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A study of the effects of music on attending behavior of children with autistic-like syndrome

Susie Wood
San Jose State University

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Wood, Susie R., M.S.

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U·M·I
300 N. Zeeb Rd.
Ann Arbor, MI 48106

A STUDY OF THE EFFECTS OF MUSIC ON ATTENDING BEHAVIOR OF CHILDREN WITH AUTISTIC-LIKE SYNDROME

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Susie Wood

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APPROVED FOR THE DEPARTMENT OF OCCUPATIONAL THERAPY

Lela A. Llorens, Ph.D., OTR, FAOTA

Jean Still, M.S., OTR

Marti Southam, M.A., OTR

APPROVED FOR THE UNIVERSITY

ABSTRACT

A STUDY OF THE EFFECTS OF MUSIC ON ATTENDING BEHAVIOR OF CHILDREN WITH AUTISTIC-LIKE SYNDROME

by Susie R. Wood

The purpose of the study was to explore the effects of music on the attending behavior of children with autistic-like syndrome.

A single system A-B-A-C-A design was used in which behavioral observations of four subjects with autistic-like syndrome were made twice weekly over a 10 week period. Phase A consisted of a period of no music in the background during mealtime, alternating with phase B, Baroque background music and phase C, a hemi-sync music background.

Results showed that three subjects demonstrated less out of seat behavior when music was played during mealtime. Three subjects demonstrated increased communication when Baroque music was played in the background.

This exploratory study of children with autistic-like syndrome has suggested that music may have a positive effect on a child's ability to communicate effectively and may increase the ability to stay seated during a self-care activity.

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CHAPTER 1

INTRODUCTION

Purpose

The purpose of the study was to explore the effects of music on the attending behavior of children with autistic-like syndrome. The effects were evaluated to determine feasibility of the use of music as an adjunct to therapeutic or educational intervention programs for children with autism.

Statement of The Problem

Autism is characterized by an "autistic aloneness" (Rimland, 1964). The child with autism exhibits inattention to the environment, relates to objects in a non-functional manner, and particularly exhibits a lack of interest in or aversion to people (Arnold, 1960; Loomis, 1960). This avoidance and decreased attention disturbs the child's relationship to his family, society, and world.

Research suggests that the brain stem reticular formation has a vital role in evocation of attention and maintenance of alertness, as well as modulating sensory activities of receptor organs (Brain, 1958; Magoun, 1961). Rimland (1964) hypothesized that children with autism might exhibit damage to the brainstem, creating attentional deficit, in addition to other sensory processing problems, leading to auditory and other perceptual impairments. Hutt (1965) described EEG studies of children with autism, who exhibit asyncronous patterns, characteristic of a state of reticular formation arousal. DeMyer (1979) has suggested that studies on attention in autism have been neglected and should be done.

Morris (1987), in observational studies with developmentally delayed children, found that certain music had a calming effect, facilitated increased attention to task, and improved interaction with people.

Music has historically been used to reinforce behavior changes in children with autism, and to help develop sensory-motor skills and communication. There are no published studies, however, on the use of music to increase attention to the environment.

Objectives

The objectives of this study were:

1. To better understand the relationship of music and attending behavior.

2. To further explore the role of sensory integration and neurophysiological theory in relationship to music and sensory processing of children with autistic-like syndrome.
3. To generate data that can be used to determine whether music can be a useful adjunct to therapeutic and educational treatment programs.

Questions

1. What effect will background music have on attending behavior of children with autistic-like syndrome?
2. Will there be a difference between responses by children with autism to Baroque and hemi-sync music in the effect of each on attending behavior?
3. Will the child with autistic-like syndrome increase eye contact with others during exposure to music background?

Definition of Key Terms

Definition of key terms used in this study are:

1. ATTENDING BEHAVIOR - operationally defined as the child's attention directed to the external environment. Specifically, attending behavior will be evaluated in terms of time spent looking at a person's face/upper body, time

engaged in activity of self-feeding, number of times needed to re-direct child to seat during feeding activity, and number of times communicated.

2. "AUTISTIC-LIKE" BEHAVIOR - includes behaviors listed in the Ornitz Autism Rating Scale including abnormal response to people including no eye contact, abnormal response to objects, inappropriate play, poor sensory modulation, and motility disturbances, including stereotypic behaviors.

3. BACKGROUND MUSIC - refers to music or sound effects used as a subordinated accompaniment to dialogue or action.

4. BAROQUE MUSIC - refers to music that flourished in Europe from 1550-1750, characterized by complex structural details, contrasts, and ornamentation.

5. BINAURAL BEAT - a response produced in the brain when two slightly differing sound frequencies are presented, one to each ear, through stereophonic speakers. The difference in sound wave frequency creates a third tone, or standing wave form. This is reflected in electro-encephalographic studies of the brain.

6. EYE CONTACT - is operationally defined as the child looking at the face or upper torso of another person, regardless of duration, whether glance is fleeting or maintained for the duration of several seconds.

7. HEMI-SYNC - a term coined by Monroe (1982), which means hemispheric synchronization, said to occur in response to a "frequency following response" of the brain to sound

frequencies creating a binaural beat frequency within the brain.

Assumptions

It was assumed that changes in behavior noted during the course of the experiment, as measured objectively, would reflect the influence of background music on the overall state of arousal, thereby affecting attending behavior. The subjects referred to this study were assumed to be accurately diagnosed. Any changes in behavior in response to background music were assumed to be for the duration, with minimal or no carry-over noted after the music session.

Limitations

The study was limited relative to sample. Due to the infrequency of autism in the population, 4 per 10,000 persons, a random sample was not possible. Three of the subjects were centralized in one classroom and other factors in the classroom environment may have influenced the outcome of the study.

There is always the possibility of observer bias in such a study; however, inter-rater reliability testing was conducted. The study is further limited due to its relatively short duration of 10 weeks.

Significance Of The Study

"Rhythm and harmony penetrate to the inner recesses of the soul, take powerful hold of it and impose order upon it" (Plato). "Who hears music feels his solitude peopled at once" (Robert Browning). If these claims have validity, perhaps these quotations explain why the evidence suggests that children with autism are frequently attracted to music.

Music is used to help children with autism develop sensory motor skills, communication, and social interaction abilities. Perhaps by utilizing slow, 60 beat-a-minute Baroque music or hemi-sync music, the classroom, therapy, or home environment can be made more relaxing and conducive to calming the child's overaroused system, thereby helping the child to focus attention on the external environment.

CHAPTER 2

LITERATURE REVIEW

The literature review consists of three sections. The first addresses the neurological substrate of attending behavior of children with autistic-like syndrome, followed by a review of music and autism. The last section describes the occupational performance frame of reference upon which this research is based.

Attending Behavior

The importance of being able to attend to stimuli in the environment, and to form affective relationships has been emphasized by many researchers (DeMyer, 1979; Kanner, 1943). Demasio (1978) has suggested that autism is caused by defects in a part of the mesocortex. The mesocortex relays information between sensory systems and the hippocampus and limbic systems. It is believed that damage to this circuit may be one cause of sensory as well as attention difficulties in children with autism (Grandin, 1978). Cerebellar damage, as well as abnormal development of the hippocampus and adjacent areas were detected by one autopsy study of the brain of an adult with autism (Demasio, 1978). The cerebellum, in addition to modulating smooth timing of and coordination of motor activities, may affect regulation of emotion and affective behavior (Ayres, 1974).

Grandin (1978), who was autistic as a child, reported that the sensory and attention problems caused by the abnormal brain can create secondary problems, as other brain areas may not receive needed stimulation due to the child's inability to pay attention to stimuli, or the need to withdraw to block out an onslaught of confusing stimuli. Social interaction, as well as structured tactile, vestibular, and kinesthetic stimulation may help a damaged nervous system to develop more normally.

A study by Ritvo (1976) examined the responses of both children with autism and retardation to contingent vestibular stimulation. The children were rated on the percentage of time which they pushed buttons to receive rocking at 30, 40, and 50 rocks a minute. The amount of self-activated rocking did not differ in the two groups; however, the children with autistic-like syndrome pushed buttons to receive 40 and 50 rocks per minute at a significantly greater rate than did the children with retardation. Ritvo suggested that autism may be the result of a major defect in sensorimotor integration. He further stated that since the frequency of stimulation is a parameter for the children with autism and not the children with redardation, this can be interpreted as evidence of a central rather than peripheral locus of control of the motility disturbances in autism (Ritvo 1974). Ritvo cited evidence that supports the hypothesis that motility disturbances are motivation-dependent. Hutt and Hutt (1968) suggested a correlation with the behavioral and physiological measures of arousal.

Hermelin (1970) has put forth a hypothesis linking social unresponsiveness with failure to process incoming sensory information adequately, and the absence of attachment to people could be regarded as only one instance of a general inability to process stimuli adequately. Hermelin continues to state that other factors may contribute to the abnormal responses of children with autism to sensory stimuli, including lack of interest and motivation, level of arousal of subject, and the connection between low verbal ability and perceptual impairment, as well as interpretation and integration of information from different sensory systems.

The normal neonate demonstrates movement responses to the adult's voice, evidenced by studies in microkinesics (Condon, 1974). The motor organization of one and two day old infants was observed to be an organized hierarchic response to the organized pattern of adult speech. Condon suggested that the normal infant entrains to the patterns of speech from the time of birth, setting down the operational format for later speech, as well as body motion styles and rhythm (Condon, 1975). It is thought that this process of entrainment to speech is panhuman. The author further suggests that it is this entraining process that results in the normal "bonding" process of infant and caretaker. The entrainment process is visual and tactile as well as auditory in nature (Condon, 1975). In studies of children who are autistic, as well as those with learning disabilities, Condon (1975) found that the kinesic responses to speech indicated a lack of synchrony in both populations, although it was more severe in the autistic group. The children exhibited a typical delayed response from 1/2 to one minute and appeared to "respond" to the same sound more than once, as evidenced from microkinesic analysis of movement patterns.

Ornitz (1973) studied the effects of vestibular and auditory stimulation on the rapid eye movement bursts (REMB) of normal children and those with autism, using encephalographies taken during the sleep cycle. He discovered that there was a decreased response to vestibular and auditory stimulation in subjects with autism, evidenced by decreased REMB clusters during the course of the sleep cycle, compared to the control group. Ornitz concluded that the depressed ocular activity seen in children with autism in response to vestibular stimulation during sleep is analogous to suppression of vestibularly induced nystagmus in the waking state, which is commonly observed in the children, pointing to a brain stem dysfunction.

Neurophysiological feedback loops for control and coordination of visual and vestibularly induced ocular activity involve the vestibular and cerebellar roof nuclei, the cerebellar vermis and the pontine reticular formation (Ornitz, 1973).

