The focus of treatment will undergo an essential shift when findings pertinent to etiology are considered. The main treatment goal in psychogenic concepts, namely establishing a relationship with the autistic child in order to treat his emotional impairment, would change its value. In light of any organic concept this treatment goal would be viewed rather as a necessary precondition to reaching the child in order to deal with his various perceptual, motor and cognitive disturbances. Music therapy would need to extend its

potential from techniques for establishing relationships to the providing of sensory stimulation according to the perceptual dysfunctions outlined above. The question arises whether music therapy can provide the necessary stimulus modalities and if music therapy can help in training perceptual processes as pertinent to etiological findings. In order to answer these questions it would be important to say something about the effect of the perceptual deficits on the ability or inability of autistic children to perceive musical stimuli.

In this connection the growing body of research literature on the subject of brain hemispheric specialization might be of considerable interest. Certain aspects of music, such as melody, harmony, and rhythm, are processed by the right brain hemisphere (Kimura, 1964). Apparently the handicaps of autistic children (e.g., language deficits) involve functions which are processed predominantly in the left hemisphere. In contrast, the abilities of autistic children (e.g., form perception, visuo-spatial perception) seem to be related to functions predominantly located in the right hemisphere. The unusual reaction of autistic children to music (Rimland, 1964), as revealed in Chapter 5, would find its neurological explanation in these observations. Two main hypotheses in regard to brain hemispheric specialization of autistic children will be revealed shortly.

Tanguay (1976) refers to the fact that differentiation of functions between the two hemispheres develops in the first few years of life; at first, both hemispheres may function as a unit relatively immature and plastic, mostly able to process information in a holistic and spatially oriented manner (functional characteristics of the right hemisphere in later brain development). Thus Tanguay suggests that autistic children fail to develop hemispheric specialization and remain at the immature

level of brain-functioning. He reports his own experimental findings which support this hypothesis.

DeLong (1978) carried out pneumoencephalographic investigations with 17 autistic children and found in 15 cases enlargement of the left lateral ventricel, and particularly, enlargement of the left temporal horn. He related these pathological findings to the possibility of hemispheric lesions in autistic children, particularly on the left side. Furthermore, DeLong suggests that in autism the left hemisphere seems uniquely impaired without takeover of the disturbed functions by the opposite hemisphere. Specific cortical functions are not transferred to the contralateral hemisphere unless there is a lesion in the cortical area involved (Milner, 1974). Thus good skills in music, visuo-spatial and mechanical areas, would account for normal right-hemispheric functions whereas left-hemispheric function would remain low and uncompensated by transfer to the contralateral hemisphere.

Interpretations of these findings have to be extremely cautious, as too many factors of the complex brain functioning remain unknown in regard to cognitive, perceptual and social processes. Nevertheless the whole area of brain hemispheric research is pertinent to music therapy: if the shift to right-hemispheric processing has occured in the autistic child, the child would be predominantly capable of processing meaningfully only right-hemisphere information such as non-verbal, musical or spatial information but virtually ignore language or any sequentially organized information.

In regard to these considerations music, in fact, could be used as a starting point to influence the perceptual processes of autistic children.

CHAPTER 3

Treatment

The treatment concepts for autistic children have traditionally followed the developments of diagnostic and etiological theories. The syndrome of early infantile autism, as initially diagnosed and described in psychiatry, seemed at first exclusively accessible for psychiatric interventions. Parental pathology, the child's failure in forming early bonds in mother-child relationships due to emotional rejection and other psychological features stood in the focus of treatment approaches. Nevertheless, already in 1956 Kanner and Eisenberg stated the small positive effect psychotherapy had on the course of the disease. Polan and Spencer (1959) and Rimland (1964) both suggested that apparently none of the various psychiatric treatments employed had any influence in altering the course of autism. Between 1955 and 1970, various treatment concepts have been put forward suggesting combinations of different therapeutic techniques. Some of them will be revealed concisely.

Polan and Spencer (1959) emphasized the importance of a warm, human relationship combined with a reality-oriented therapeutic situation involving structure, and teaching the patient daily-living skills. Brief periods of play therapy were found to stimulate the patient's responsiveness. Similar concepts were reported by Schopler (1964) and Zaslow (1957). Both authors emphasized persistent verbal and physical stimulation in the therapeutic situation. Schopler (1964) suggested therapeutical intervention focused on physical contact and bodily games such as swinging the child by the feet. The concept was based on viewing the autistic child's disturbances on a sensory level (high stimulus threshold coupled with mothering of low stimulation).

Zaslow (1957) also proposed a treatment approach based on an intensive physical interaction between therapist and child. His approach attempted to reproduce the mothering act of holding and picking up the infant in order to transform his rage and motor resistance into positive affective responsiveness. Waal (1955) emphasized bodily stimulation and manipulation which eventually would result in bodily maturation and a break in the autistic withdrawal. All three authors, Schopler, Zaslow and Waal, emphasized warm relationships and strong physical contact with the patient. Zaslow and Waal suggested this under solely psychogenic considerations in regard to etiology whereas Schopler also considered some physiological features (stimulus threshold) as important for establishing his treatment concept.

Bettelheim (1967) suggested a treatment concept based on intensive, analytically oriented psychotherapy. The child was put into complete freedom of behavior to give room for regression processes which might lead back to the pathological experience which has caused the ego-distortion and withdrawal of the autistic child. In regard to the effect of his treatment program (healing quote of 42%) Bettelheim's reports failed to give clear diagnostic distinctions and, thus, remained strongly disputed, (Ward, 1970) particularly as the amount of quoted "healings" is such an "unusual" figure compared to all other treatment approaches.

Clancy (1969) proposed a concept of family therapy suggesting that congenital and psychogenic (mother-child bond) factors may be involved in establishing the autistic process, which operates within a social system, the family. In contradiction with Bettelheim, Clancy emphasized forceful demands by parents and a rigid structure in which negative behavior (withdrawal) has to be intruded upon and rejected.

Elements of this concept show resemblance to the concept of behavior modification for autistic children which has been fostered particularly by Lovaas (1974). This approach will be mentioned later in regard to educational approaches.

Haffter (1973) mentioned the importance of psychomotor therapy for developing body-image, self-concept, and imitative skills in autistic children.

None of these approaches discussed so far, however, has shown more than very limited progress with autistic children. As O'Gorman (1967) has pointed out, one major reason for this general failure might have been the lack of clarity as to the etiology of autism. It seems as if a permanent shift between considerations of psychogenic and organic factors has caused much confusion in treatment approaches. A cure based on a fully identified cause would be, certainly, most desirable, especially for the autistic syndrome. Nevertheless, as Rutter (1978) points out, effective treatments often are discovered or developed without knowledge of why they work. Unfortunately a similar position occurs in autism where the "true" cause has not been discovered yet. Thus treatment can only be developed by trial-and-error searching, evaluating effect and mode of action solely by observations and practicality.

As already discussed in Chapter 2, research findings in the last decade tend to view autism as some organic dysfunction manifesting itself in cognitive and other various developmental deficits. Consequently autistic children would not need, primarily, psychological interventions but treatment programs geared to their specific needs and abilities which provide a maximum of educational, linguistic, cognitive and behavioral training. Interestingly, one of the most important studies in investigating different treatment programs for autistic children

pointed strongly in the direction hypothesized above. The study was carried out by Bartak and Rutter (1973) and Rutter and Bartak (1973) and actually emphasized a new direction in setting up a practical treatment concept for autistic children. The study was designed to assess the value of special educational treatment for autistic children. Three different school programs were investigated: one school employed regressive techniques in a warm, permissive atmosphere. The treatment was psychotherapeutically oriented. Minimal attention was given to the teaching of specific skills. Much time was spent by the children in free play with individual staff members present. The other school employed special educational methods in a permissive classroom environment. Programs varied from fairly structured, to free play, settings. The third school provided a highly structured and didactic approach in which the main focus was on perceptual, motor and cognitive handicaps, viewed as primary symptoms of autism. Most time was spent on teaching the child specific skills. Follow-up studies were performed for all children in all schools over a period of three and a half years. The results demonstrated that all children had made considerable progress in educational, linguistic, cognitive and behavioral status. The children of the third school (highly structured and didactic approach) showed significantly better results in all areas, except the behavioral area (no significant difference). The progress in using speech, a very crucial aspect of autism, was markedly better in the very structured program. This study may serve as an example to illustrate the change which has taken place in the treatment approach towards autism.

Education, after 25 years of lay-back, has begun to claim responsibility for the treatment of autistic children, assuming with qualified optimism, that autistic children can realize their potential best in an

educational setting. A most important feature, as the above mentioned study revealed, would be the aspect of structure: structuring the child's responses as well as structuring the environmental stimuli around the child.

The educational treatment approach also changed the evaluation of the parent's function in the treatment process. Often seen as a disturbing factor or even viewed as patients deserving some treatment as well, the working partnership between parents and professionals is now considered to be an essential element in the whole treatment. Lovaas (1973, 1978), Schopler and Reichler (1971) and Schopler (1978) have emphasized this point quite eloquently. Parents and professionals can complement their findings and observations in regard to the child's behavior, in order to create a consistent external environmental organization in school and home. This would facilitate the transference and maintenance of acquired progress and improved skills in different environments for the autistic child.

Both points, the structured educational setting and the involvement of parents in the treatment, have been outlined by Tanguay (1978) as commonly emphasized aspects of recent literature about educational treatment programs.

According to Callias (1978) three general aims of education for autistic children may be outlined: (1) to prevent or reduce secondary behavior handicaps; (2) to find approaches which circumvent the primary handicaps; (3) to find ways of helping children to develop functions which are involved in the primary handicaps.

Every educational program so far has developed its own techniques of initial assessment procedures, in order to determine the child's level of functioning. In reviewing some literature about school programs for

autistic children, curricula seem to center around five main teaching areas:

1. Social-behavioral:

   Decrease of attention-deleting behavior such as motility disturbances, self-aggressive behavior, self-stimulation and temper tantrums. Fostering of cooperative play, social interaction and awareness, control over own behavior, peer-relations.

2. Independent living and self-help skills:

   Toileting, eating, dressing, hygiene, safety.

3. Sensory-motor:

   Fine and gross-motor skills, sensory integration and perception in different modalities, body image, movement imitation, physical contact, motor response.

4. Cognitive:

   Reading, spelling, basic math concepts.

5. Language:

   Usually major focus of educational efforts. Psycholinguistic concepts for developing receptive and expressive language in phonemic, syntactic and semantic areas; frequent techniques used are matching pictures to objects or words, sign-language, imitation sequences from gross-motor to fine-motor, oral motor and finally vocalization.

Behavioral (mainly operant) approaches determine most of the reviewed school programs. Limitations of the behavioral approach are most often mentioned in regard to the failure to teach "to learn how to learn" (Graham, 1976). Nevertheless some essential features seem to have proven their efficiency and usefulness in teaching autistic children (Callias, 1978). Lansing and Schopler (1978) emphasized that behavior modification

techniques must be adapted to the child's needs and the practicalities of home and school environment. The same authors reported a task analysis study which reveals some of the essential features of the behavioral teaching method:

1. Deciding on a relevant task.
2. Functional analysis of child's behavior.
3. Breakdown of task in learning steps.
4. Monitoring progress and altering training approach if necessary.

Callias (1978) also suggested that systematic reinforcement techniques may help to overcome some motivational problems typical for autistic children. Graham (1976) pointed out the importance of social reinforcers such as a smile or praise in order to avoid meaningless performance of skills or even hindrance of progress.

Overall it can be summarized that a structural approach to teaching autistic children which frequently employs aspects of behavioral techniques is generally accepted as the most useful approach. Structure means, as well, a thorough, planned time-table for the daily program as an organization of learning situations which may facilitate correct behavior (Callias, 1978).

Some aspects of the above reviewed treatment programs will be outlined again as they may gain special pertinence for music therapy in developing its own treatment program.

1. The relative success, which educational programs seem to provide in treating autistic children, could also determine the treatment approach which music therapy eventually would establish. This would mean mainly four things for music therapy: (1) to shift institutionally from hospital settings or psychotherapeutically oriented programs to educational settings which integrate

specialized learning and therapeutic techniques; (2) to focus on perceptual, motor, and cognitive deficits as main treatment areas in autism; (3) to develop music therapeutic techniques which serve the three general educational goals for autistic children as stated by Callias (1978); (4) to view music therapy as part of a specialized treatment program where many different learning and therapeutic techniques from different scientific fields have to work together, complementing each other.

2. Music therapy should try to integrate parental support and active cooperation in its treatment program. Parents may watch treatment sessions, and as well they may contribute by their own observations or transferring music therapeutic activities into the situation at home.

3. Music therapy programs for autistic children should possess a threefold structure. A structural approach refers to the succession of activities as well as to a long-term assessment of therapeutic goals based on diagnostic findings in regard to primary symptoms. The third aspect of structure would refer to the micro-organization of learning situations. Task analysis and other behavioral techniques may be employed here.

4. An appraisal of music therapeutic techniques in regard to the five main areas in curricula for autistic children (social/behavioral, self-help skills, sensorimotor, cognitive, language) would possibly locate music therapy predominantly in the areas of social/behavioral and sensorimotor development. Music would be employed as a tool, working as a nonverbal communication system related to the autistic child's responsiveness, and as a sensory medium working on the level of sensory perception, integrating

aspects of motor, auditory, visual and tactile perception. Applications of music therapy would also be conceivable regarding cognitive and language movement. Music therapy would function mainly as a mediating tool to facilitate or clarify the comprehension of nonmusical concepts, e.g., number concepts, vocalization exercises, oral motor imitation, and music as part of the learning environment (action songs).