Ayres (1980) studied the responses of ten subjects with autism to a Program of Sensory Integration during the course of a year and found that the subjects who were hyperresponsive to vestibular and tactile stimuli responded better to the intervention program than did those children who exhibited a hyporeactivity to vestibular stimulation, evidenced by depressed post-rotary nystagmus. The disturbance in sensory processing reflects either poor modulation or inadequate registration of incoming stimuli, according to Ayres.

Hutt and Hutt (1965) analyzed EEG patterns in both children with autism and those with emotional problems. The "free field" behavior in a variety of settings was analyzed, correlating behavior with resultant EEG patterns during the activities. It was found that gesturing, or stereotypical behavior, increased in the children with autism with increasing complexity of the task. The characteristic EEG of the child with autism exhibited low voltage, with irregular record, and no dominant rhythm. In the group of ten subjects with autistic-like syndrome, one exhibited an irregular alpha rhythm, two subjects exhibited bilateral beta waves, and one exhibited an unstable theta pattern of brain waves. In contrast, a normal control group of 60 obtained only one desynchronous or "flat" EEG. The patterns in this group consisted primarily of waves with higher voltage and a dominant rhythm. Hutt and Hutt hypothesized that behavioral withdrawal and stereotyped behavior occur in states of high arousal, and that children with autism engage in stereotypies as a safety device to prevent further bombardment of sensory input, protecting the organism from the deleterious consequences of excessive excitation. Hutt and Hutt (1965) suggested that it is possible for children with autism to have chronically high levels of arousal of the Reticular Activating System (R.A.S) which produces blocking of sensory pathways, accounting for reports of reduced sensitivity to sound, to pain, and lack of visual fixation on specific stimuli.

Demasio (1978) and associates analyzed the behavioral and motor disturbances in childhood autism and compared signs and conditions seen in adult neurology. Using this model, the disturbances of motility (stereotyped movements, and abnormalities of gait and posture) and of attention (abnormal responses to auditory, visual and vestibular stimulation) are comparable to those seen in adults with certain forms of brain damage, in which the frontal lobe or related structures of the basal ganglia or limbic system are involved. A variety of behavioral disturbances is associated with dysfunction of basal ganglia or frontal lobes, evidenced by animal studies (Demasio, 1978). The disturbances of attention and perception were analyzed, and subjects with autism exhibited less sustained orientation towards visual stimuli than did the control group of normal children and those with retardation. Children with autism were also noted to use peripheral vision more frequently than central vision. Demasio has suggested that experiments conducted with primates provide evidence that supports the notion that the responses of an organism to a given stimulus depends on the set of "goals" of the organism that modulate responses to the stimuli. The author suggested further that "limbic" system markings are necessary for the operation, and that the determination of and marking of the importance of a stimulus takes place at different levels of limbic system processing. These defects are apparently due to lack of initiative to communicate and from a lack of orientation toward stimuli, suggesting an underlying impairment of higher motor or perceptual control. Further, lesions in mesial aspects of the frontal lobe, particularly in the region of the supplementary motor area or the cingulate gyrus, may produce these effects (Demasio, 1978).

Chusid (1973) suggested that structures in the anterior limbic area may exert an inhibitory influence on brain stem mechanisms concerned in the emotions such as anger. The author cited evidence that damage in this area also results in restlessness and hyperactivity.

Autism and Music

Blackstone (1978) compared the listening preferences of children with autism to those in a normal control group. The children with autism preferred the sung songs and listened to both verbal and musical material primarily with the left ear. In contrast, the control group listened to the song with the left ear and to the verbal material with the right ear, and showed no preference for verbal or "sung" material. The author suggested that the evidence supports the hypothesis that children with autism are right hemisphere processors. The child with autism lacks the analytical aspects of language, but processes in a predominantly non-verbal, holistic information style. Sound gestalt, melodic component of pitch, harmony, and intensity, as well as visuo-spatial information, are predominantly processed by the right hemisphere.

There are many references to musical abilities of people with autism in the literature (Applebaum, 1979; Rimland, 1978). An investigation by Applebaum (1979) studied three children with autism who were matched with controls for age and reported musical skill. The children with autism performed as well or better than normal children on recognition of pitch, rhythm, and duration, on 62% of trials. Blasco (1978) referred to a case study, in which a child with autism exhibited extreme discomfort with high tones, strident harmonies, and fast rhythms by reacting with physical aggression. On the other hand, when the investigator played "Morning Mood" from Grieg's "Peer Gynt Suite," the child visibly relaxed and participated in activity in an organized fashion. The child showed preference for soothing lullabies and music with a slow "sorrowful" tempo, according to the author, and was able to find pleasure and stimulation in some aspects of external reality provided by the positive musical experience. In conclusion, the investigator found that music therapy, mediated by drawing, helped the subject lengthen attention span and broaden the range of thoughts and feelings to gain a firmer hold on reality (Blasco, 1978).

Stevens and Clark (1969) assessed the "pro-social" behavior of five boys with autism following individual music therapy which was participative in nature. Pretest/posttest design utilized the Ruttenberg Autism Rating Scale. Three of the five boys made significant gains which were reflected at the end of the eighteen week treatment program. Orff-Schulwerk, a form of music education developed by Carl Orff, has been used effectively with autistic children (Hollander, 1974). The child with autism is engaged in playing instruments and imitating sign language, utilizing the propensity of the child to enjoy rhythm, order, and repetition. The advantage of music in therapy is that music can communicate at the more primitive, physiologic level of rhythm and develop rapport that is not possible with verbal language (Hudson, 1973).

According to Hollander (1974), the significant therapeutic value of music is its ability to engage the child with autism, facilitating a voluntary investment in the external world.

King (1978) described a demonstration school for children with autism, where the curriculum is based on neurodevelopmental and sensory integrative principles. Music is a component of the program, and the author suggests that increased oral language often results from intervention, and that the children usually respond positively to the modality of music.

Morris (1986) referred to the use of background music to enhance learning, as implemented by investigations by Alexander (1982), Gamble (1982), and Schuster & Mouzon (1982). Their research shows that an increase or enhancement of learning occurs when music is incorporated into a learning activity (Schuster & Mouzon, 1982). With the use of slow Baroque music with a 60-beat-per-minute tempo, the researchers found that students learning vocabulary lists with a background of Baroque music (Handel's "Water Music") achieved a 24% higher acquisition score and 26% higher retention score than students learning the list without music (Mouzon & Schuster, 1982). Morris (1986) cited studies by Cook (1981), Halpern (1985), Hudson (1973), and Safranek (1982) which indicate that music influences the rhythms of the body, including heartbeat, respiratory rate, and rhythmical movement coordination, including the suck-swallow pattern of early feeding. Morris speculates that music through the auditory system may facilitate learning (Morris, 1986). Patterns and the distribution of electrical energy are associated with different types of learning and different states of consciousness (Monroe, 1982; Morris, 1986). Brainwave patterns change under different stimulus conditions and respond to sound by changing their electrical waveform, as measured by electro-encephalograph (EEG). Oster (1973) identified a "frequency following response" in the brain, in which, at the cortical level, the brain follows the frequency of sounds presented to the ear. The investigator was able to monitor the changes in electrical frequencies of the cortex, monitored as sounds presented auditorily. When two sound frequencies differing by a small amount are produced, a third sound is created, perceived as a pulsing or warbling of the tone. The pulsed tone, called a beat-frequency, occurs as portions of original waveforms amplify or cancel each other out. This third tone consists of a pulsing "standing wave form" (Morris, 1986; Oster, 1973). Monroe (1982) and associates at the Monroe Institute of Applied Sciences monitored EEGs of subjects, listening to two different frequencies, one presented in each ear through headphones. The difference tone, or third warble tone, could be identified by changes in the electrical pattern produced by the brain, known as a binaural beat. This pattern was duplicated with the same frequency in both hemispheres of the brain. Monroe identified this pattern of hemispheric synchronization as hemi-sync. It is not known whether the synchronization is achieved through integration of sounds subcortically or cortically, according to Morris (1986).

Receptivity for learning associated with specific states of consciousness has been investigated (Bruya, 1984; Furman, 1978). Beta frequencies ranging from 13-26 Hertz are associated with concentration and alert problem solving. Alpha frequencies (8-13 Hz), when state of alert relaxation is present, and theta frequencies (4-7 Hz) are associated with deep relaxation and high receptivity for new experiences and learning (Morris, 1986). Theta frequency is associated with the 30 seconds to one minute period prior to drifting off into sleep.

Edrington (1984) reported results of studies in which narrow band frequencies of alpha, theta, and beta were woven into an existing musical composition. The EEG waveform results showed that the subject's brain tended to show increase in frequency of occurrence of the signals in both hemispheres. Teachers, using the hemi-sync music with students in pilot studies, found that the students were more focused in attention, more enthusiastic about learning and able to learn more material in a given period of time (Morris, 1986). A state of hemispheric synchronization has been documented in a state of deep meditation, characterized by profound physical relaxation, combined with clear mental alertness (Goldberg 1983).

Occupational Therapy Frame of Reference

The Occupational Performance frame of reference (Llorens, 1989) organizes human occupation into three general areas: Work Activities, Play/Leisure Time Activities, and Self-Care Activities. Work Activities include school, home and family management, and employment. Play/Leisure Time Activities consist of games, sports, hobbies, and social activities. The third area consists of Self-Care Activities, which include feeding, dressing, hygiene, and object manipulation. The three areas of performance occur within, and are affected by life space influences, including cultural background, as well as the human and non-human environment.

The performance components of the occupational performance frame of reference are dependent upon adequate functioning of the individual in the following:

1. Sensory-Integrative Functioning includes body schema, posture, body integration, visual-spatial relationships, sensory-motor integration, and adequate processing of sensory information.

2. Motor Functioning depends upon adequate joint range of motion, gross muscle strength, and functional use for gross and fine motor skills.

3. Psychological Functioning refers to emotional states and feelings, coping behaviors, self-identity, and self-concept.

4. Social Functioning refers to dyadic interaction and group interaction ability.

5. Cognitive Functioning includes comprehensive written and verbal communication, concentration, problem solving, time management, conceptualization, and the functional integration of learning.

The child with autism exhibits dysfunction in four of the performance components, including sensory-integrative, psychological, social, and cognitive functioning (Ayres, 1980; Rimland, 1964). Delays in motor functioning can be observed, especially in the development of gross and fine-motor skills. The self-care activity of feeding requires adequate integration of these five performance components. Adequate concentration and coping behaviors are necessary for the child to develop the ability to sit at a table long enough to complete a meal. Communication skill and dyadic interaction requiring eye contact are essential in order for the child to make choices, indicate likes and dislikes, and to generally enjoy the social experience associated with mealtime, thereby helping to create a pleasant social experience.

Occupational therapy intervention includes enabling purposeful, functional activity and enhancement of sensory, motor, psychological, social/interpersonal, and cognitive abilities.