All of the outlined aspects pertinent to music therapy will be elaborated in concrete detail in Part Two of this study.

CHAPTER 4

EXPERIMENTAL STUDIES AND CLINICAL OBSERVATIONS ABOUT PERCEPTUAL, MOTOR AND COGNITIVE DEFICITS IN AUTISTIC CHILDREN

Much has been said in the preceding chapter about the perceptual problems of autistic children. A huge amount of the research which has been done in the last 15 years centers around these perceptual problems. The research findings, mainly in the field of neurophysiological and psychological investigations, suggest that the disturbances of perception, usually in absense of an overt sense organ pathology, have to be considered a central part of the behavioral characteristics of autism (Ornitz and Ritvo, 1976).

In this chapter attention will be drawn to specific perceptual disabilities of autistic children as revealed by a number of experiments. The findings will be interpreted in their specific pertinence to music therapy as a treatment tool for autistic children.

Ritvo and Provence (1953) reported certain findings in a group of autistic children seen for diagnosis over a period of two years. The findings can be summarized in five main features: (1) persistent tactile exploration of objects (mouthing, tapping, rubbing); (2) poor body motility; (3) repetitive, monotonous motility patterns (head banging, body rocking, walking in circles); (4) poor imitation in the areas of drawing, movement activities, sound imitation; (5) high form perception, adequate to chronological age using form-board, color forms and geometrical forms.

For interpreting these findings the authors assume an underlying disturbance in perceiving the periphery of the organism, the rind of the

ego. This interpretation would account for the high value of tactile manipulation in perceiving the environment as well as for the superior performance on the formboard where the hand can lend cathexis to the object. The repetition of motility patterns would give persistent motor feedback for experiencing the boundaries of their own bodies. The poor differentiation between self and nonself would account for the paucity in imitation.

Schopler (1966) measured the receptor preference of normal and schizophrenic children between visual and tactile stimuli. The author did not differentiate between the autistic and schizophrenic syndrome in this study but claimed in other studies (1965) the validity of the results also for receptor processes in autistic children. The schizophrenic children showed a significantly lower preference for the visual stimuli than the age-matched normal children. Retarded children, used as the mental-age control group, showed greater visual preference than schizophrenics of comparable mental age. The fact that the schizophrenic children did not make normal use of their visual receptors, but spent a greater proportion of time in tactual near receptor exploration, was consistent with Goldfarb's (1956, 1961) receptor hypothesis which suggests that schizophrenic children make excessive use of tactile-kinesthetic exploration of objects and environment. This behavior is comparable to the sensory-motor period of very young children (Piaget, 1952), during which the change from reflex behavior (near receptors) to increased goal directedness (distance receptors) occurs. Thus Schopler interprets his results in light of a proposed hierarchy of receptor usage in which schizophrenic children remain at the early developmental level of near-receptor usage.

O'Connor and Hermelin (1965) tested the sensory dominance in autistic

imbecile children. The research was based on a proposed concept of sensory system hierarchy according to which the developing child changes his sensory dominance from tactile and kinesthetic to auditory, visual and sensory systems, until finally the system of language and cognitive meaning becomes dominant and begins to direct the other sensory perceptual modalities. In this experiment a light and a sound (single tone), or a light and a verbal command were presented simultaneously in various intensity combinations. The autistic children's responses to the various stimulations yielded four main results: (1) autistic children responded more often to intense than to less intense stimuli; (2) there was a relatively weak predominance of responses to light; (3) the responses of autistic children were often determined by position habits (motor response) independently of stimulus modality or intensity; (4) in the light/verbal command presentation the word signals proved to be ineffective for the autistic children in eliciting positive response (mongoloid and non-mongoloid imbecile children showed significant increase of response toward word signals).

Hermelin and O'Connor carried out a number of other experiments with autistic children in which they specifically dealt with the problem of relating sensory experience to memory in terms of integrating current experience with schemes and representations stored from previous sensory impressions. In the first experiment, Hermelin and O'Connor (1971) investigated the question of whether touch and movement would be sufficient for developing spatial orientation or if the conceptualization of space requires an integration of actual tactile and kinesthetic experience with an inner spatial image derived from an earlier visual experience. Blind-born children (naturally no visually derived spatial image available), blindfolded autistic and blindfolded normal children were compared.

Blindfolded autistic and blind-born children responded similarly during the test activities in developing solely a relative, movable image of space, depending on different tactile and kinesthetic stimulations.

The same authors (1973) tested normal, deaf and autistic children for their ability to recall a presented visual stimulus (three letters) whereby the successive-temporal order and the left-to-right spatial order of the letter presentations did not coincide. Normal children tended to recall the letters in the temporal-sequential order; whereas the responses of autistic and deaf whildren were predominantly spatially organized. On the basis of Hermelin's and O'Connor's postulation that vision is a spatially organizing sense, whereas hearing is a temporally organizing sense, normal children treated visually presented stimuli as if they were auditory. In contrast, autistic and deaf children treated the stimulus input in the modality it had been presented.

In another study by Hermelin and O'Connor (1975) it was found that blind-born, blindfolded autistic and normal children performed equally on the test tasks when the information for solving the task-problems (matching two-dimensional shapes) could be gained only by tactile exploration; thus, no visual reference could facilitate the problem-solution. When asked to differentiate between models of left and right hands in different spatial postures by touch alone, blindfolded normal children, apparently using a visual image to determine the orientational feature of the hands, performed much better. Left and right hand have the same shape and thus sole tactile exploration is not sufficient for discrimination.

The last study by Hermelin and O'Connor (1975) which will be described dealt with the problem of whether kinesthetic feedback is sufficient for the derivation and storage of limb-movements in the absence of spatial

invariable fixpoints. Blind-born children and blindfolded autistic and normal children were asked to reproduce location and distance features of arm movements. No significant differences were found on the location task but the blindfolded normals performed much better on the distance-reproduction task. The authors explained these results by the fact that there are receptors in muscles and joints which signal limb position but there are no such receptors for signaling distance. Thus it seems to be necessary, in order to reproduce distances, to relate the actual kinesthetic feedback to an inner spatial image, derived by visual experience, which apparently is not available for congenitally blind children.

The most intriguing result of all the described experiments by Hermelin and O'Connor is certainly the fact that autistic children behaved operationally blind or deaf although they lack an overt sense organ pathology. It seems that autistic children, though able to receive the complete range of sensory information, lack the ability to use it, in terms of establishing a perceptual reference system. Normal children, having established a perceptual reference system, seem to be able: (1) to process sensory input from one sense modality to another (cross-modal associations); (2) to integrate current experience with previously stored sensory impression. Autistic children seem: (1) to remain stimulus-bound in handling sensory experience; (2) to lack an internal representation of sensory input in terms of structured mental processing and remembering (Hermelin and O'Connor, 1970).

Bryson (1970) carried out an experiment investigating a systematic identification of perceptual disabilities in autistic children. Matching-to-sample tasks were used to test the ability of six autistic children to make visual, vocal and fine-motor responses in response to visual and auditory stimuli. Three main results can be outlined: (1) the

auditory (cue, stimulus)-to-visual (response) matching and the visual-to-vocal matching showed poor performance (lack of cross-modal associations); (2) the children were quite adept at using their hands for repetitive stereotype manipulations but showed serious impairment in perceptual-motor coordination; (3) an additional meaningful stimulus when presented simultaneously with the original cue did not facilitate the performance but was usually disregarded by the children.

Lovaas and Schreibmann (1971) investigated the ability of autistic children to respond adequately to simultaneous stimuli consisting of components in two different modalities (white noise, red floodlight). After the children had learned to respond to the complex stimulus both components were presented singly to assess their control over the children's behavior. The autistic subjects, unlike the normal control group, responded usually only to one of the components. No sensory modality preference was shown. Control over the previously non-functional component could be acquired by later training. The behavior of stimulus-overselectivity was also found in an experiment by Koegel and Wilhelm (1973). They presented a stimulus-complex in only one sensory modality (visual) in order to avoid any influence on the stimulus-response by different sensory-modalities. Nevertheless the previous results from Koegel and Schreibmann about the stimulus overselectivity were fully replicated.

Frith (1972) carried out experiments in which she let autistic children and different control groups produce spontaneous color sequences (with inkpads and rubber stamps) and tone-patterns (xylophone). The patterns were scored for complexity, rule-adherence, restriction and originality. The autistic children achieved equal results compared to the control group of normal children in producing tone-patterns whereas

the color-sequence of autistic children showed significantly lower results. Thus the modality (visual vs. auditory) seemed to have a striking effect on the performance of autistic children.

Weber (1973) reported clinical observations which could be observed in autistic children as well as in blind and visually severely deficient children: hand and finger movements before the eyes, tapping and scratching on objects, restless trips on the spot, mimic rigidity associated with mask-like expression patterns, pricking one's eyes with the finger. Hence no visual sense organ pathology was present. The author suggested the existence of a central visual perceptional disorder.

In summarizing the findings of the described experiments in a rather concise way, eight areas of perceptual and other performance disabilities of autistic children may be outlined:

1. High dependence on tactile and kinesthetic sensory experience in perceiving environment and oneself.
2. Severe perceptual impairment in visual sense modality.
3. Inadequate perception of complex stimuli (stimulus overselectivity).
4. Lack of sensory-integrative behavior:
   - disability of relating current sensory experience to previously stored sensory impression
   - disability of combining and relating different sense modalities in perception and response (cross-modal associations)
5. Poor perceptual motor coordination.
6. Poor body-image.
7. Motility disturbances (repetitive stereotyped movements).
8. Unresponsiveness to verbal stimuli.

Every treatment approach for autistic children has to take into consideration these specific findings which accentuate certain aspects

within the whole range of an autistic symptomatology. Without anticipating an explicit discussion of symptoms and their relevant treatment techniques in detail, nevertheless the conclusion of this chapter will delineate three objectives for music therapy in dealing with autistic children based on the preceding findings.

I. In following clinical and experimental observations it seems apparent that autistic children need intensive training for their sensory perception. This, however, seems only a first step.

II. Furthermore, as a second step; they need training in relating and integrating these different sensory experiences in a meaningful way: (1) perceive different, simultaneously presented stimuli; (2) associate information from one sense modality into another modality, e.g. transfer visual or auditory information into motor response; (3) relate sensory experience to memory. This whole second step, broken down into three different aspects, seems absolutely crucial for the ability to carry out basic intelligent operations: connecting two different pieces of information (input) in such a way that a new piece of information (output) is created. The acquisition of all complex cognitive concepts seems to depend on this process of relating and integrating stimulus input in such a way that a meaningful response as a new piece of information can result.

III. As a third step it should be mentioned that autistic children apparently need specific training, not only in perceiving and understanding their environment, but for perceiving themselves, differentiating self and nonself, establishing body-image and ego-boundaries.

What general potential posesses music therapy in order to realize these objectives within the presented findings:

1. Considering the perceptual peculiarities of autistic children, instructional methods should involve objects and activities which

provide tactile and kinesthetic experience rather than written or spoken directions, pictures, etc.

2. Music therapy can offer a broad variety of instruments and movement activities which initially satisfy tactile and kinesthetic sensory experience. Both tools, when used in structured settings, have the potential to also transmit auditory and visual sensory experience.
3. Thus, the variety of sense modalities in which these objects and activities can be perceived enables music therapy to work on sensory-integration behavior. A tactile experience (plucking a string) eventually can be associated with a particular sound, or a particular tone-sequence can be associated with a particular body movement.
4. In tactile, auditory and visual exploration of instruments motor coordination could be sharpened by giving immediate sensory feedback to particular fine-motor actions, using strings, tone-bars etc. as sounding targets.
5. Finally the training of sensory perception, which integrates their own body by movement and dance exercises, would appeal to the problem areas of the third objective, particularly the problems of body-awareness and motility disturbances.

These rather concise comments shall clarify the pertinence of experimental and clinical observations in autistic children for music therapy as a prospective treatment tool. Having identified areas of deficiencies which suggest specific treatment, music therapy thus can analyze its potentials which apply to specific autistic behavior characteristics and establish a starting point for systematic therapeutic and educational intervention.

CHAPTER 5

EXPERIMENTS AND CLINICAL OBSERVATIONS ABOUT MUSICAL RESPONSES OF AUTISTIC CHILDREN

After having discussed the peculiarities in sensory perception of autistic children on a broader level, their particular reactions to musical stimuli will be revealed in this chapter. An unusual sensitivity and attention towards music is one of the most frequently reoccurring observations in autistic children. Unfortunately most of these reports remain highly anecdotal. Musical abilities and responses of autistic children have not been tested adequately yet in a comprehensive way under strictly controlled circumstances in order to make precise statements about their musical behavior. Only a few reports include attempts for an understanding of this unusual responsiveness towards music in autistic children. Despite these facts, an overview about observations and experiments already done, might yield common criteria for a better understanding of this phenomenon, providing a starting point for further research of music therapy.