Anecdotal evidence has suggested that selected music can have a beneficial effect on individuals, which can include increased focused attention to tasks, relaxation, and receptivity to learning new information. This study attempts to determine what effect music has on attending behavior of children with autism during a self-feeding activity. The parameters to be investigated include the amount of communication engaged in by the child during the meal, the ability to stay seated in a chair during the meal, the amount of food eaten, and the quantity of eye contact occurring within the context of the mealtime experience.

CHAPTER 3

DESIGN AND METHODOLOGY

The research questions for this study were:

1) What effect will background music have on attending behavior of children with autistic-like syndrome?

2) Will there be a significant difference in responses by children with autism to Baroque and to hemi-sync music in effect on attending behavior?

3) Will the child with autistic-like syndrome increase eye contact with others during exposure to music background?

It was assumed that changes in behavior would occur differentially as influenced by background music relative to the overall state of arousal.

The objectives of the study were to better understand the relationship of music and attending behavior, as well as to further explore sensory integration and neurophysiological theory in relationship to music and sensory processing of children with autism.

Design

A single system A-B-A-C-A design was used in this study. Each phase consisted of a two week period, during which behavioral observations were made twice weekly for

10 minute periods, for a total of 10 weeks. The A phase of the design represents the baseline, in which the subject's attending behavior was observed in the absence of background music. Baseline A phases occurred at three separate intervals over the course of the experiment to help rule out maturation as an intervening factor in the data results. During phase B, Baroque music was played daily at mealtime, while during phase C, hemi-sync music was played.

Sample

The subjects consisted of children who attend special classes through the Santa Cruz County Office Of Education. All four children were referred to the study by their teachers, in response to requests by the investigator for participants exhibiting autistic-like behavior. The four subjects were evaluated by both teacher and parent, using an Autism Rating Scale adapted by Rendle-Short, University of Queensland Brisbane Children's Hospital, Australia (Appendix A). According to the scale, a child must exhibit seven or more autistic-like behaviors to be considered autistic. All four subjects chosen for participation in the study were rated as having eight or more identified behaviors by both teachers and primary caregivers. Medical records of two subjects contained diagnoses of autistic syndrome made by a physician, and two subjects were identified by school psychologists as having "autistic-like" behavior. The subjects, all males, ranged in age from two and one half to 12 years at the time of the study, and all were determined to have hearing within normal limits. Informed consent for participation in the study was obtained from the guardian of each of the four subjects prior to their participation in the research.

Methodology

The investigator videotaped the subjects twice weekly for 10 minutes during lunchtime in the classroom over a 10 week period. Three subjects were in the same class and sat together at a common table for lunch. The fourth subject was videotaped sitting at a semi-circular table with six peers, and a teacher sitting next to him.

Musical selections for the experiment were obtained from the Monroe Institute, and included a tape cassette of Baroque music with tempos from 60 to 80 beats per minute, and a hemi-sync selection entitled "Metamusic-Modem."

A tape recorder and two speakers were positioned in the classroom, approximately 10 feet from the subjects, and the volume was adjusted to a comfortable level, as determined acceptable by the classroom teacher present. The music was played during the 45 minute period during lunch, although data were collected only during the first 10 minutes of the meal.

A videocamera was mounted on a tripod and positioned at a distance of approximately 15-20 feet from the subjects. After the camera was turned on, the investigator sat quietly nearby and did not initiate interaction with the subjects during the videotaping. All of the subjects exhibited some curiosity about the camera and looked at it frequently during the sessions. The subjects were videotaped twice weekly for 10 weeks. Baseline A, in which there was no background music, consisted of weeks one, two, five, six, nine, and ten. Phase B, in which Baroque music was played occurred during weeks three and four, and phase C, in which hemi-sync music was presented, during weeks seven and eight. There was zero attrition during the study, and all four subjects were in attendance for the scheduled 20 videotaped sessions.

Data pertaining to the selected four parameters of attending behavior were collected from observation of the videotapes. The four parameters consisted of: 1) Number of times subject was out of seat during the feeding activity and redirected to task by teacher (out of seat), 2) Number of times child looked at teacher or another child's face or upper part of body (eye contact), 3) Number of bites taken during the meal (bites taken), and 4) Number of times child engaged in communication with another person, either verbal, with use of gestures, sign language, or communication board (communication). Each 10 minute segment was observed separately for each aspect of attending behavior on the checklist (Appendix B).

Inter-rater reliability testing was conducted, using two trained observers, and the results for the four aspects of attending behavior were analyzed as follows, using simple percentage of agreement formula (Table 1). The first parameter, number of times out of seat, resulted in 100% agreement between the trained observers and primary investigator. The number of times the subject looked at teacher's or other child's face, upper body or eye contact made resulted in a 93% agreement between the first trained observer and primary investigator and 76% between second observer and primary investigator. The third parameter of attending behavior, attention to task, measured by the number of bites taken in 10 minutes, resulted in 89% agreement between first observer and primary investigator, and 90% agreement between second rater and investigator. Measurement of the number of communications initiated or to which the child responded resulted in 100% agreement between first rater and primary investigator and 78%

Table 1

Inter-rater reliability Analysis: Simple Percentage of Agreement With Primary Investigator

	Out of seat	Eye contact	Attention to task	Communication
Rater 1	100%	93%	89%	100%
Rater 2	100%	76%	90%	78%

agreement between second rater and primary investigator.

Serial dependency, the degree to which sequential responses emitted by an individual are correlated, was also examined. Computation of the autocorrelation coefficient across the entire data series was necessary due to the small number of data points in each phase (Ottenbacher, 1986). Bartlett's test was used to determine the significance of the autocorrelation coefficient. The data in Table 2 did not demonstrate a statistically significant degree of autocorrelation at $\underline{p}<.05$ in the four areas of attending behavior, with the exception of subject T, whose scores in the areas of eye contact and out of seat behavior were both significant at .51.

Table 2

Results of Serial Dependency Tests for Subjects J, A, R, and T.

Subjects	Eye contact	Out of seat	Bites taken	Communication
J	.320 < .447	.063 < .447	.030 < .447	.196 < .447
A	.215 < .447	.097 < .447	.090 < .447	.215 < .447
R	.063 < .447	.300 < .447	.443 < .447	.046 < .447
T	* .510 > .447	* .513 > .447	.209 < .447	0.000 < .447

* Significant autocorrelation coefficient

CHAPTER 4

ANALYSIS OF DATA AND RESULTS

This study analyzed the attending behavior of four children with autistic-like syndrome during mealtimes, during which Baroque music and hemi-sync music were played in the background for two week periods, alternating with two week intervals in which background music was absent.

Demographics

The four male subjects ranged in age from two and one half to 12 years of age (see Table 3). They were each diagnosed as having autistic-like syndrome or developmental delay with evidence of autistic-like behaviors.

Data on Attending Behavior

The following four parameters of attending behavior were analyzed relative to their influence by the two types of background music:

1) Number of times subject was out of seat within a 10 minute period during the feeding activity and redirected to task by teacher (Out of Seat).

2) Number of times child looked at teacher or another

Table 3

Subject Demographics

Subjects	Birthdate	Age	Diagnosis
J	4-01-77	10 years 11 months	Developmental delay
A	2-26-77	11 years 1 month	Developmental delay
R	6-28-78	9 years 9 months	Autistic disorder
T	2-02-86	2 years 1 month	Autistic disorder

child's face or upper part of body within 10 minute period (Eye Contact).

3) Number of bites taken during the meal within 10 minute period (Bites Taken).

4) Number of times child engaged in communication with another person, either verbal, with use of gestures, sign language, or communication board within a 10 minute period (Communication).

The data for each of the four areas of attending behavior are shown in Tables 4, 5, 6, and 7. The data were also plotted on line graphs for visual inspection and graphic analysis.

Table 4 and Figure 1 show the number of times out of seat during the first 10 minutes of mealtime for the four subjects. Subject J was out of seat two times during both phase B and baseline A2, and out of seat one time during phase C. Subject A demonstrated a variable pattern of out of seat behavior during phases B and A, but no out of seat behavior occurred during phase C. Subject R demonstrated out of seat behavior six times during phase A3. Subject T exhibited out of seat behavior during baseline phases A1 and A2.

The frequency of eye contact for the four subjects is demonstrated in Table 5 and Figure 2. Subject J demonstrated a variable frequency of eye contact across phases A, B, and C, with the greatest amount of eye contact

Table 4

Number of Times Out of Seat In Ten Minutes

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10
Subject J										
Trial 1	0	0	2	0	0	1	1	0	0	0
Trial 2	0	0	0	0	1	0	0	0	0	0
Mean	0		0.5		0.5		0.3		0	
Subject A										
Trial 1	0	0	0	1	1	0	0	0	0	1
Trial 2	0	0	0	0	0	1	0	0	1	0
Mean	0		0.3		0.5		0		0.3	
Subject R										
Trial 1	0	0	0	0	0	0	0	0	0	1
Trial 2	0	0	0	0	0	0	0	0	3	2
Mean	0		0		0		0		1.5	
Subject T										
Trial 1	2	1	0	0	0	1	0	0	0	0
Trial 2	4	1	0	0	1	0	0	0	0	0
Mean	2		0		0.3		0		0	
Phase	A_1		B		A_2		C		A_3	

Table 5

Frequency of Eye Contact In Ten Minutes

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10
Subject J										
Trial 1	89	99	128	110	109	99	118	98	86	114
Trial 2	96	90	108	74	112	104	103	65	106	123
Mean	93.5		105		106		96		107.2	
Subject A										
Trial 1	46	47	51	40	61	55	56	71	35	53
Trial 2	26	36	48	35	61	73	35	35	36	31
Mean	38.80		43.5		62.5		49.3		38.8	
Subject R										
Trial 1	17	26	51	31	17	29	24	29	30	57
Trial 2	46	32	27	37	41	28	35	21	33	42
Mean	30.30		36.5		28.8		27.3		40.5	
Subject T										
Trial 1	10	13	49	45	57	66	68	51	57	30
Trial 2	16	23	48	80	49	46	36	36	42	45
Mean	15.5		55.5		54.5		47.7		43.5	
Phase	A_1		B		A_2		C		A_3	

Table 6

Number of Bites Taken In Ten Minutes

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10
Subject J										
Trial 1	33	76	48	81	87	61	101	80	61	121
Trial 2	63	75	83	61	80	97	95	67	72	123
Mean	61.8		68.3		81.3		85.8		94.5	
Subject A										
Trial 1	42	52	56	15	59	23	43	45	57	1
Trial 2	78	56	41	50	38	47	56	52	19	0
Mean	57		40.5		41.8		49		35.5	
Subject R										
Trial 1	50	44	50	37	55	54	43	35	58	1
Trial 2	50	45	49	21	51	50	38	39	52	2
Mean	47.3		39.3		52.5		38.8		44.3	
Subject T										
Trial 1	15	21	14	17	42	20	17	10	29	0
Trial 2	0	17	28	18	7	4	15	9	30	0
Mean	13.3		19.3		18.3		12.3		24.5	
Phase	A_1		B		A_2		C		A_3	