Already, Sherwin (1953) has noted unusual reactions toward music in three case-studies. The autistic children showed a strong memory for melodies, could recognize classical music pieces and showed a high interest in piano playing, singing and listening to music. One child lost his interest in music after he had made improvement in his autistic state. Theoretical speculations about reasons behind these phenomina were offered: (1) sound and vibrations as sensory stimuli which meet the child, by-passing cognitive disabilities, on an early instinctual level; (2) preoccupation with music as a symptom in autistic children of

preference for relationships to objects rather than to people; (3) the use of music as a nonspecific means of communication, mainly expressing narcissistic or undifferentiated emotional desires.

Pronovost (1961) carries out a long-term observation of 12 autistic children over a period of two years. In gathering data by rating scales about speech production, language comprehension, and relationship to environment, he found that 11 out of 12 children showed a heightened response and interest toward musical sounds compared to other environmental sounds. The child without considerable interest in music was the only one who had developed the ability to read words.

Goldstein (1964) reported a treatment program for an autistic girl, including vocal exercises, singing, dance, movement to music and painting. After six months, progress was noted in motor coordination, attention span, body awareness, relationship to other people, lowering of self-aggressive behavior, extension of communication skills by music, language and body movement. On the Stanford-Binet Intelligence Scale, Form L, there was an increase after the six-month treatment period of ten months in mental age.

Stevens and Clark (1969) carried out an experiment trying to determine the effectiveness of a music therapeutic treatment with five autistic boys. Pretest and posttest measurements were assessed by using the Autism scale by Ruttenberg (1966) and a scale devised by the authors which measured different degrees of attention. The children's behavior as measured by the Ruttenberg scale showed significant improvement. The results on the attention scale proved to be of no significant value. The improvement, measured on the subscales relationship to therapist, communication, drive for mastery was generally characterized as an increase in prosocial behavior.

Frith's (1972) experiments of analyzing and comparing spontaneously produced tone and color sequences of autistic children, has already been described in Chapter 4. Here it should be sufficient to direct attention to the most striking observation that autistic children produced far better tone sequences than color sequences. Thus it was concluded that music would be a sensory modality in which autistic children perform better than in other modalities. Their performance scores for tone sequences were close to the scores of normal children.

Mahlberg (1973) reports about the implementation of a music therapy treatment program for a seven-year-old autistic boy. The treatment was designed to: (1) increase attention span; (2) interrupt and reduce autistic behavior; (3) teach nonverbal communication techniques. The first goal was mainly approached by action songs which required attentive behavior and performance such as locating body parts. Movement and dance techniques were used to accomplish the second goal. Frequently changing rhythms and change of music interrupted repetetive motility patterns. The third goal was approached by teaching rhythmic patterns which stood for words or easy sentences. The author gave subjective evidence that observable progress was made for all three goals. Additionally, the child started to relate to the therapist, being aware of him as a person rather than as an object.

Saperston (1973) reported a case study where he used music in the treatment of an eight-year-old profoundly retarded boy who also exhibited a considerable amount of autistic behavior. The main goal was to establish a form of communication. Piano music was improvised accompanying specifically the boy's movements such as walking, stomping, rocking, shuffle-steps, hand-pounding. In the 20^{th} session the boy grasped the relation between specific movements and their designated musical

accompaniment. This awareness stimulated the boy to extend his activities in order to directly influence the music. Progress in eye-contact and relating to the therapist could be observed in the course of the proceeding treatment. He transfered his experience in musical interaction also to other people and objects in his environment. As the boy didn't receive other treatment in this period, his progress in communicative behavior could be attributed directly to the music therapeutic work with him.

Hollander and Juhrs (1974) developed a treatment method for autistic children based on the Orff-Schulwerk. The authors found a strong correlation between initial nonverbal (including musical) contact and subsequent nonautistic response. Initial verbal contact -- even when affectionate -- proved to produce more tuning-out or self-destructive behavior in autistic children. Based on these findings the Orff treatment program was mainly used to focus on language development. The emphasis on rhythm in rondo forms for speech and body movement activities, extended by the inclusion of sign-language, proved to enhance the adaption of vocalization of word sounds. Other areas of treatment, based on the integration of speech, singing, playing instruments, play-action, body-movement and rhythm, were: (1) body image; (2) body-awareness; (3) self-concept; (4) laterality; (5) gross-motor expression; (6) fine-motor coordination; (7) receptive language; (8) spatial relationships; (9) simple categorizing; (10) simple association. The authors mainly used rondo forms for working in group settings.

O'Connell (1974) reported a case study of an eight-year-old autistic boy who had exceptional musical ability. Individual musical training on the piano brought an overall improvement in the boy's symptomatic behavior. Attention span, hyperactivity and meaningless repetition of

numbers and phrases could be controlled to the extent that he could attend a normal school program.

Schmidt, et al. (1976) used music as a teaching program (learning songs) for three autistic boys during which appropriate individual and social behavior were shaped, based on the free-operant method. Although the study mainly gave evidence for the effectiveness of different shaping and reinforcement techniques in altering behavior of autistic children, music proved to be of a twofold value: (1) it served as an effective curriculum to teach appropriate musical responses; (2) it served as a stimulating context to shape and alter individual and social behavior in autistic children.

Litchman (1976) used music for establishing a learning environment for language instruction with autistic children. The experimental group received a treatment consisting of 20 sessions where they listened to recorded nursery rhyme music lyrics. At 18-second intervals one-syllable words were presented on the tape. Additionally a picture of the word-object was shown at each interval. The experimental group made significant gains in language comprehension in a pre-test, post-test comparison with the scores of the group without musical instruction. Furthermore a comparison with the results of the same test with severly retarded children revealed that autistic children seemed to benefit more from the learning environment with music than the retarded ones.

Blackstock (1978) carried out two experiments investigating listening preferences of autistic and normal children, when given a choice between verbal and musical material. Furthermore it was investigated if the experimental groups showed a different predominance in listening to the different material with the right or left ear. This question was of specific importance in regard to research about brain-hemispheric

specializations (Kimura, 1973; Kinsbourne, 1972, 1974) and their implications for autistic children (Tanguay, 1976). The results of the experiments showed that: (1) autistic children preferred music, while normal children showed no preference; (2) autistic children listened to both types of material predominantly with the left ear, while normal children tended to listen to music with the left ear and to verbal material with the right ear. Interpretations of the results were offered by the author in regard to research in the field of cerebral cortex functioning: as the left ear is connected to the right brain hemisphere and the left brain hemisphere to the right ear by the more efficient cross-lateral pathways, it could be concluded that autistic children, showing preference for music (processed by the right brain hemisphere) and for listening with the left ear, are predominantly right-hemisphere processors. The result of such a cerebral processing would be a hierarchically organized structure of nonverbal or spatial schemes that would process only nonverbal, musical, or spatial information and virtually ignore language.

Applebaum, et al. (1979) tested three normal and three autistic children for their ability to imitate individual tones and series of tones delivered by voice, piano and synthesizer. The autistic children overall performed as well as or better than the age-matched normal children.

All attempts to infer and categorize anything from the preceding observations and experiments have to be undertaken with considerable caution. The investigated samples are small. The reports usually lack a consistent diagnosis of their subjects. Many reports are based on subjective evidence and lack objective control for further replication. Thus all conclusions remain tentative at best. Nevertheless the attempt will be undertaken to delineate three aspects under which the described

data can be subsumed:

I. A number of research findings testing musical responsiveness (Pronovost, Frith, Hollander, Blackstock, Applebaum) give evidence that autistic children show particular responsiveness to music, even when compared to other groups such as normals and different groups of retardation. Thus three tentative conclusions will be stated:

1. Autistic children perform unusually well with musical means compared to their deficiencies in most other areas of performance. This also holds true when compared to normal control groups.
2. Autistic children respond to music more frequently and intensely than to other auditory stimuli.
3. The musical responsiveness of autistic children should be seen in relation to the cerebral cortex functioning and brain hemispheric processing of autistic children.

II. Treatment areas.

Music was applied in experimental and clinical settings to the following treatment areas:

1. Improve fine and gross-motor coordination.
2. Increase attention span.
3. Develop body awareness.
4. Develop body-image.
5. Develop self-concept.
6. Establish interpersonal relationships.
7. Provide and develop means of communication (nonverbal, verbal) and self-expression.
8. Interrupt and alter repetitive behavior patterns.
9. Lower self-aggressive behavior.
10. Enhance and support language development (receptive, expressive)

by vocalizing sounds, speech-rhythms, etc.

11. Develop body-laterality (arms, legs).
12. Provide experience of spatial relationships (kinesthetic sensory perception).
13. Reduce hyperactivity.
14. Establish concepts involving simple categorizing and associating.
15. Help in creating an environment which stimulates and facilitates learning in nonmusical areas.

III. Treatment techniques.

A number of musical techniques were used in the described clinical and experimental settings which will be listed as follows:

1. Vocalization exercises.
2. Singing.
3. Dancing.
4. Movement.
5. Painting.
6. Play-action.
7. Rhythm activities (including body-percussion).
8. Rondos.
9. Adaption of sign-language.
10. Improvisations on piano, Orff instruments, percussion.
11. Listening to music.

Although the amount of reported applications of music as a treatment tool for autistic children is still fairly small, the preceding review and attempt at systematizing available data reveals three main areas of research for music therapy: (1) precise investigation of musical behavior of autistic children in regard to neurophysiologic research in, and etiological concepts about, autism; (2) identification of treatment areas;

(3) development of particular techniques which help to accomplish the treatment goals.

CHAPTER 6

TWO TREATMENT STUDIES FOR THE AUTISTIC CHILD IN MUSIC THERAPY

Only a few and mostly sporadic reports exist until today about experiences of music therapists in dealing with autistic children. The publications of Nordoff and Robbins (1971, 1977) and Alvin (1978) about their music therapeutic work with autistic children still have to be considered as exceptions in this field. Nevertheless the careful descriptions in both approaches reveal a considerable amount of valuable information regarding music therapy and autism. Therefore both concepts will be briefly reviewed at this point.

Alvin (1978) emphasizes in particular the autistic child's disability to establish communication and relationships with his/her environment. Relationships and communication skills are notions which are used here in the broad meaning of experiencing and understanding all the stimuli of the external reality which help the child's maturation and development. Thus Alvin describes the function of music in therapy as an integrating force which stimulates and structures mental, emotional, physical and social operations.

Alvin describes three periods which usually occur in the treatment of autistic children. Firstly music functions mainly as a medium which can bypass cognitive processes and reach emotional and personality disturbances. The concrete and perceptual aspects of music contribute to its use as a nonverbal, self-expressive sensory medium. In the second period music therapy supports a growing awareness of human and musical relationship. The presence of the therapist and his interferences may

eventually direct the autistic child's use of music to more directed and purposeful activities. This period leads into the third period where the treatment takes a definite direction towards specific musical areas in which the child feels familiar and competent. All music therapeutic techniques, according to Alvin, work on perceptual and cognitive processes in the autistic child. In the same time they produce psychological results which eventually will manifest themselves in a human working communication. Two basic techniques are separated by Alvin, namely receptive and active techniques. Receptive techniques are based on the penetrating power of sound, stimulating hearing and listening processes. Even tactile experiences (vibrations) can be affected by sounds. A safe and non-threatening environment and a careful employment of physical contact between therapist and child are further aspects integrated in receptive techniques. Active techniques will involve the child in carrying out activities. Musical activities will stimulate cognitive processes in terms of relating instruments, sounds and movements to each other. In the first stage the autistic child will identify himself better with objects (instruments) than persons. This feature can be employed for many different directions. Music serves as an intermediary object fostering perceptual and motoric awareness. Perceptual processes mean the awareness and differentiation of sounds, combining tactile, motor, and auditory sensory experience. Wind instruments will help the oral motor performance to strengthen the aspects of vocalization. Vocal responses eventually can be developed into melodic shaping, thus being elementary for sung words. Rhythmical awareness, achieved by relating sounds to specific movements, will help the autistic child to establish awareness and control over his motility, gradually decreasing his obsessive movement patterns. A second stage

will particularly emphasize an increasing involvement of the therapist. The aspects of external structure, demands and interaction will gradually shape the demands on the child's cognitive processes. Alvin explicitly elaborates on musical interactions, improvisations and ostinatos, for building together musical form. In further development the field of musical action will be extended to everything the child needs to deal with; sounds, numbers, spelling, reading, movements, plays. Musically the child will increasingly relate thought and action, thus producing predictable results in terms of, e.g., tone color, intensity, duration.

Alvin points out that the ultimate goal of therapeutic treatment still remains social integration. Here musical activities have to follow the patterns of social development. Common musical denominators such as rhythms, movements or dynamics, will facilitate the interaction of all group members, producing an immediate feedback of success or failure. Alvin mentions in particular dance activities which depend on mutual physical contact and thus seem to provide an environment where social interaction can almost physically be developed within the framework of an enjoyable, shared activity.