Table 7

<u>Frequency of Communications In Ten Minutes</u>

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10
Subject J										
Trial 1	13	6	41	13	1	8	1	1	3	15
Trial 2	6	5	0	1	7	23	6	12	24	8
Mean	7.5		13.8		9.8		5.0		12.5	
Subject A										
Trial 1	3	7	25	15	2	5	0	4	3	3
Trial 2	3	0	3	50	1	3	4	2	10	1
Mean	3.3		23.3		2.8		2.5		4.3	
Subject R										
Trial 1	0	6	7	2	14	0	0	1	0	1
Trial 2	0	3	1	1	0	3	0	2	0	2
Mean	2.3		2.8		4.3		.8		.8	
Subject T										
Trial 1	8	19	9	11	10	5	8	6	7	12
Trial 2	2	10	9	18	6	6	6	5	1	9
Mean	9.8		11.8		6.8		6.3		7.3	
Phase	A1		B		A2		C		A3	

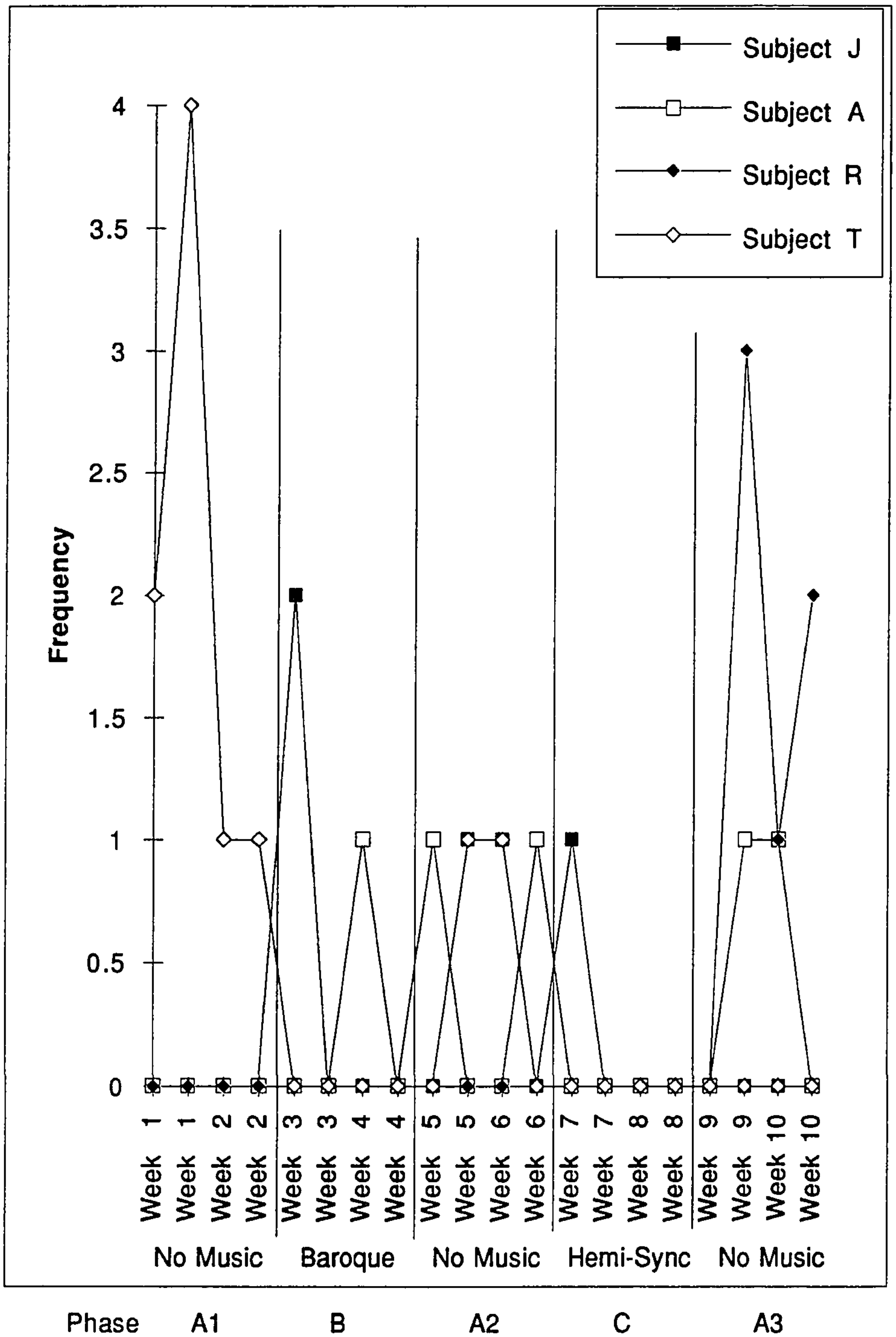


Figure 1. **Out of seat behavior in ten minutes.**

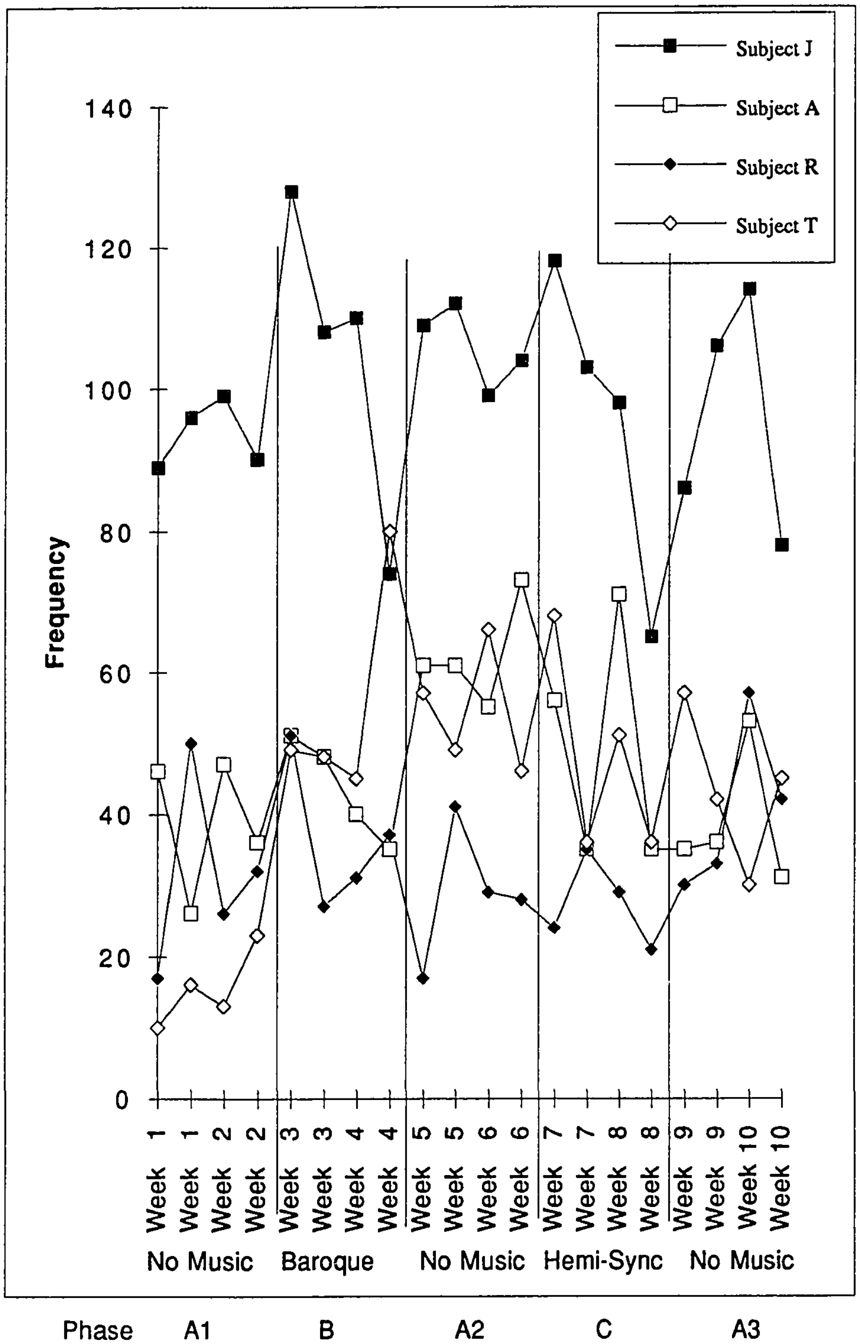


Figure 2. **Eye contacts in ten minutes.**

occurring during phase A3, in which no music was presented in the background. Subject A demonstrated minimal variability in the frequency of eye contact over all five phases; however, the greatest frequency of eye contact occurred during phase A2, in which no music was presented in the background. Subject R demonstrated a low frequency of eye contact throughout all five phases, with the greatest frequency occurring during experimental phase B, in which Baroque music was presented in the background, and during baseline phase A3. Subject T demonstrated variable frequency of eye contact across all five phases, with the most frequent eye contact occurring during experimental phase B.