Nordoff's and Robbin's (1971, 1978) concept of creative, improvisational music therapy is not especially geared towards autistic children but is rather directed to a wide spectrum of very differently handicapped children. The experiences they report in dealing with autistic children have to be seen under these circumstances. Their music therapeutic concept is built upon improvisational techniques through which the child's current internal state will be reached and influenced. The therapist creates, by piano improvisation, a musical environment where he can meet the child on his own level of responsiveness. Mood expressions can be accompanied or music can be put to movements the child exhibits. The

goal is threefold: (1) to relieve the child's tension and provide a non-threatening, pleasant medium for self-expression; (2) to train perceptual awareness and perceptual associations between the child's actions and the therapist's musical accompaniments; (3) to influence the child's mood and help him in stabilizing and structuring his state of emotional arousal. Improvisational settings will eventually lead into influencing habitual sounds, thus stimulating free-singing impulses. The child also will eventually pick up instrumental activities, mainly percussion playing. Rhythmic structure will be shaped by therapist's and child's musical interaction, fostering perception, control and forms of experience. This will work on the child's personality in terms of cooperation, stability and structure. Nordoff and Robbins elaborate that music fosters the organization of receptive, cognitive and expressive capabilities. All these functions are viewed to be central for the organization of the personality in terms of self-realization and self-integration. Creative music therapy trains the mental operations of recognition, perception and memory. Emotional experience is provided in the framework of form and order.

Nordoff and Robbins differentiate three areas of music therapeutic application for autistic children, each employing different patterns of techniques, namely for higher-functioning (responsive) children, severely autistic children, and differential diagnostic purposes. The more responsive children are usually led in situations where limited response activity and the discovery of pleasure over anxiety can be established. This can be used as a starting point for specific activities geared toward the child's interest and abilities. The range of responses will be broadened eventually, thus increasingly providing participation and self-expression on the side of the child. Creative music therapy with

the severely autistic children has to deal with the problem of transfering any habitual behavior or fragmentary response into a musical context. The establishment of the child's perceptual awareness and willingness to respond may take a rather long time, as no external demands or directions will be helpful to evoke perception and responsiveness. Nordoff and Robbins report that, once response contact has been established, further development in providing musical experience and receiving self-expressive responses can take place. New stages of self-realization of the child can be acquired by improvisational methods, giving the child the space and time to form a new inner ego-organization. As last area Nordoff and Robbins suggest that the analysis of musical responses of autistic children may aid differential diagnosis discerning symptoms which point to specific brain injuries, aphasia, or emotional disturbances. As an example they describe the case of an autistic boy who showed considerable abilities in controling his motor performances when beating accelerandos and ritardandos alternately. These astonishing findings led to increasing educational efforts which eventually could extend his high cognitive and sensorimotor functioning in music to other areas of intellectual performance.

Both Alvin's and Nordoff's and Robbin's concepts are derived from empirical standpoints, relying on practical clinical experience and observations in regard to the musical responsiveness of autistic children. Naturally such an approach has its difficulties in setting objective, replicable criteria for success and gains, especially as both concepts do not elaborate on consistent diagnostic criteria or etiological considerations which might also influence the therapeutic approach toward primary and secondary symptoms of autism.

The particular strength and importance of both approaches for all further elaborations on treatment in music therapy lies in the variety and multitude of creative, explorative musical techniques applied.

PART II

A THEORETICAL TREATMENT CONCEPT

Introduction

A theoretical treatment concept of music therapy for autistic symptoms will be delineated in this part of the study. The concept is derived from the review and reappraisal of research literature in Part I as well as from individual working experience and personal communication with teachers and other therapists dealing with autistic children. The division into treatment areas and the sequences of treatment techniques are suggestive and not meant to be of a dogmatic nature. Not all music therapeutic techniques are described in full detail or are all possible applications and variations of activities listed; although, the attempt was undertaken in this part to be rather concrete and specific.

CHAPTER 7

GENERAL OBJECTIVES AND PRECONDITIONS

Diagnosis

Before setting up a treatment plan, careful consideration of diagnostic findings should take place, particularly, results from neurological assessments and differential diagnosis would help in applying a symptom-oriented and efficient music therapeutic treatment. In order to emphasize the application of consistent diagnostic criteria the use of Rutter's (1978) or Ornitz's and Ritvo's (1976) criteria will be recommended. It is suggested by this study that both lists of diagnostic criteria complement each other under specific etiological considerations.

Etiology

There is evidence in the research literature suggesting the likelihood that autism has a neurophysiological cause in terms of some organic brain disorder. This disorder manifests itself in a variety of perceptual, cognitive and motor disturbances. Ornitz and Ritvo (1974) have set forth that perceptual disturbances are of fundamental importance in autism. They manifest themselves in perceptual inconstancy, lack of cross-modal associations, distortion of normal receptor hierarchy, dependence on kinesthetic feedback, sensorimotor disintegration. Music therapy, working on a sensory-perceptual level in different modalities, as well as integrating sensorimotor processes, can explain its treatment approach under these etiological considerations. Further, evidence is provided by electrophysiological investigations about brain-hemispheric

specialization which support the frequent observation that autistic children are able to perceive and process musical stimuli despite their various other perceptual deficits. This also suggests an extended application of music as a mediating medium for nonmusical concepts such as language and other cognitive concepts.

Treatment

Recent experiences in treatment programs for autistic children point out the efficiency of educational settings. Thus it is recommended that music therapy integrate its treatment concept in a comprehensive special education program for autistic children. If this is institutionally not possible there should be, nevertheless, the attempt to adapt consistent treatment criteria in educational and music therapeutic settings. Music therapy should stress parental cooperation in all stages of treatment. Music therapy should use a structural approach to set up its treatment: (1) macro-structure (long-term goals and assessment of learning steps); (2) micro-structure (organization of learning situations and sequencing of activities in order to facilitate appropriate behavior).

Four treatment areas are suggested by this study in which music therapy can develop a concept of treatment applications: (1) impaired language development; (2) impaired social development; (3) impaired development in cognitive and other academic areas; (4) sensorimotor disturbances.

All objectives and preconditions mentioned in this chapter should be applied to all four treatment areas in order to produce a consistent treatment concept.

CHAPTER 8

IMPAIRED LANGUAGE DEVELOPMENT

Symptoms

Expressive Language

1. Muteness; oral apraxia; sound vocalizations.
2. Non-communicative speech with monotonous intonation; echolalia; pronoun reversal.
3. (Rarely) Development of functional speech with atonal, arrythmic quality; no emotional attachment; limited vocabulary and semantic concepts.

Receptive Language

From complete unresponsiveness and incomprehension to limited understanding of speech.

Diagnostic/Etiological Background

Language deficiencies are listed in all diagnostic systems as a major autistic symptom. The acquistion of language is considered to be a crucial aspect in further social and intellectual development of the child. It is assumed that a specific cognitive impairment affects the four aspects of the language system, namely conceptualization, symbolization, comprehension and production. So far no convincing etiological explanation exists about the brain pathology responsible for the autistic language disorder. Autistic children seem to suffer from a disorder impairing central coding processes which also strongly affects social and other cognitive skills. Music therapeutic techniques work on production processes as well as trying to stimulate mental processes in respect to

conceptualization, symbolization and comprehension.

Music Therapeutic Techniques

1. Non-verbal communication skills: Fostering of fundamental awareness of making meaningful expressions whatever mode is used. Improvised musical accompaniment of child's habitual expressions (crying, laughing, sounds, movements) is intended to demonstrate a communicative relationship between a particular sound, rhythmical pattern or movement and some expression exhibited by the child. The autistic child might perceive sounds or movements better than verbal approaches. Awareness of music and of relation between music and own action might serve as motivational factor for desire to communicate.
2. Combining words with sounds, rhythms or movements (Orff technique). The technique is intended to appeal to a maximum of perceptive channels in the child. Perceptual awareness and comprehension is facilitated by integrating different sense modalities and providing additional cues.
3. Adding melodic intonation to verbal instructions. This is an extension of step two based on the observation that autistic children tend to recognize the melodic shape of words and sentences better than the actual semantic meaning. Receptive language comprehension can be facilitated by melodic intonation.
4. Oral motor exercises. This step refers to expressive language techniques. Playing wind instruments can strengthen awareness and functional use of lips, tongue, jaws and teeth.
5. Imitation sequences. This technique uses proceeding imitation exercises which can be carried out employing movements with music

and sounds or tone sequences. It starts with: (1) gross-motor imitation such as moving to music, dance-steps, clapping hands, circling arms, and proceeds gradually to; (2) fine-motor imitation, such as playing with fingers, etc. Next step then is the; (3) oral motor imitation, which imitates mouth positions without sound. From here it proceeds to; (4) oral vocal motor imitation where single sounds are imitated. An integrative technique would be to maintain gross or fine motor movements during oral imitations and teach the vocalizations for words of the body parts used for the movement. Example: keep circling arm and teach oral motor and eventually oral vocal imitation of "a", "r" and "m". Advantage would be the integration and maintenance of auditory, motor and kinesthetic modalities before and during vocalization exercises.

6. Activities for intonation problems. These techniques can be used if some kind of speech is already acquired. Four applications can be distinguished: (1) stimulation of free-singing impulses. Accompaniment of the child's habitual sounds by organum chords or chordal progressions in order to evoke some melodic shaping of intonation and sound awareness. Free singing by therapist along with improvisation also can evoke songlike responses in child. (2) Support sound vocalization by bringing resonating instruments (chime bars) close to the ear of child. Resonating sounds help to stabilize and encourage voice in terms of duration and volume. Full chords on piano, with some rhythmical shaping, may have same effect after child shows some progress in sustaining sounds. (3) Shape sound vocalization. Pitch and modulate voice by singing vowels, sustaining long sounds. Graphic notations can

facilitate child's efforts: watching the movement of the pen on the paper, drawing lines and curves by himself or following lines and curves with his fingers. The last activity also appeals to the fascination for geometrical shapes exhibited by some autistic children. (4) Improve breathing by playing wind instruments (melodica, recorder, kazoo, etc.). Wind playing strengthens breathing processes, enlarges breathing capacity and helps to loosen up laryngeal functions. It also helps the refinement of vocal production (awareness of lips, tongue, etc.) and the awareness of physical resistance in breathing process by pressure of wind entering lungs and entering instrument in controlled ways.

CHAPTER 9

IMPAIRED SOCIAL DEVELOPMENT

Symptoms

1. Deviant eye contact; limpness/stiffness when held; absence of social smile; lack of physical responsiveness.
2. Lack of affective responsiveness and empathy; aloofness; lack of social play/role play; lack of peer relations; lack of attention; lack of perseverance; anxiety.
3. Attachment to objects (often as obsessive preoccupation); use of others as extension of self; maintenance of sameness in environment.

All these features may change after five or six years of age in terms of intensity. The social aloneness, however, markedly remains.

Diagnostic/Etiological Background

The traditional diagnostic criteria of maintenance of sameness and autistic aloofness are combined in this treatment area. The social withdrawal was viewed as a primary autistic feature for many years. Most of the etiological considerations and treatment attempts centered around possible causes for this behavior. This might have been the reason for viewing autism for a long time primarily as a psychic disorder. Today the impaired social development is considered to be a manifestation of some kind of physical disorder (see Chapters 1 and 2). Various perceptual and cognitive dysfunctions are emphasized as underlying factors for the social behavior deficiencies. A central deficit of encoding stimuli and building concept formation is assumed which impairs all types of

complex behavior. Less is known, however, about neurobiological factors underlying the formation of social behavior.

Music Therapeutic Concepts

1. Provide object-relation for autistic child through instrument. Offer a variety of different instruments. Give freedom of exploration. Instruments serve as intermediary object providing enjoyment without grasp of abstract concepts as well as satisfaction of need for self-expression.
2. Provide listening experience, preferably by live performance. Additional tactile and visual experience helps to establish awareness of sounds.
3. Gradual offering and initiation of physical contact through, for example: (1) moving to music, holding hands of child; (2) leading hands of child to instruments.
4. Becoming part of activity in a physical, non-verbal manner. Hands might be used in a more directive manner, pressing child's hands down on piano keys, clap-slap attempts, etc. Therapist also might try to match sounds of the child, thus trying to initiate some interaction.
5. Musical cooperation. Therapist enters activity in more structured manner, doing movement imitations, clap-slap activities, adding ostinatos or rhythms to musical interaction.
6. Establish demands of social learning in one-to-one relation by structuring musical activities by dynamics, speed, rests, movements, dance steps, alternate playing. The objective that acquired behavior should never become ritualistic behavior deserves special importance. Frequent change of movement sequence or

musical speed is indicated.

7. Begin social integration, introducing child to group-situation. Main goal is awareness of contrast between self and group. Movement and dance activities in circles emphasize and clarify group-concepts. Physical contact provides experience of other person's presence. Therefore children usually should hold hands when dancing and frequently face each other.
8. Use of Orff methods for advanced group participation. Dance songs or instrumental pieces with Orff instruments combine movement, singing, body and other instruments, initiations of social play, etc. The rondo form can foster social learning by emphasizing the contrast between self-identification (solo) and identification with group members (tutti). Imitations of stereotyped or ritualistic behavior in rondo form might help to decrease this behavior.

With increasing structure of activities the therapist should keep four basic attitudes in mind:

1. Rigid insistence of eye-contact.
2. Frequent recall of attention.
3. Repeat of instructions until appropriate effort of performance is made.
4. Encouragement of perseverance during activities.

CHAPTER 10

IMPAIRED DEVELOPMENT OF COGNITIVE AND OTHER AREAS

Symptoms

Impairment in verbal understanding, abstraction, sequencing temporal information, decoding and encoding information in auditory and visual modes.

Impaired use of symbols in play, meaning in memory, gestures, memory (organization, rule retrieval, lack of evoked internal representations).