Table 6 and Figure 3 report the number of bites taken by the four subjects during the first 10 minutes of mealtime. Subject J demonstrated a pattern in which the number of bites increased at a relatively stable rate over the 10 week observation period, with the greatest number of bites taken during weeks nine and ten, baseline phase A3, in which no music was played in the background. The greatest number of bites was taken by subject A in baseline phase A1. Subject R demonstrated relative consistency in the number of bites taken throughout the 10 week observation period; however, the greatest number of bites was taken in baseline phase A2. Subject T demonstrated a gradual increase in the number of bites

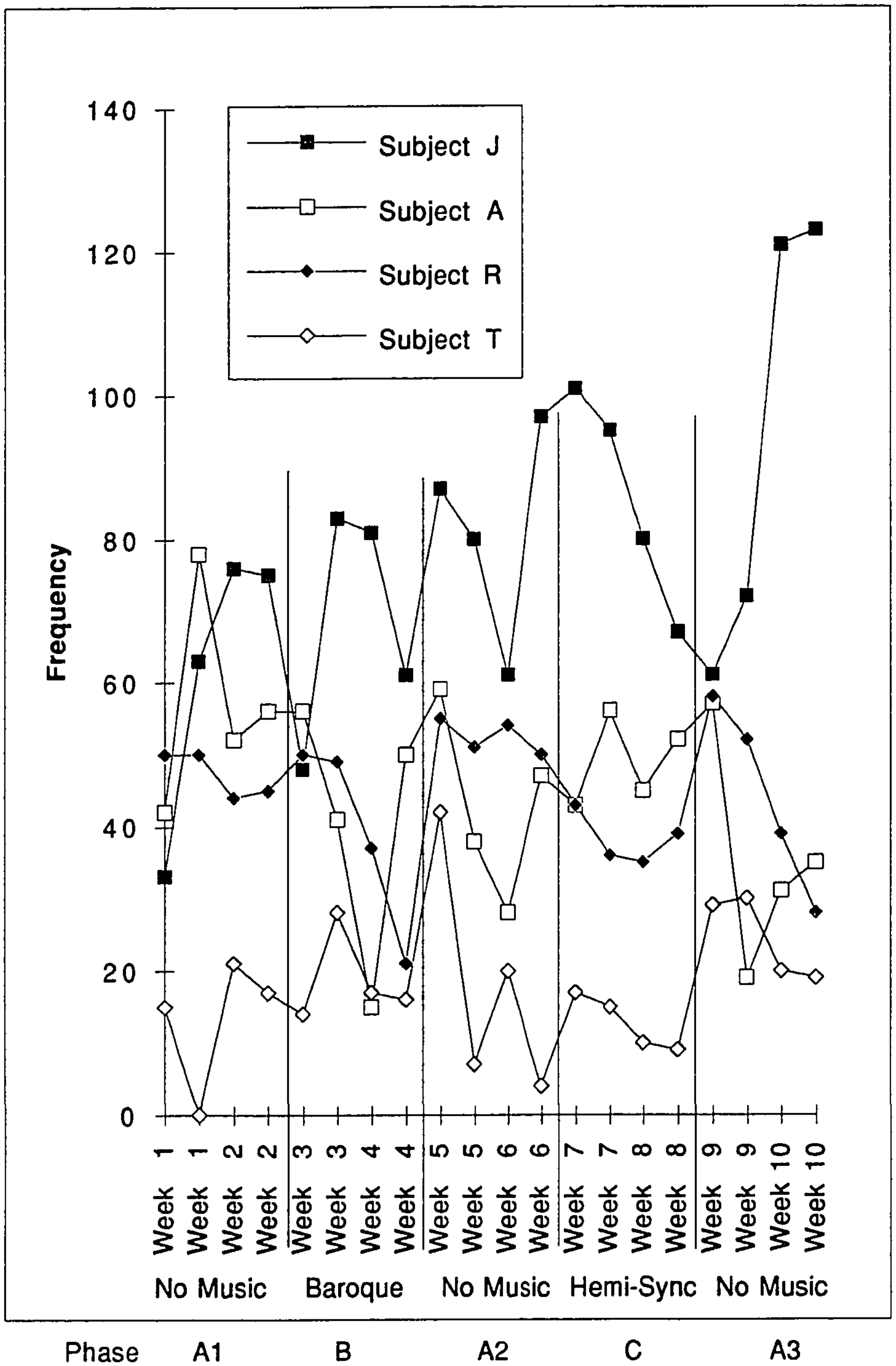


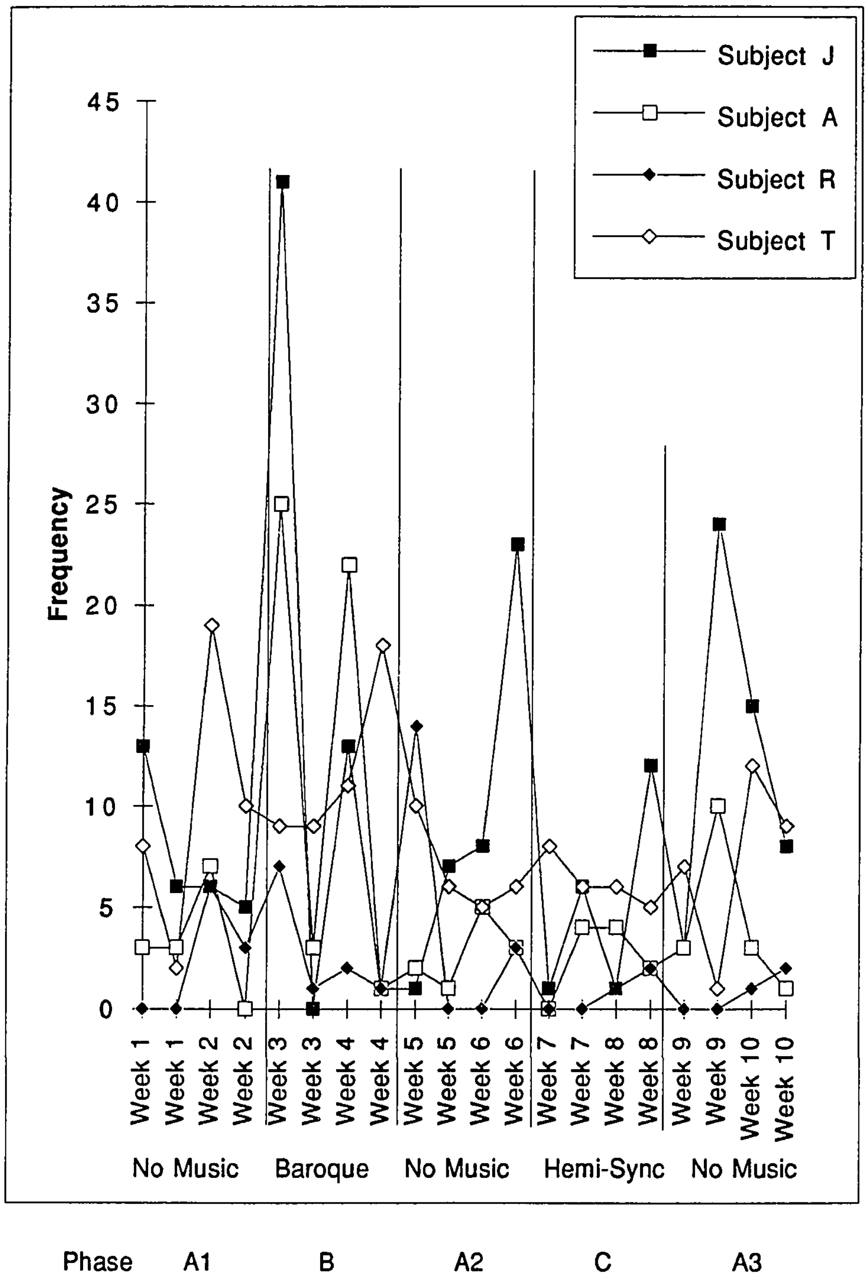
Figure 3. **Bites taken in ten minutes.**

taken over the 10 week period, with the greatest number of bites taken during baseline phase A3.

Table 7 and Figure 4 show the frequency of communication for the four subjects. Subject J demonstrated the greatest frequency of communication during experimental phase B. Subject A demonstrated a marked increase in communication during experimental phase B. Subject R demonstrated a low frequency of communication across all five phases, with the highest frequency occurring during phase A2. Subject T exhibited the greatest frequency of communication during experimental phase B, in which Baroque music was played in the background.

Evaluation to determine whether visual inspection corresponded to statistical evidence was performed using the two standard deviation band method of analysis (Ottenbacher, 1986).

In Figure 5, the graph depicts two standard deviations above and below the mean out of seat behavior for Subject J. The data show that Subject J remained in his seat during 16 of the 20 observations, which presents a flat graph at zero. Subject J demonstrated one data point above the two standard deviation band for out of seat behavior during experimental phase B, which is not statistically significant. Two standard deviation band analysis of



<u>Figure 4.</u> **Communications in ten minutes.**

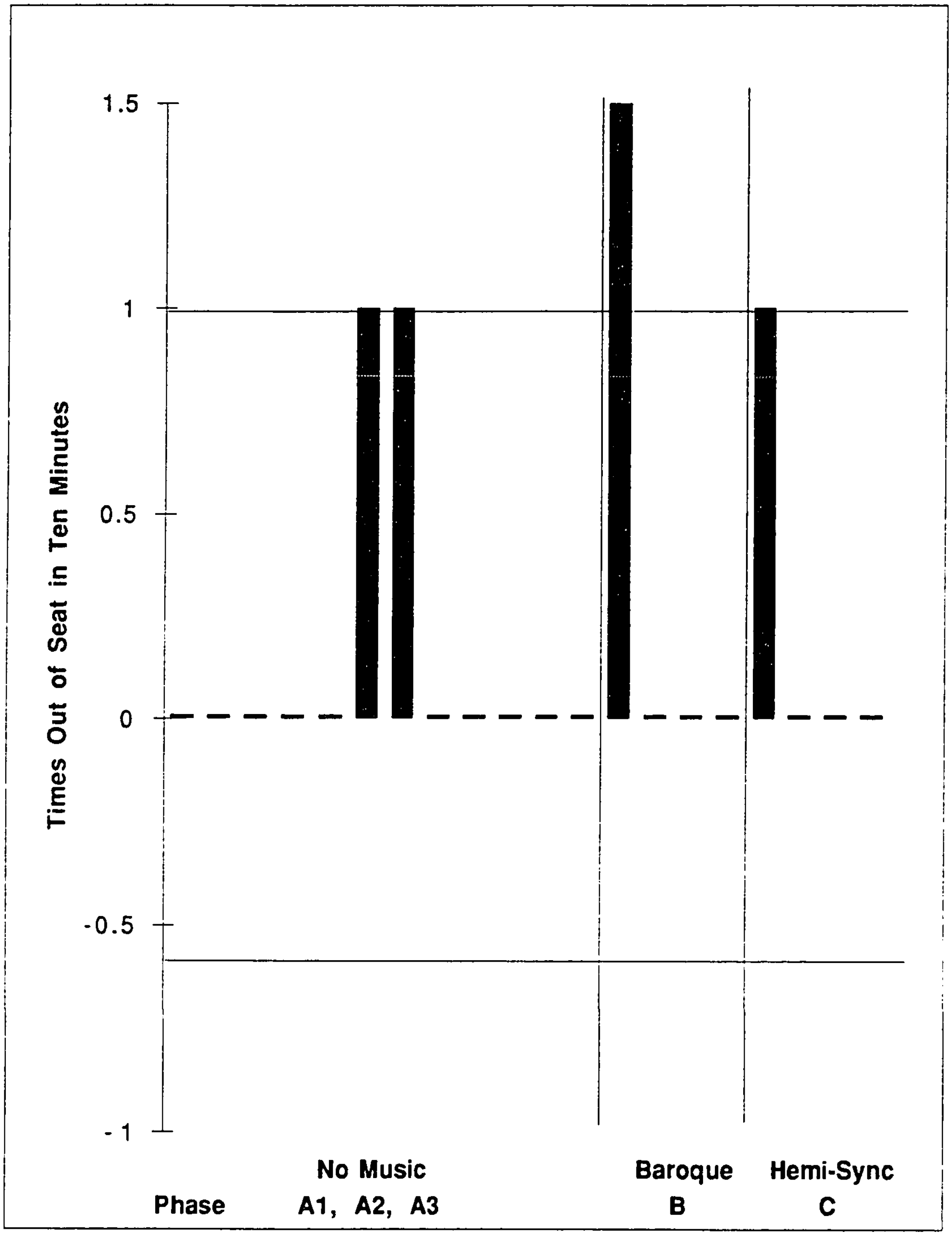
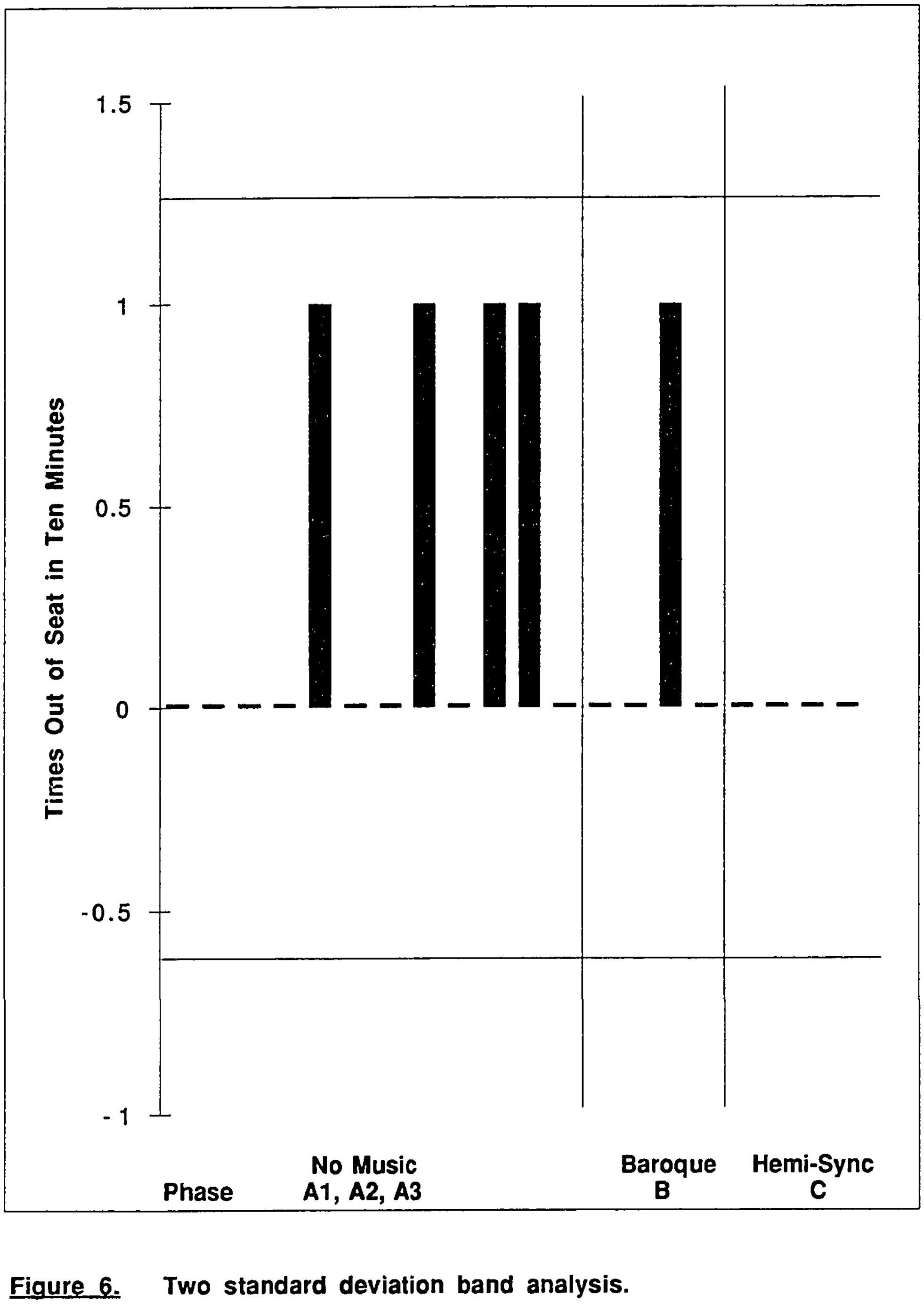


Figure 5. Two standard deviation band analysis.
Out of Seat, Subject J.

out of seat behavior for Subject A (Figure 6) demonstrates a consistent pattern during baseline phase A and experimental phase B, although the data points do not extend beyond the two standard deviation band line. In Figure 7, Subject R exhibited one data point beyond the two standard deviation line for out of seat behavior during baseline phase A3. Figure 8 demonstrates the two standard deviation band analysis for out of seat behavior for Subject T. Subject T did not demonstrate statistically significant changes, with only one data point slightly above the two standard deviation band line during baseline phase A1.

In Figure 9, Subject J demonstrated one data point above the two standard deviation band in the area of eye contact, which did not reach statistical significance. Figure 10, which shows the two standard deviation analysis of eye contact for Subject A, did not demonstrate any data points beyond the two standard deviation band in any of the five phases. Subject R (Figure 11) and Subject T (Figure 12) demonstrated one data point above the two standard deviation band in the area of eye contact, which did not reach statistical significance.

Data for two standard deviation band analysis of the number of bites taken are shown for the four subjects in Figures 13, 14, 15, and 16. In Figure 13, Subject J did not demonstrate data points above the two stand deviation



<u>Figure 6.</u> Two standard deviation band analysis.
Out of Seat, Subject A.