"Gestalt"-perception and recall of information apparently function better than analytical (sequential) perception and recall of information in both visual and auditory modes.

Diagnostic/Etiological Background

Cognitive deficits are viewed as resulting from some organic brain dysfunction which causes perceptual dysfunctions on different levels (Rutter, 1978). Demonstrable deficits include memory functioning, motor integration and some social features (Churchill, 1978). Nature and boundaries of cognitive deficits are not fully discovered yet. In early clinical observations autistic children usually were suspected of possessing high intelligence which is only masked by autistic symptoms.

Investigations in intellectual functioning of autistic children usually agree nowadays that their IQ-distribution functions in the same way as in any other group of the population (Rutter, 1978). Mental retardation and autism can clearly coexist as well as higher intellectual functioning and autism. Assessments of cognitive abilities try to

demonstrate the importance of showing not only what autistic children can do but how much they can learn to do. Specific cognitive deficits seem to become essential diagnostic features in autism. In order to be a valid diagnostic criterion the cognitive dysfunctioning must be out of keeping with the autistic child's mental age.

Music Therapeutic Techniques

Music functions as mediator and facilitator of cognitive concepts. All activities should be carried out as musical activities (e.g. resonator bells not only used for counting, but for counting and playing).

1. General concepts.

   Following directions of one or more steps and identifying objects (musical instruments) by: (1) pointing to; (2) playing; (3) recognizing different sounds; (4) recognizing different shape; (5) recognizing name of instrument.

2. Number concepts.

   "How many," "Give me one/two...," add and subtract concepts by building up scales with tone bars, resonator bells, chimes, etc.

3. Color concepts.

   Using instruments with different colors. Using a set of keys or bars with different colors. Using colored graphic notations.

4. Auditory memory.

   Imitation of single tones up to longer tone-sequences. Play a sound (from tape or live) and let the child find the instrument which can produce this sound.

5. Matching skills. (Also applicable for color concepts, form perception, receptive and expressive language training).

   Matching color, shape, name of object (musical instrument) by

word cards, picture cards, hand signs, verbal response. Activities are indicated to work on auditory/visual perception and motor, visual and vocal expression.

6. Form perception.

   Ordering and completing tone scales, consisting of bars, bells, etc., with different sizes. Building geometric constructions with drums or chime-bars with definite shapes.

7. Decoding and encoding symbols.

   Apply graphic notations using colors and geometrical shapes. Let the child draw or follow the lines with finger.

8. Integration of music in learning environment.

   (1) Learning words or concepts as part of songs (also in movement or dance), e.g. verbs (jump, walk), or prepositions (up, down).

   (2) Alternation of instructional learning and music listening during a learning task to keep up heightened perceptual processing and attention (Litchman, 1977).

   (3) Alteration of time units with instructional learning and musical play (Graham, 1976).

CHAPTER 11

SENSORI-MOTOR DISTURBANCES

Symptoms and diagnostic/etiological background will be divided in two parts.

Disturbances of Perception

Symptoms

1. Dependence on motor feedback to make sense out of perception.
2. Tactile and kinesthetic receptor preference.
3. Hypo-, hypersensitivity to sensory input (staring, catatonic-like arresting, visual and tactile detail scrutiny, cover ears, behave as if deaf, overreaction to sounds).
4. Failure of imitative behavior.
5. Preoccupation with isolated sensory impressions.
6. Avoidance of new sensory experience.
7. Lack of cross-modal associations in different sensory modalities.
8. Stimulus overselectivity (distorted perception of complex stimulus with different components).

The faulty modulation of external sensory input and internal motor output can be considered as linking symptom between perceptual and motor disturbances.

Diagnostic/Etiological Background

Ornitz and Ritvo (1976) not only view these disturbances as primary but as underlying all other autistic disturbances. They put forward the notion of a central perceptual disturbance in terms of some brain

pathology. Neurophysiological explanations center around the theory of perceptual inconstancy (imbalance between neurophysiological state of excitation and inhibition), extended to the theory of sensori-motor inconstancy. Research focuses on the vestibular reactivity in the brain stem (Ornitz and Ritvo, 1968, 1970, 1974) and the operation of homeostatic brain stem reflexes (Piggot, 1973; MacCulloch and Williams, 1971). Lelord, et al. (1973) have suggested defective interactions of sensory receptive pathways in the brain.

Motor Disturbances

Symptoms

1. No functional use of hands.
2. Poor gross and fine motor coordination.
3. Poor body awareness/image.
4. Poor laterality.
5. Poor sensori-motor integration.
6. Self-injury.
7. Motility disturbances (self-spinning and object spinning, toe-walking, head-banging, body-rocking, hand-flapping, finger-flicking).

Diagnostic/Etiological Background

Motor disturbances are not listed originally in diagnostic lists. Partially they were viewed as part of the criterion maintenance of sameness. Kanner even had emphasized good motor skills in autistic children. The poor motor development is usually understood as part of the distorted perception of ego boundaries, resulting in poor body-image and disturbed

motor functions. A disturbance of the CNS-functions is suggested (Ornitz and Ritvo, 1976) in respect to motility disturbances since they are likely not to be affected by environmental factors such as presence of persons or toys. Looking at a spinning top or cymbal frequently elicits patterns of motility disturbances. A neurophysiological relation between faulty perception of sensory input and occurence of motility patterns is suggested by Ornitz and Ritvo (1976).

Music Therapeutic Techniques

All techniques are intended to: (1) work on perceptual and motoric awareness; (2) work on relating different sensory experiences and motor responses.

1. Exploration of instruments; training of tactile, visual and auditory perception.
2. Dance and movement in physical contact with therapist; integration of tactile, kinesthetic and auditory perception. Training exercises of awareness for physical body resistance. Training exercises of imitative behavior.
3. Playing instruments; relationship between tactile sensations and visual and auditory perception (percussion of Orff instruments, string instruments). Training of cross-modal associations between different sensory perceptual channels (touch to sound, sound to visual).
4. Playing instruments; improvement of fine-motor skills; visuo-motor coordination. Functional use of fingers and thumb (mallets, plucking strings). Experience of physical resistance in hand (e.g. therapist presses child's hand on piano keys) combined with auditory and visual perception.

5. Movement exercises; preparation for fine-motor exercises. Experience of different body parts. Conceptualisation of self/non-self, left/right. Improvement of gross-motor coordination.
6. Rhythmic exercises; decrease motor disturbances by breaking stereotyped motility patterns with rhythmic activities (snare drum, cymbal, claves, etc.); e.g. use music which is slightly faster than speed of body-rocking.

EXPERIMENT I

VISUAL VERSUS AUDITORY RECEPTOR PREFERENCE IN AUTISTIC CHILDREN

Background

Numerous experimental studies have attempted to investigate specific areas of perceptual dysfunctions in autistic children. A special interest was directed toward the investigation of sensory input channels and their importance for perceptual processes and the development of sensory dominance in autistic children. O'Connor and Hermelin (1965) compared responses of autistic children toward visual (light) and auditory (single tone and verbal signal) stimuli. Autistic children showed a weak preference for the light stimulus. Verbal signals could not increase the auditory preference of autistic children in contrast to the control group of normal children who responded significantly more often to the auditory stimulus when verbal signals were used instead of single tones.

Schopler (1966) tested the receptor preference of schizophrenic children in tactile and visual modalities. Schizophrenic children were found to significantly prefer tactile perception over visual perception. Blackstock (1978) compared the auditory stimulus preference of autistic children between verbal and musical stimuli. Autistic children selected significantly more often the musical stimuli in contrast to the control group of normal children who showed even preference for verbal and musical stimuli. Recent research findings (Tanguay, 1976; DeLong, 1978) suggested brain-hemispheric factors as underlying the perceptual peculiarities of autistic children. This would be supported by the apparent preference of autistic children for musical stimuli (right-hemispheric

processed) over verbal stimuli (left-hemispheric processed). Schopler (1966) suggested a sensory dominance of near receptors (tactile, kinesthetic) over distant receptors (visual, auditory).

Despite the many reports about particular musical responsiveness of autistic children, no study has been undertaken yet to investigate the preference between auditory musical stimuli and visual (distant vs. distant) or musical and tactile stimuli (distant vs. near) in autistic children. Especially in regard to a comparison of responses toward distant and near receptors in autistic children, different age-groups necessarily would need to be tested. Due to limitations in available test subjects fullfilling the requirements of a primary diagnosis of autism, in this study only one autistic age group could be tested.. Thus the study was undertaken to test sensory dominance between two distant receptors, namely visual and auditory (musical) stimuli.

The problem of this study, therefore, was to determine the following: (1) whether autistic children prefer visual or auditory musical stimuli; (2) whether the preference of autistic children within each modality differs from the preference of a normal control group equated by chronological age; and (3) whether the preference of autistic children within each sensory modality differs from the preference of a normal control group equated by developmental age.

Subjects

Fifteen children, five autistic and ten normal, were selected for this study. The five autistic children were randomly selected from a class of autistic school children in a developmental center, fulfilling the age requirement (not younger than eight years) and the diagnostic requirement (primary diagnosis of autism). All autistic children were

male. Developmental age was determined by the Psychoeducational Profile (PEP) using the age determination in the areas of perception, motor behavior and eye-hand integration. The autistic children had a mean C.A. of 10.6 years (SD = 1.5). The mean D.A. was 4.5 years (SD = 0.6). Five normal children were randomly selected from a third-grade class in an elementary school, serving as control group I. The mean C.A. was 8.2 years (SD - 0.4). Another five normal children were randomly selected from a church Sunday school, serving as control group II. The mean C.A. was 4.4 years (SD - 0.3). The children in each group had approximately the same amount of weekly music teaching. No child had additional private music lessons.

Methods and Materials

The technical equipment consisted of: (1) two press-buttons mounted on a table, 25 inches apart, connected by wire to a relaybox; (2) a standard Sawyer caroussel slide projector; (3) a tape recorder Sankyo ST-45, connected to a stereo amplifier system Sansui 210 (two loudspeakers). Both the slide projector and the amplifier system were connected to the relaybox. The relaybox was connected to the electrical source. Pressing the buttons on the table changed the position of the relays so that either slide projector or amplifier were supplied with electricity. The tape recorder ran continuously to avoid initial sound distortion when switched on.

The visual stimulus consisted of fifty colored slides of animals commonly found in zoos, showing them in different environments. No human figures were present on the pictures. The auditory stimulus consisted of ten minutes of instrumental music recorded from the LP record "Perceptual-Motor Rhythm Games" (AR50).

Procedure

The subjects were tested individually. Each was seated in a chair behind a table on which the two press buttons were mounted. The experimenter demonstrated the operation of the buttons, whereby the sequence of demonstrating the stimuli was reversed for each child. Eventually the child was asked to operate the buttons. The right button started the slide-show, the left button started the music. When the child showed control over the operations, the system was switched off and the child was asked to play with the buttons to watch slides or to listen to music according to his preference. Timing began with the first manipulation of buttons. Each child had ten minutes time to play with the press buttons. The time each child spent with each stimulus was recorded separately by stop-watches. Whenever a child had spent three minutes in one stimulus condition without change the experimenter verbally directed the child's attention to the possibility of changing to the other stimulus. The pictures were changed automatically by remote-control every 20 seconds. The average length of each of the music pieces presented was two minutes and 30 seconds.

Each child was seen individually for one session. A session lasted 15 minutes.

Results

A one-way analysis of variance with planned comparisons was applied for statistical analysis to the time-data each group had spent in the musical stimulus. Separate tests were carried out to compare the time-data for music and pictures, respectively, within each group.

A comparison of the preferred stimulus modality within each group showed that autistic children stayed longer in the music, than in the

visual stimulus. The preference, however, was too small to yield a statistically significant difference. The group equated by approximate chronological age preferred the visual stimulus over the music ($p<.05$/two-tail test). These results were similar for the group equated by development age to an even greater extent ($p<.02$/two-tail test).

A comparison across all groups, contrasting the autistic group to each of the normal groups for the time each group spent in music yielded significant differences for both contrasts. Autistic children stayed significantly longer in music than the group equated by developmental age ($p<.02$) and longer than the group equated by chronological age ($p<.05$).

All autistic children showed strong motor reactions such as jumping up and down in the chair, body-rocking, and swinging the torso whenever the music was playing. One autistic child started humming along with the music and continued this even after every stimulus was turned off; it was difficult to persuade him to leave the session room. Normal children reacted more markedly to the pictures, identifying names of animals or commenting on the actions in the pictures.

All children gained control over the button-system within two trials and were subsequently able to operate the system without external help.

Interpretations and Conclusions

The experiment shows results in two directions. A comparison of receptor preferences within the autistic group shows no significant results. Marked preferences for music occured along with more evenly distributed preferences among all autistic children. Possible confounding influences should be considered as follows: (1) the visual stimulus source (slide projector) was placed in the session room visible to the child, whereas, all other equipment was installed outside this room. No

child in all groups, however, showed any particular observable reaction (eye-contact, etc.) toward the slide projector whenever it was switched on; (2) the visual stimulus changed every 20 seconds, whereas, the music ran for about two minutes and 30 seconds for one piece. Thus the child, having watched a slide and returning to the music, usually heard the same piece as before whereas returning to slides usually resulted in a new picture appearing on the screen. A design, using more frequently changing musical stimuli, adjusted to the frequency of visual change might influence the stimulus choice.

A contrast, however, of the autistic children's time spent in music with their normal control groups shows very marked differences between both. Autistic children listened significantly longer to the music than the normal children; whereby, this difference was most prominant when using the normal group, equated by developmental age as control.

A careful interpretation of the results would suggest that there is a marked difference in preference and response to music between autistic children and normal children. This also holds true when compared for chronological and developmental age. When comparing receptor preference (visual vs. auditory-musical) within the autistic group, the data (preference for music) showed no significant difference. Thus this aspect of the study might deserve further investigation, employing larger samples and better controlled stimulus sources. Nevertheless the results in both directions of the study suggest that autistic children seem much more apt to perceive musical stimuli than normal children. Further research might test autistic children's responses for more complex stimuli, employing auditory and tactile, auditory and kinesthetic, or auditory and visual components simultaneously.

TABLE 1

Time Involvement For Experimental And Control Groups For Two Stimulus Conditions

Groups	Stimulus: Music		Pictures	Difference Values
1. Autistic Children	Mean = 5 min. 20 sec.		4 min. 40 sec.	0 min. 40 sec.
(N = 5)	S.D.	2.13		4.27
2. Normal Children by C.A.	Mean = 2 min. 37 sec.		7 min. 23 sec.	-4 min. 46 sec.
(N = 5)	S.D.	1.28		2.56
3. Normal Children by D.A.	Mean = 2 min. 10 sec.		7 min. 50 sec.	-5 min. 40 sec.
(N = 5)	S.D.	1.35		3.10

The value signs for the difference values yield the direction of the difference. Negative value signs indicate that the group stayed longer in pictures, positive values indicate that the group stayed longer in music.

TABLE 2

A Statistical Analysis of Means of Each Stimulus Condition for Each Group

Groups	Difference Mean	df	t Value	P (two-tailed test)
1. Autistic Children (N = 5)	0 min. 40 sec.	4	0.33	$p > .2$
2. Normal Children by C.A. (N = 5)	-4 min. 45 sec.	4	3.59	$p < .05$
3. Normal Children by D.A. (N = 5)	-5 min. 40 sec.	4	3.96	$p < .02$

TABLE 3

Planned Comparisons Summary Table

Group		Music
(1) Autistic vs. (2) Normal Children by C.A.	Diff. Value	2 min. 43 sec.
	t Value	2.38
	P	.034*
(1) Autistic vs. (3) Normal Children by D.A.	Diff. Value	3 min. 10 sec.
	t Value	2.78
	P	.017*

* = significant at .05 level (two-tailed test).

EXPERIMENT II

ANALYSIS OF TONE SEQUENCES OF AUTISTIC CHILDREN

Background and Problems

The unusual interest in, and response to, music by autistic children has been documented by many studies in the last 30 years. Sherwin (1953) reported unusual musicality in three case studies of autistic boys. Pronovost (1961) found considerable interest and response to musical sounds in 11 out of 12 children. Rimland (1964) even included unusual capabilities in music in his diagnostic criteria for autistic children. Stevens and Clark (1969) found an increase of prosocial behavior in a group of autistic boys by applying music therapeutic activities. Hollander and Juhrs (1974) found an increase in quality and types of nonverbal communication with autistic children by introducing Orff-Schulwerk techniques. Blackstock (1978) found that autistic children, when given a choice between verbal and musical stimuli, preferred music in contrast to normal children who showed no preference.

Only a few studies, however, have investigated particular aspects of musical performance in autistic children. Applebaum, et al. (1979) found that autistic children overall performed as well as, or better than, normal children when tested for the ability to accurately imitate individual tones and series of tones. His sample consisted of three autistic and three normal children. Frith (1972) analyzed spontaneously produced sequences of colors and tones of autistic, normal and mentally retarded children. Tone sequences produced by autistic children were superior to their color sequences in approaching normal pattern characteristics.

The results and methods of the latter study were of considerable interest for this study. A freely structured musical test, employing the technique of improvisation, seems to be the most adequate way of investigating autistic children, bypassing their various social/behavioral deficits which would initially interfere with any traditionally structured musical setting.

This study was undertaken to analyze the quality of spontaneously produced tone sequences of autistic children and compare them with tone sequences produced by normal children and mentally retarded ones, respectively.

Specifically the purpose of the study was to determine whether: (1) there was a significant difference in ability of autistic children to improvise on a xylophone as well as normal children or mentally retarded children; and (2) whether autistic children perform better in selected sub-aspects of musical analysis.

Subjects

Twenty-two subjects, five autistic, six mentally retarded, and 11 normal, were selected for this study. The five autistic children were randomly selected from a class of autistic school children in a developmental center, fulfilling the age requirement (not younger than eight years) and the diagnostic requirement (primary diagnosis of autism). All autistic children were male. Developmental age was determined by the Psychoeducational Profile (PEP) using the age determination in the areas of perception, motor behavior and eye-hand integration. The autistic children had a mean C.A. of 10.6 years (SD = 1.5). The mean D.A. was 4.5 years (SD = 0.6).

Six normal children were randomly selected from a fifth-grade junior

high school class, serving as control group I. The mean C.A. was 10.2 years (SD = 0.4). Another five normal children were randomly selected from a first grade class in an elementary school, serving as control group II. The mean C.A. was 6.1 (SD = 0.6).

Six members of a group of severely mentally retarded adults, who participated in group music therapy at Michigan State University served as control group III. The mean C.A. of the mentally retarded subjects was 24 (SD = 5.1).

The autistic children and the subjects of control group II had no special music instructions besides the regular music teaching in school. Subjects of control group I participated in a school string program.

Methods and Materials

A xylophone was prepared with a scale consisting of the first four tones of a pentatonic scale (tone-bars e', g', a', c'; authentic mimode). Three mallets were laid beside the instrument.

A Panasonic cassette recorder was used for recording the melodies improvised on the xylophone. The tone sequences were analyzed under five aspects; rhythm, restriction, complexity, rule adherence and originality. A rating scale was devised for each aspect, allowing scorings from one point (minimum) up to eight points (maximum). A total score for each tone sequence was derived by adding the score of all five scales. Thus a maximum total score of 40 points and a minimum score of four points was possible.

Rhythm. This scale consisted of two sub-scales: (1) Number of different rhythmical elements (e.g., quarter notes, eighth notes, dotted notes)

- Four or more elements (4 points)

- Three elements (3)
- Two elements (2)
- One element (1)

Every element had to occur at least twice to be considered for scoring.

(2) Rhythmical shape of tone sequence

- Consistent two/three/four-beat rhythm with deviations (4)
- Even meter without accentuated rhythm or rhythmical figures of at least four notes within an unidentifyable rhythmical pattern (3)
- Even meter with deviations (2)
- Erratic, unidentifyable patterns (1)

A metronome was used to determine the beat of each identifyable melodic unit.

Restriction. This scale consisted of two sub-scales: (1) Usage of available intervals. Five interval types were possible (unisons, seconds, thirds, fourths, sixths).

- All intervals used (4)
- One interval missing (3)
- Two intervals missing (2)
- Three or more intervals missing (1)

(2) Usage of available tones. Four tones were possible (e', g', a', c'). Every tone had to occur at least twice to be accounted for scoring.

- All tones used (4)
- Three tones used (3)
- Two tones used (2)
- One tone used (1)

Complexity. Every tone-pattern reoccuring at least once (motif) was scored on this scale. As the complexity analysis only considered the first 16 tones, the longest possible reoccuring motif would consist of

eight tones.

- Motif consisting of 8 tones (8)
- Motif consisting of 7 tones (7)
- Motif consisting of 6 tones (6)
- Motif consisting of 5 tones (5)
- Motif consisting of 4 tones (4)
- Motif consisting of 3 tones (3)
- Motif consisting of 2 tones (2)
- Motif consisting of 1 tone (1)

Rule adherance. The total number of single tones in the whole tone sequence which belonged to a motif were accounted for scoring on this scale. For example a two-tone motif, repeated eight times, would score low on the complexity scale (2 points) but high on the rule adherence scale (8 points), because all 16 tones are part of one reoccuring motif.

- Motive(s) applied to 15 or 16 tones (8)
- Motive(s) applied to 13 or 14 tones (7)
- Motive(s) applied to 11 or 12 tones
- Motive(s) applied to 9 or 10 tones (5)
- Motive(s) applied to 7 or 8 tones (4)
- Motive(s) applied to 5 or 6 tones (3)
- Motive(s) applied to 3 or 4 tones (2)
- No rule adherence (1)

Originality. Any tone pattern occuring only once, but fulfilling particular criteria of melodic and rhythmic shape, was scored on this scale.

- Four tone pattern, one tone repeated, rhythmic shape (4)
- Three tone pattern, one tone repeated, rhythmic shape (3)
- Four or three tone pattern, one tone in common, even meter (2)
- Four or three tone pattern, no tone in common, even meter (1)

Additional points were given for:

- Playing part of whole tone sequence with two mallets (1)
- Playing whole tone sequence with two mallets (2)
- One two-tone chord (1)
- Two or more two-tone chords (2)

Procedure

The subjects, tested individually, were seated on a chair, the xylophone in front of them. Three mallets were laid beside the instrument. No demonstration of the xylophone and the required activity was given by the experimenter. The children were asked by the experimenter to play spontaneously on the xylophone whatever they wanted to play. The children were allowed to continue playing until they came to a natural ending. If they stopped before producing 16 tones they were encouraged to go on. Every improvisation was taped and the first 16 tones of each child were transcribed after the recording sessions. The analysis (see Methods and Materials) considered only the first 16 tones. Praise was given freely for any pattern in the experimental series.

Each child was seen individually for two sessions. Every session lasted from 15 to 20 minutes. In every session one tone sequence was recorded. In each case the tone sequence with the higher scores was used as the individual test result.

Results

Statistical analysis was applied to the scores of each group on each scale by using a one-way analysis of variance with planned comparisons. The method of planned comparisons allowed the contrast of the autistic performance scores with the scores of each control group for every scale.

A probability level of .05 was accepted to yield significant differences.

In terms of rhythm no significant differences were found between the autistic group contrasted with each of the control groups. The group I, normal children (NCA-group), scored slightly better than the autistic children; whereas, the groupII, normal children (NDA-group), and the autistic children scored almost equally. The contrast between autists and mentally retardates (MR-group) approached significance ($p = .059$) which suggests a better rhythmical performance by the autistic children. The rhythm scores of the autistic children, however, showed very different, widely scattered results (SD = 1.6/Min. = 2, Max. = 6) compared to the results of group I and II which yielded individually very different performances among the autistic group.

In terms of restriction the scores of autistic children and NCA-group and NDA-group were almost the same. This also holds true for the spread of the individual scores. The contrast to the MR-group showed a significantly lower performance ($p < .05$) of this group compared to the autistic children. Only one autistic child left out more than one available element (interval/tone bar).

In terms of complexity autistic children scored significantly lower than the NCA-group ($p < .05$) and the NDA-group ($p < .02$). No significant differences were found between autistic children and MR-group on this scale, although the autistic group scored slightly higher. Only two autistic children improvised musical motives which consisted of more than two successive different tones, whereas the average motive of normal children contained about five tones.

In terms of rule adherence autistic children scored lower than the NCA-group and the NDA-group, but only the contrast to the NDA-group was of significant character ($p < .05$). The MR-group scored almost as high

as the autistic group on this scale. Autistic children applied rules to an average of seven tones, whereas the MR-group usually used rules for five-six tones (out of 16 tones maximum).

In terms of originality autistic children scored significantly better than the MR-group ($p < .05$) and the NDA-group ($p < .01$). No significant difference ($p < .066$) was found between autistic and NCA-children. The overall performance on this scale was very low (Total mean of 1.23). The autistic scores showed an extremely wide spread (SD = 2.45/Min. = 0, Max = 6) compared to all other group's results.

In terms of total scores NCA-children scored best (M = 24.0) with the NDA-children (M = 23.4) next best. Both total group scores were not significantly better than the performance results of the autistic children (M = 20.8). The autistic group scored significantly better ($p < .02$) than the MR-group. Characteristic for autistic and MR-group is a wider scattering of individual scores compared to the individual scores of the normal groups. In terms of deviation the autistic score spread shows more similarity to NDA-children than to their C.A.-matched controls. The highest individual score of all tested children comes from an autistic child (28 points out of 40).

Autistic children scored significantly better than the MR-control group in terms of rhythm, restriction, originality and total performance score. The complexity score showed slightly better results for the autistic group whereas both groups scored closest of all scales in terms of rule adherence. No significant differences between normal control groups and autistic children were found in terms of rhythm, restriction, total performance score, and rule adherence (NCA), originality (NCA), although the normal children usually scored slightly higher. In terms of complexity and rule adherence (NDA) autistic children fell behind the

normal controls significantly. Autistic childred scored significantly higher than the NDA-children in terms of originality. Autistic children achieved the highest mean score on the restriction scale, the lowest mean score on the complexity scale. The best results in contrast to the normal controls were achieved by autistic children on the originality and restriction scale.