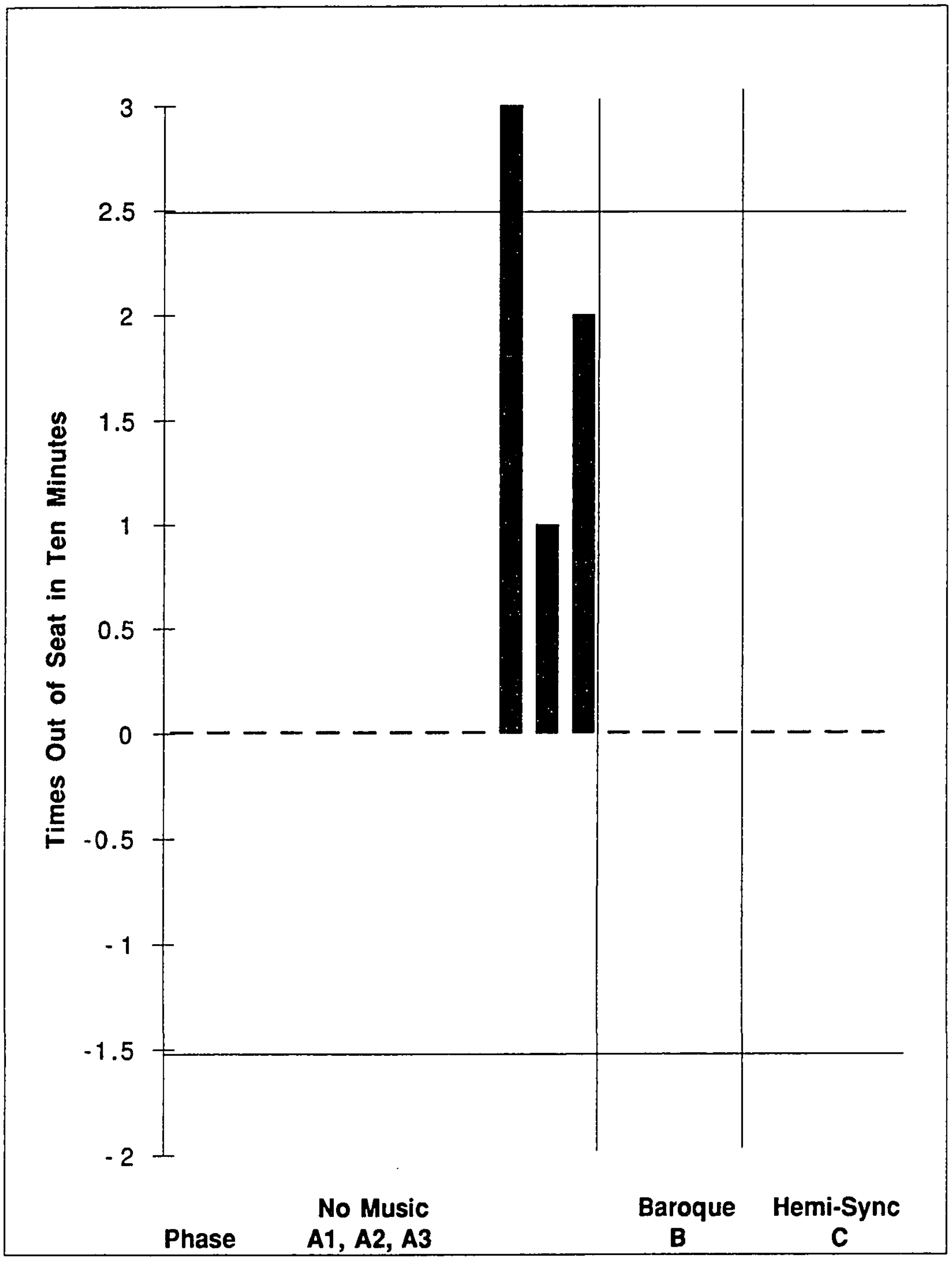


Figure 7. **Two standard deviation band analysis. Out of Seat, Subject R.**

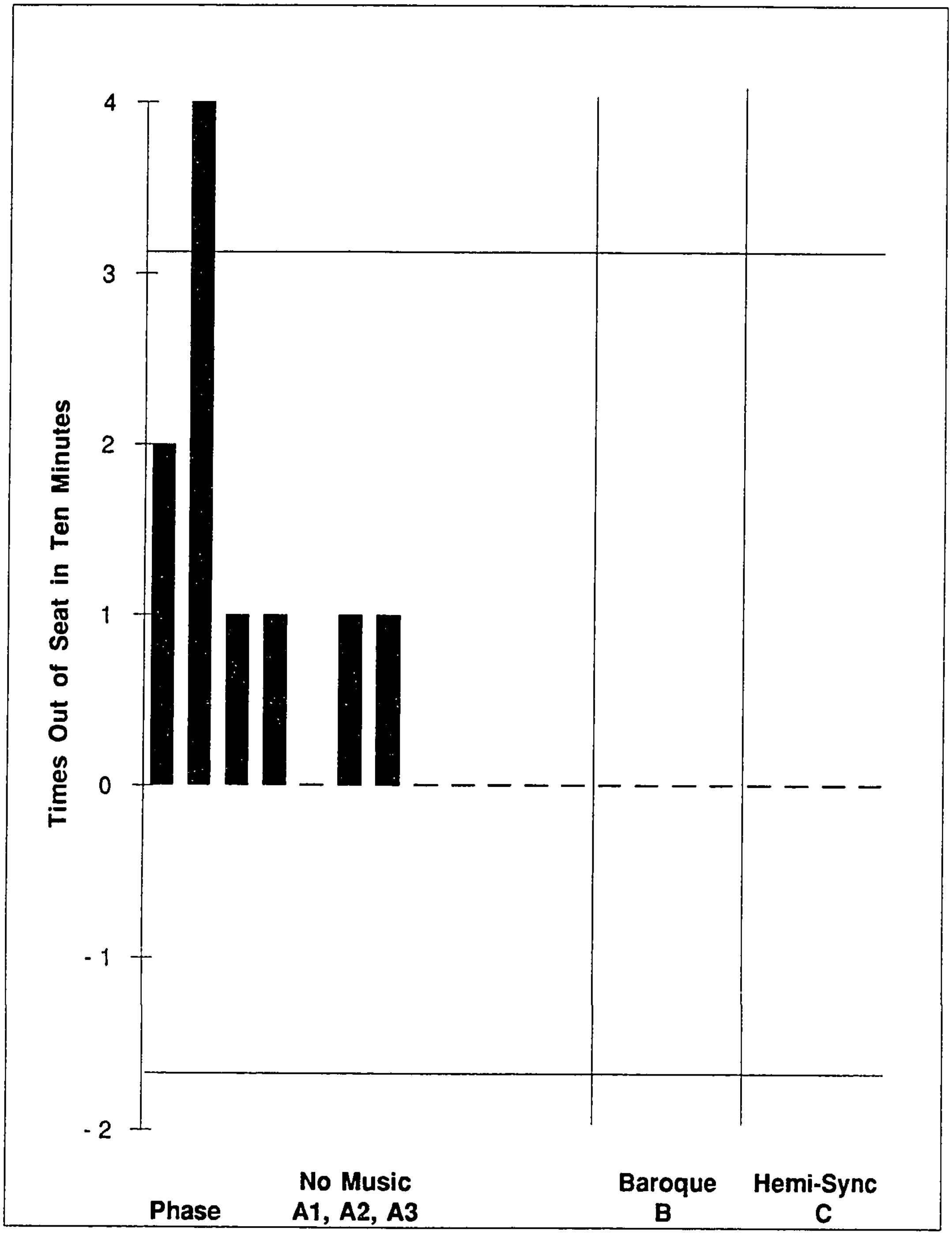


Figure 8. Two standard deviation band analysis.
Out of Seat, Subject T.

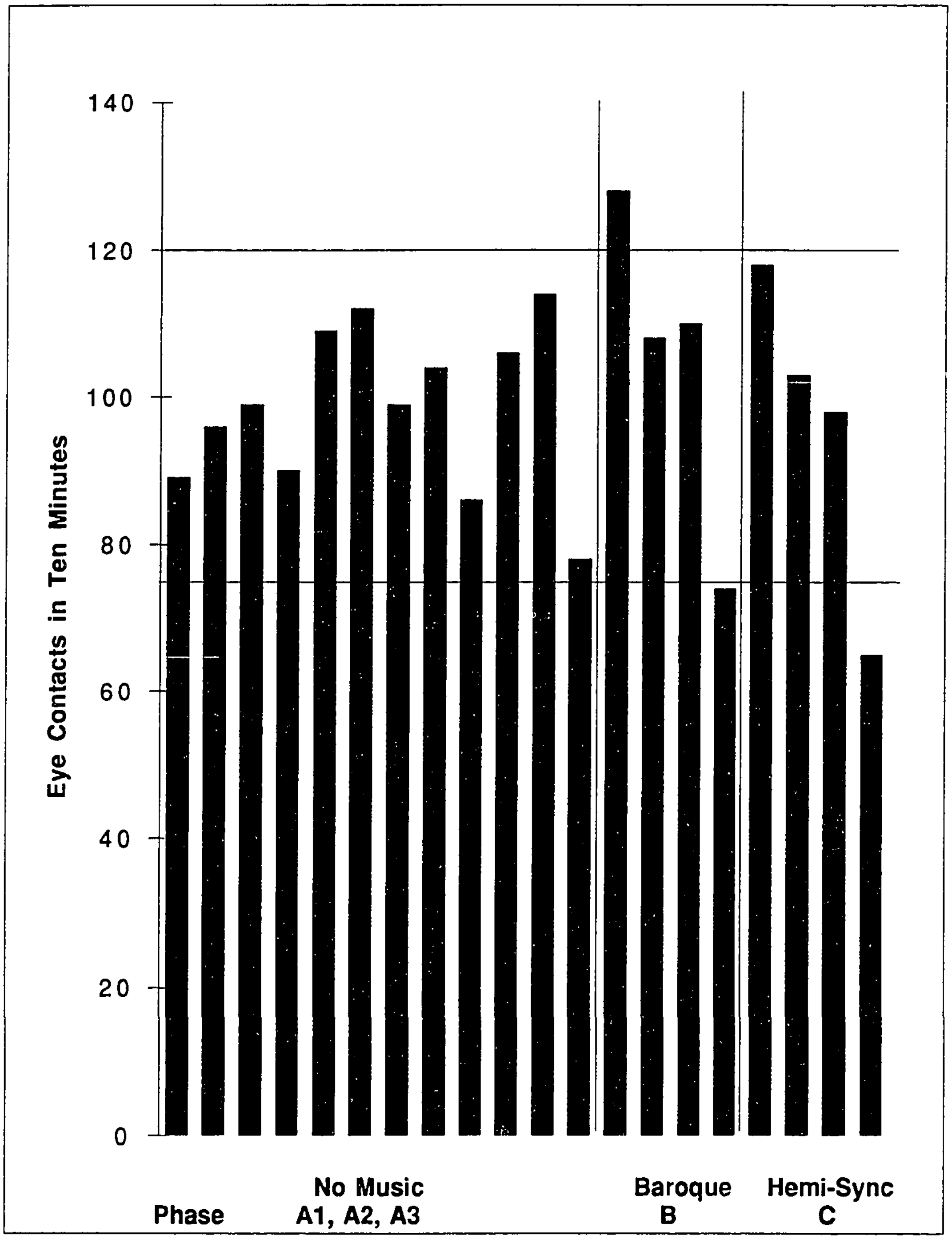


Figure 9. Two standard deviation band analysis.
Eye Contacts, Subject J.

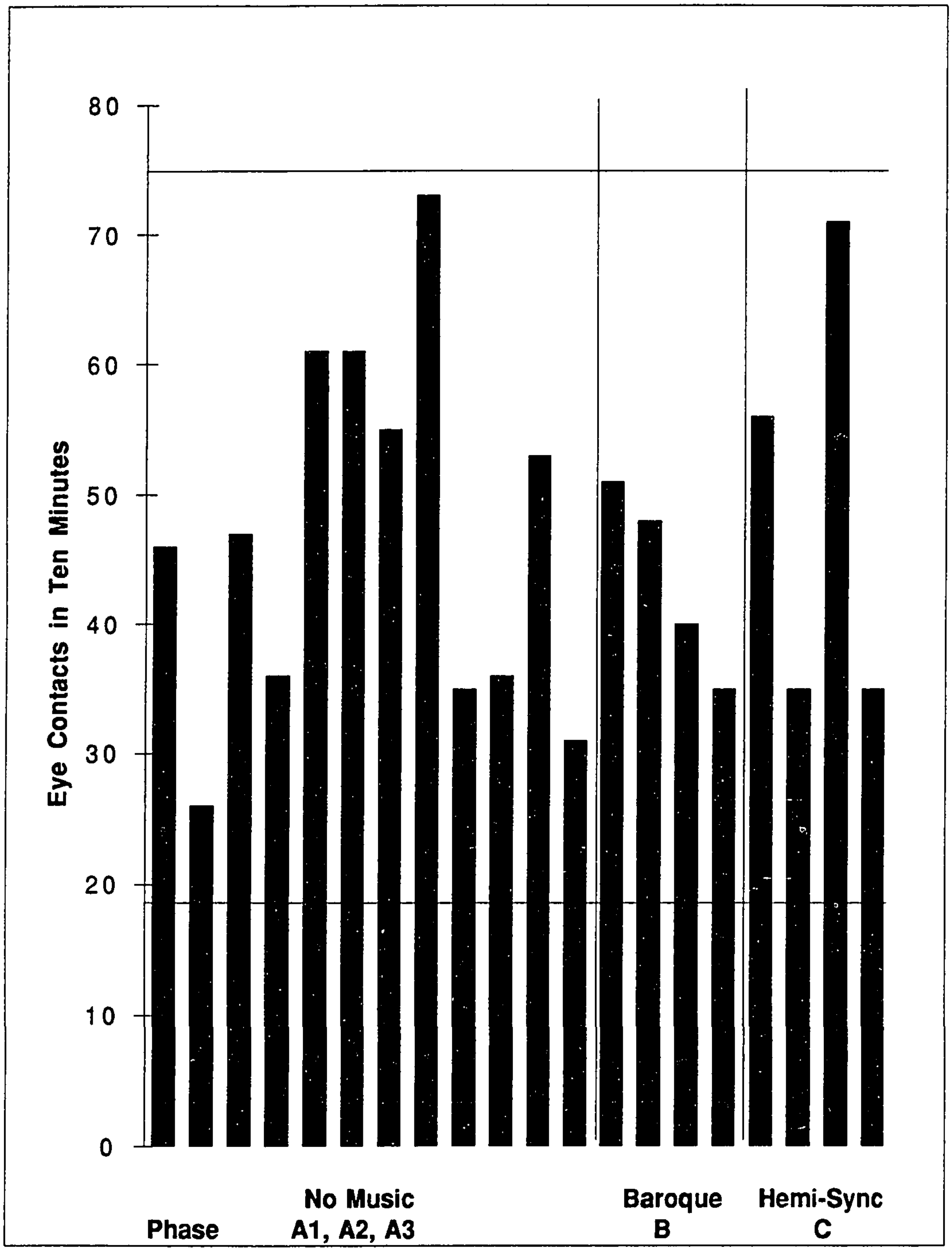


Figure 10. Two standard deviation band analysis.
Eye Contacts, Subject A.