Interpretations and Conclusions

A careful interpretation of the results presented would suggest that, on the given musical performance test, autistic children overall did not perform significantly lower than normal children; whereby, the distinction between the control groups (matched by C.A. and D.A.) appeared to be of limited importance for the comparisons. The most apparent distinction between the NCA- and NDA-groups can be found in the spread of individual scores. The older, normal children's scores were very consistent, whereas the younger normal children showed a spread close to the autistic scores. The autistic scores analyzed for each scale show normal and abnormal features. Good performance on the rhythm scale would point in the direction of motoric abilities as well as support the notion of an absorption of rhythm on a physiological level, thus bypassing cognitive deficits. The high scores for restriction show that autistic children perceived and explored the available musical material just as normal children. This can also be supported by the results on the originality scale, where points were given for use of two mallets or two-note chords. Autistic children and normal children made use of this material in a similar way. Autistic children also produced a number of motives not governed by rules which might have been a direct product of free exploration of the available medium. In these three aspects

(rhythm, restriction, originality) autistic children showed normal features which would support the notion of unusual musical responsiveness and abilities compared to results in other performance areas. A comparison to the scores of the MR-group would support this observation as well. On these three scales autistic scores can be unequivocally distinguished from the MR-group scores.

In terms of complexity and rule adherence the tone sequences of autistic children show some abnormal features, resembling the performance of mental retardates. Rather short, reoccuring motives, which are applied only by one child for more than half of the analyzed total tonal sequence, are characteristic of the autistic group. An interesting feature occurs in the MR-group where low complexity is accompanied by a relatively high increase in rule adherence. Mental retardates behaved much like the autistics on this scale. The distinctive feature is that autistic children did not differ as much between complexity and rule adherence as mental retardates. Apparently the MR-group behaved in a more repetitive manner than autistic children who frequently employed more original motives instead of complex and rule-governed tone sequences. The discrepancy between complexity and rule adherence, thus, might be a distinctive feature of tone patterns for mentally retarded individuals compared to those of autistic individuals.

The low performances on complexity and, somewhat better, rule adherence of autistic children point strongly in the direction of some cognitive deficiencies which might be responsible for generating mental structures in order to organize and retain complex information sequences. A connection might be drawn to language development in which semantic and syntactic rule-systems provide organizational basis for the meaning and production of sounds. An interesting comparison can be drawn between

the autistic scores on rule adherence and rhythm, viewing rhythm as a sort of temporal or motoric rule-system working on a physiological level. Here the autistic children approached almost normal scores, whereas the performance on rule adherence as an application of complex motives to longer tone sequences resembled the performance of mental retardates.

The most startling observation during the experiment was that an autistic child achieved the highest score of all children tested. This would support the notion that among the scattered individual abilities of autistic children even extreme abilities may be found. The child mentioned shows the usual autistic symptoms and deficiencies but is reported to process musical stimuli better than verbal or visual instructions (e.g., follows sung commands better than verbal commands).

In summarizing the results and interpretations it can be said that the experiment has shown musical performance scores of autistic children which highly approach normal level. Their individual score spread extended, in one case, all normal children's scores. The autistic group scored significantly better than the MR-group on most scales. All results suggest that music is a medium facilitating performance and response of autistic children. The findings of Frith (1972) can be generally supported by this study. It has to be taken into account that the test structure (improvisation) required minimal formal perception of external stimuli or structures and therefore facilitated the autistic children's performance. Nevertheless these findings might help to set up more structured tests where musical achievements and abilities of autistic children can be evaluated in further detail.

TABLE 4

Scores for Experimental and Control Groups Obtained from Tone Sequence Analysing Scales

Group		Scales: Rhythm	Restriction	Complexity	Rule Adherence	Originality	Total
1. Autistic Children (N = 5)	Mean	4.2	7.2	2.8	3.6	3.0	20.8
	S.D.	1.6	0.8	1.6	1.5	2.4	4.2
2. Mental Retardates (N = 6)	Mean	2.8	5.3	1.8	3.0	0.6	13.6
	S.D.	0.9	2.4	1.1	2.5	1.0	6.2
3. Normal Children by C.A. (N = 6)	Mean	5.1	7.1	4.8	5.6	1.1	24.0
	S.D.	0.9	0.7	1.1	1.6	1.6	0.8
4. Normal Children by D.A. (N = 5)	Mean	4.0	7.2	5.4	6.6	0.2	23.4
	S.D.	1.0	0.8	1.9	2.0	0.4	3.2

TABLE 5

Planned Comparisons Summary Table

Group		Scales: Rhythm	Restriction	Complexity	Rule Adherence	Originality	Total
(1) Autistic vs. (2) Mentally retarded	Diff. Value	1.36	1.86	0.96	0.60	2.33	7.13
	t Value	1.93	2.12	1.07	0.49	2.49	2.82
	p	.059	.047*	.296	.626	.023*	.011*
(1) Autistic vs. (3) Normal children by C.A.	Diff. Value	-0.96	0.03	-2.03	-2.06	1.83	-3.20
	t Value	-1.36	0.03	-2.26	-1.70	1.95	-1.26
	p	.188	.970	.036*	.105	.066	.221
(1) Autistic vs. (4) Normal children by D.A.	Diff. Value	0.20	0	-2.60	-3.00	2.80	-2.60
	t Value	0.27	0	-2.76	-2.37	2.86	-0.98
	p	.789	1.000	.013*	.029*	.010*	.338

* = significant at $p < .05$ level

The value signs for the difference values and the t values yield the direction of the comparison. Negative value signs indicate that the control group has scored better, positive values indicate that the autistic children have scored better.

APPENDICES

MICHIGAN STATE UNIVERSITY

DEPARTMENT OF MUSIC EAST LANSING · MICHIGAN · 48824

APPENDIX A

PARENTAL CONSENT FORM

Dear Parent,
I am writing to ask your permission for your child to participate in my Musical Responsiveness Testing Project. This is a research study within my thesis work for the Master's degree in music therapy. The study is supervised by the Music Department of Michigan State University. The objective of my study is to find out how different children respond to music and if they prefer music compared to other media such as ictures etc. To accomplish this your child will be asked to participate in two individual activities:(1) he will be asked to play spontaneously on the xylophone;(2) he will be asked to play with two press-buttons which switch on either a slide projector, showing pictures of animals or country scenery, or a tape recorder with recorded music specially designed for children.

This study has already been explained to your school principal and to your child's classroom teacher, and has been approved by both. Your support would be most helpful for a deeper understanding of music in Special Education.

Therefore I would be very thankful if you also could approve, and indicate this by signing and returning the consent form below.

Yours sincerely

Michael Thaut
Graduate Student in Music Therapy

R.F. Unkefer, Associate Professor
Associate Chairman
Chairman, Music Therapy

Musical Responsiveness Testing Project Consent Form ----------
I have read the explanation above and hereby give consent for my child to participate in your study of musical responsiveness

I understand that my child is free to withdraw from the study at any time. I understand that my child will remain anonymous and that his or her responses will remain confidential. I understand that no pictures or video-taping will be made during the project. Within these restrictions, I understand that when the study is completed the overall results of it will be made available to me upon my written request.

Signed_____

Date_____

Child's Name_____

Teacher's Name_____

APPENDIX B

EXPERIMENTAL RAW DATA

Experiment I

Group Autistic Children

		Case I	Case II	Case III
Stimulus	Music	7 min 37 sec	7 min 50 sec	4 min 11 sec
	Pictures	2 min 23 sec	2 min 10 sec	5 min 49 sec
		Case IV	Case V	
Stimulus	Music	3 min 02 sec	4 min 00 sec	
	Pictures	6 min 58 sec	6 min 00 sec	

Group Normal Children By C.A.

		Case I	Case II	Case III
Stimulus	Music	3 min 04 sec	4 min 30 sec	3 min 00 sec
	Pictures	6 min 56 sec	5 min 30 sec	7 min 00 sec
		Case IV	Case V	
Stimulus	Music	0 min 30 sec	2 min 03 sec	
	Pictures	9 min 30 sec	7 min 57 sec	

Group Normal Children By D.A.

		Case I	Case II	Case III
Stimulus	Music	1 min 15 sec	0 min 00 sec	4 min 08 sec
	Pictures	8 min 45 sec	10 min 00 sec	5 min 52 sec
		Case IV	Case V	
Stimulus	Music	2 min 52 sec	2 min 37 sec	
	Pictures	7 min 08 sec	7 min 23 sec	

EXPERIMENTAL RAW DATA

Experiment II

Group Autistic Children

	Cases				
	I	II	III	IV	V
Rhythm	2	6	5	5	3
Restriction	7	8	7	6	8
Complexity	5	4	2	2	1
Rule Adherence	5	4	4	4	1
Originality	0	6	1	4	4
Total Score	19	28	19	21	17

Group Mentally Retarded

	Cases					
	I	II	III	IV	V	VI
Rhythm	2	4	2	2	3	4
Restriction	8	7	3	2	7	5
Complexity	2	4	1	1	2	1
Rule Adherence	3	7	1	1	5	1
Originality	2	0	0	0	0	2
Total Score	17	22	7	6	17	13

Group Normal Children
By C.A.

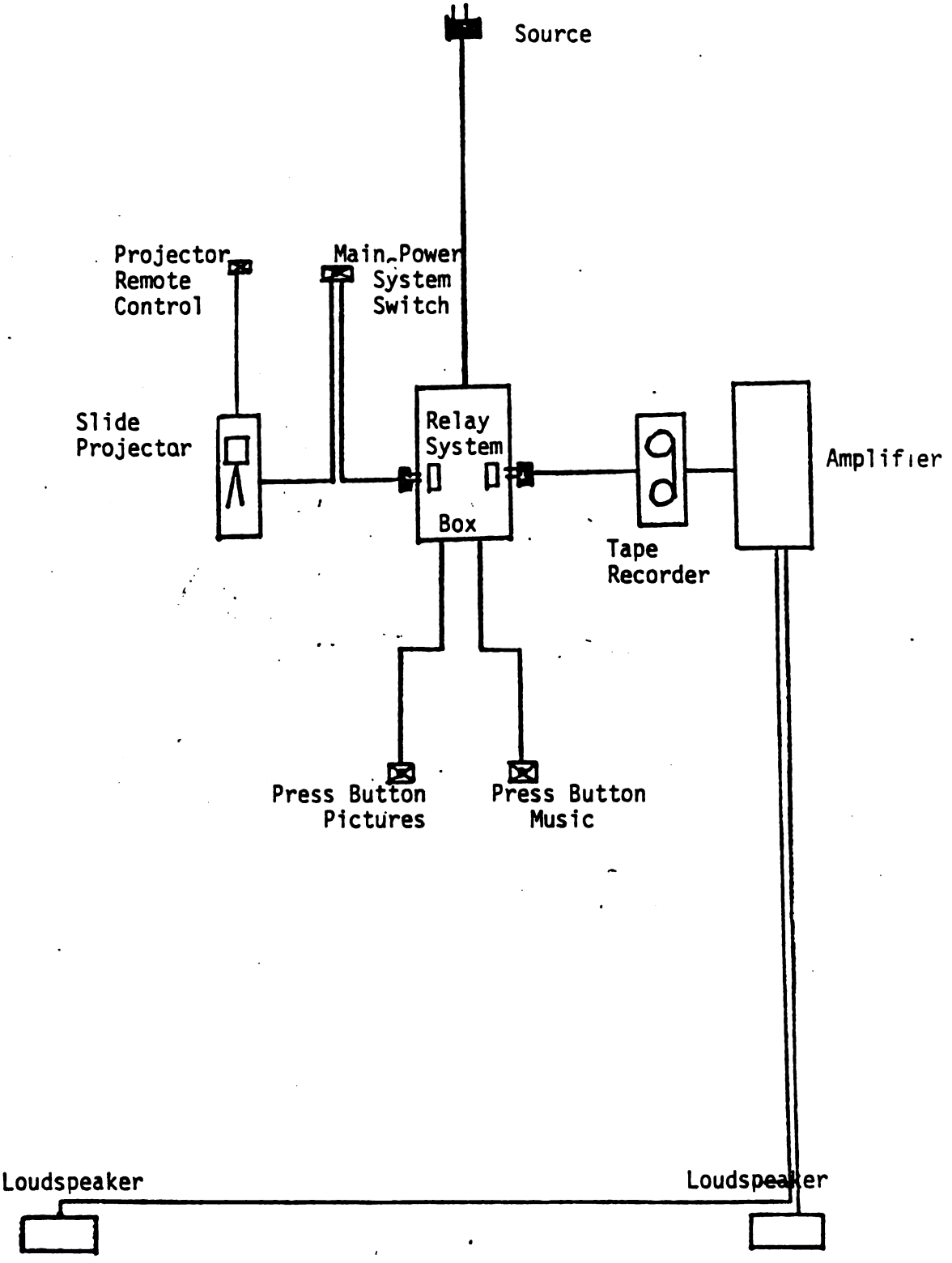
	Cases					
	I	II	III	IV	V	VI
Rhythm	5	6	6	4	6	4
Restriction	8	6	7	7	8	7
Complexity	4	5	3	6	5	6
Rule Adherence	5	8	3	6	6	6
Originality	2	0	4	0	0	1
Total Score	24	25	23	23	25	24

Group Normal Children
By D.A.

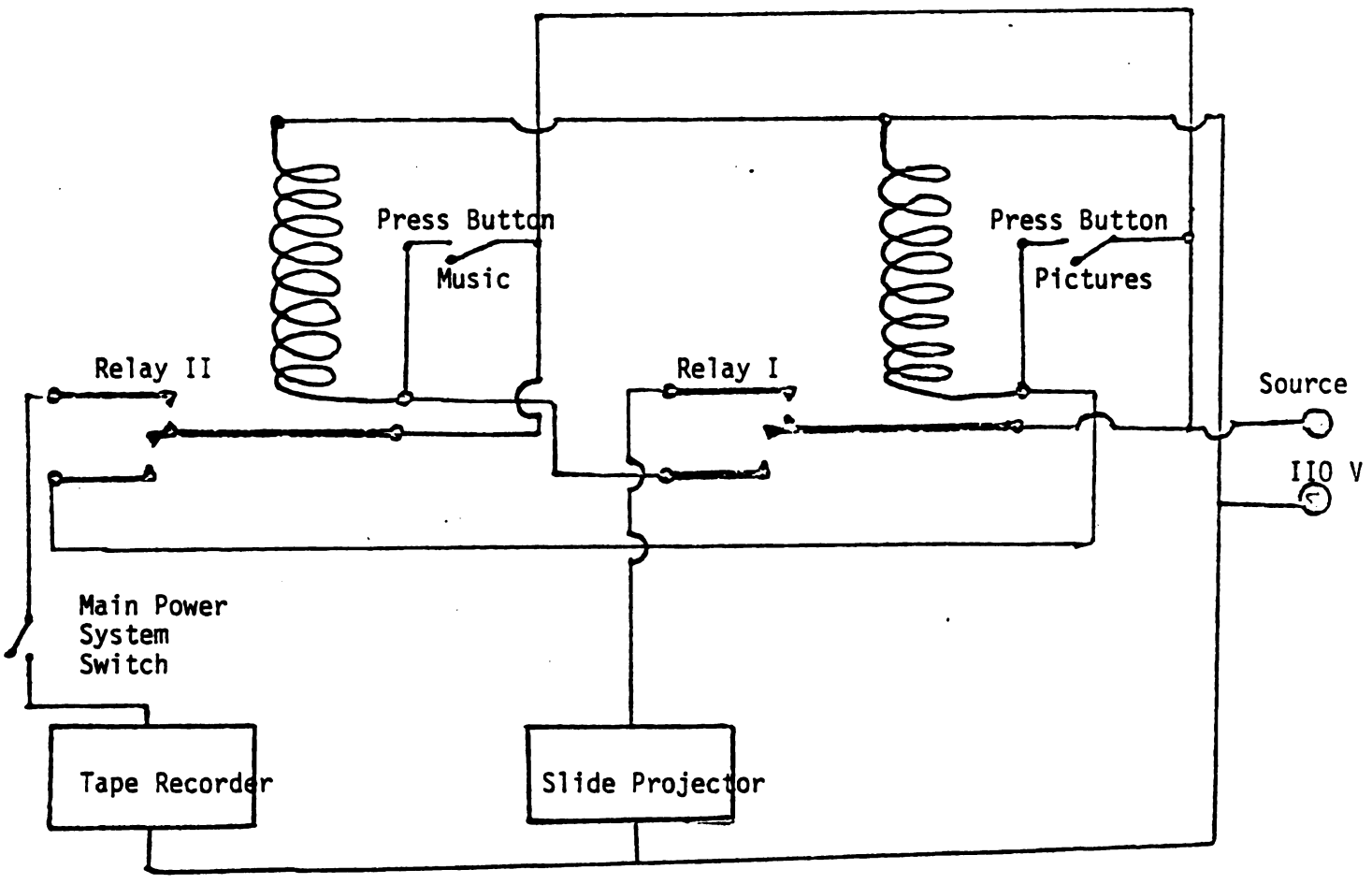
	Cases				
	I	II	III	IV	V
Rhythm	5	3	4	3	5
Restriction	8	7	7	6	8
Complexity	6	7	6	6	2
Rule Adherence	7	8	7	8	3
Originality	0	0	1	0	0
Total Score	26	25	25	23	18

APPENDIX C

SETTING OF ELECTRICAL EQUIPMENT FOR EXPERIMENT I



ELECTRICAL CIRCUIT SYSTEM DIAGRAM FOR EXPERIMENT I

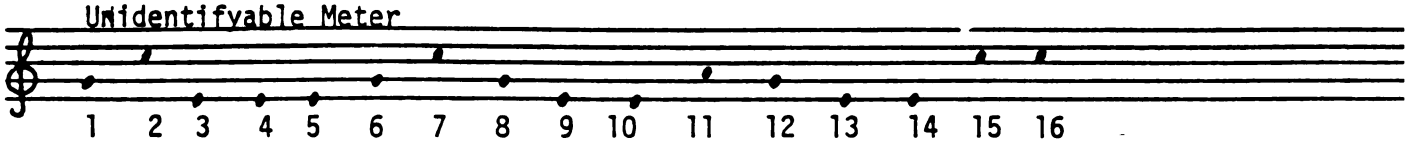


APPENDIX D

TRANSCRIPTION OF TONE SEQUENCES

Tone Sequences of Group I, five autistic children

Unidentifyable Meter



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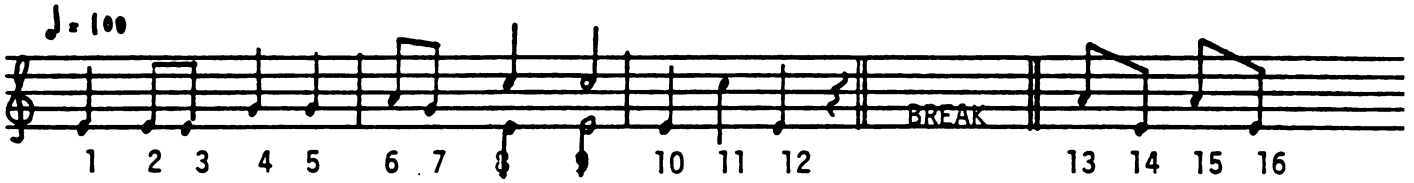

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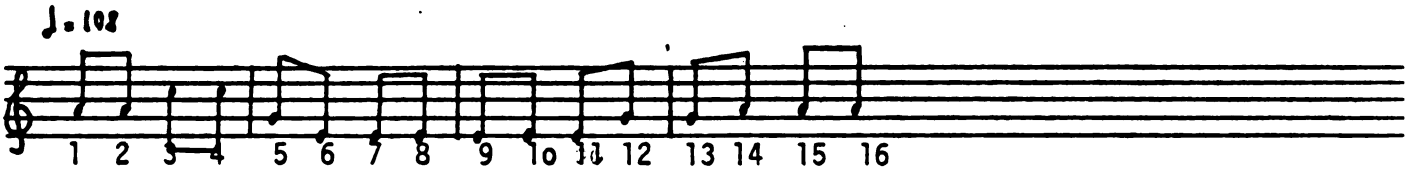
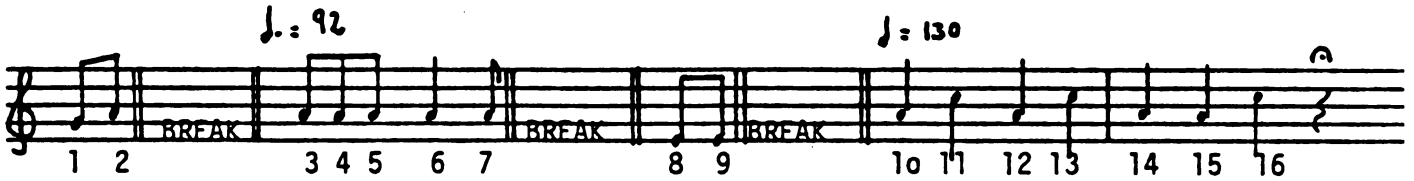


♩. = 92

♩ = 130



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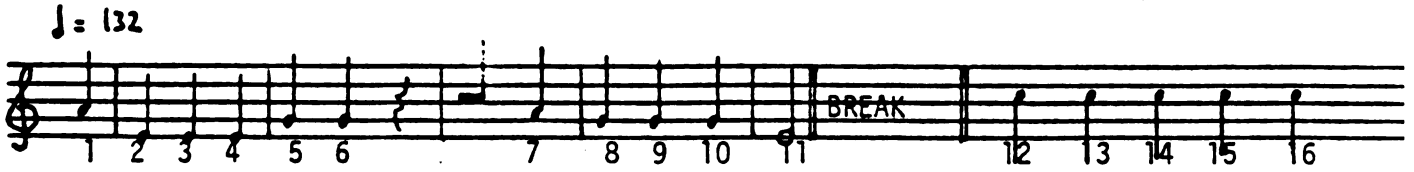
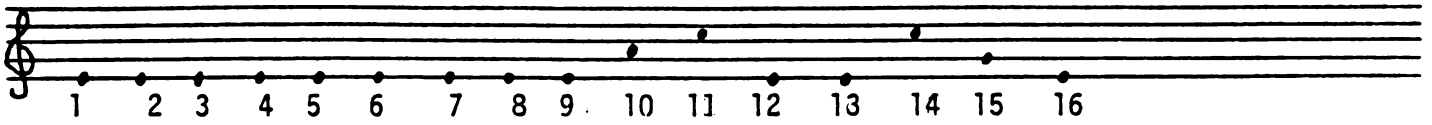
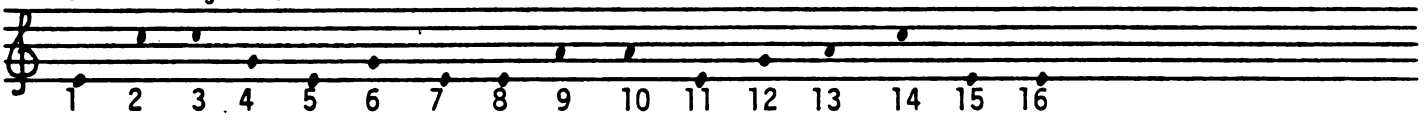


Two sample tone sequences of Group II, six mentally retarded adults, which achieved total scores closest to the group mean

♩ = 104

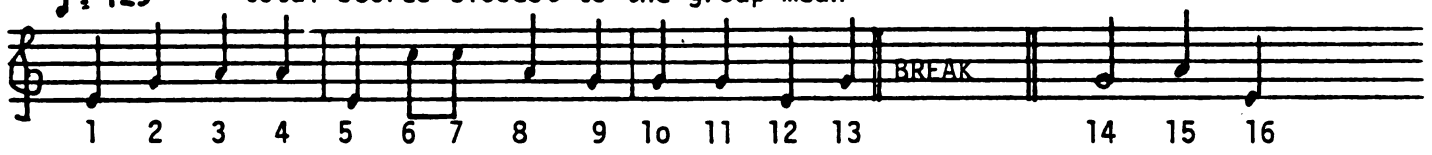


Unidentifyable Meter

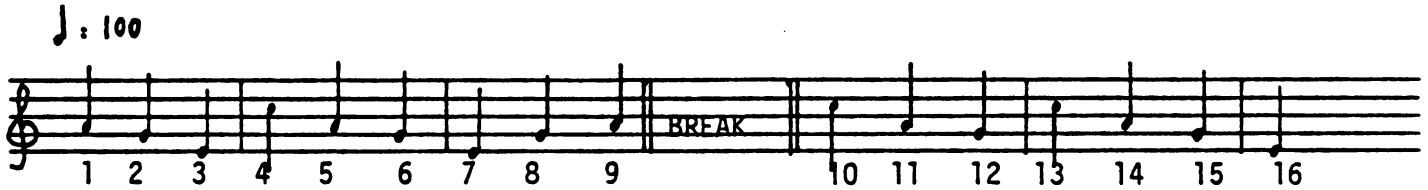


Two sample tone sequences of Group III, six normal children by C.A., which achieved total scores closest to the group mean

♩ = 125

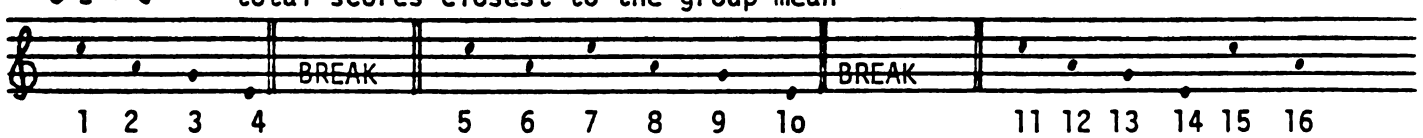


♩ = 100

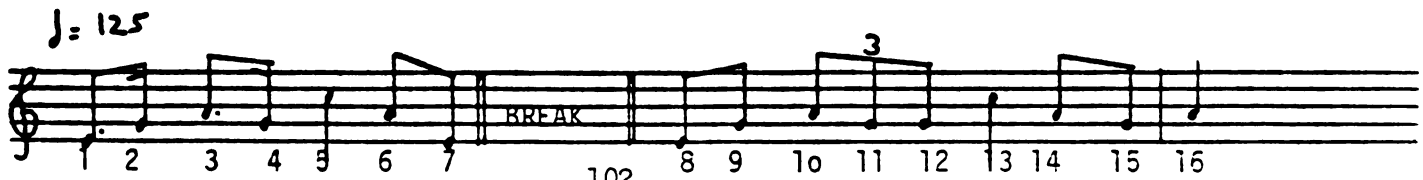


Two sample tone sequences of Group IV, five normal children by D.A., which achieved total scores closest to the group mean

♩ = 108



♩ = 125



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