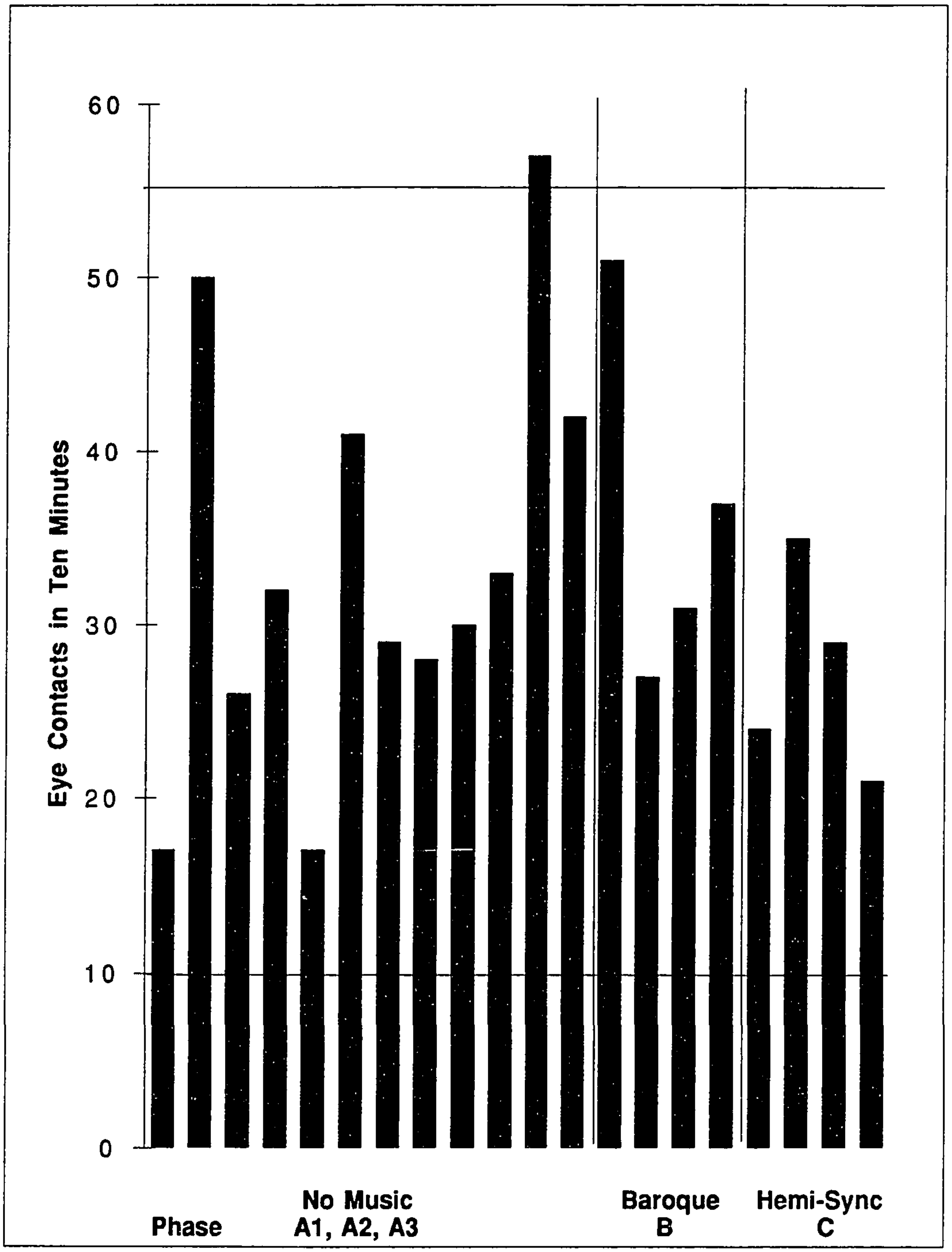


Figure 11. Two standard deviation band analysis.
Eye Contacts, Subject R.

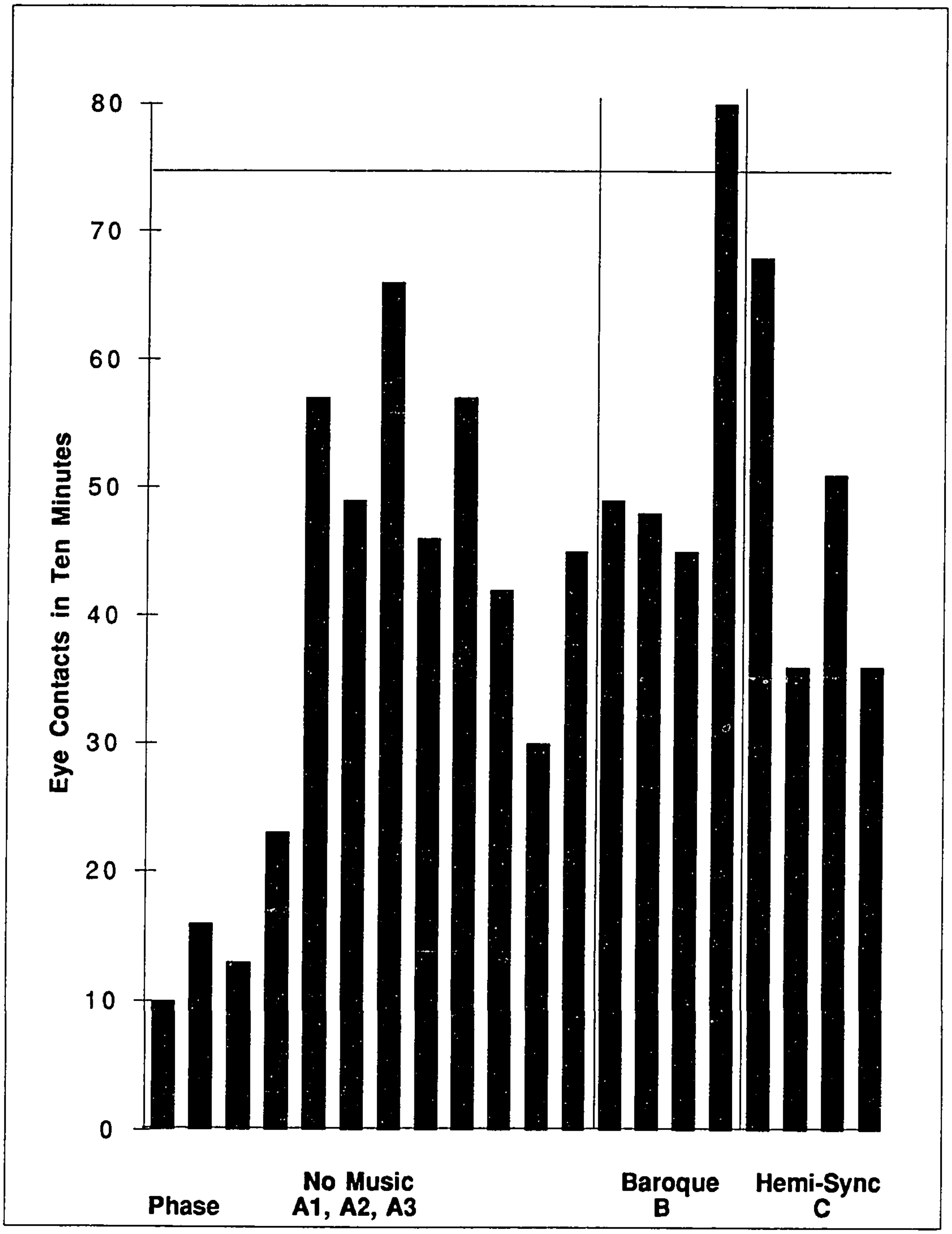


Figure 12. Two standard deviation band analysis.
Eye Contacts, Subject T.

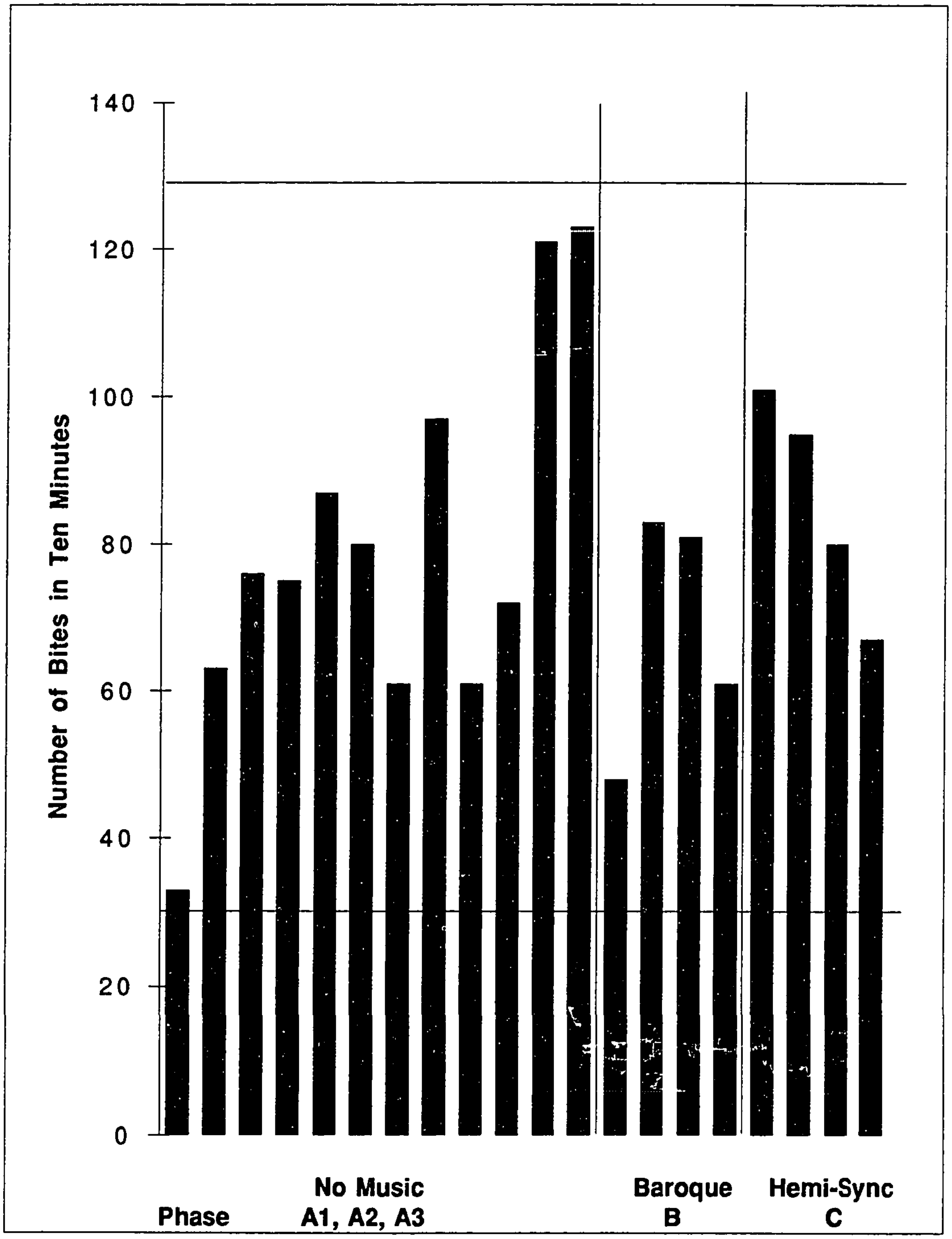
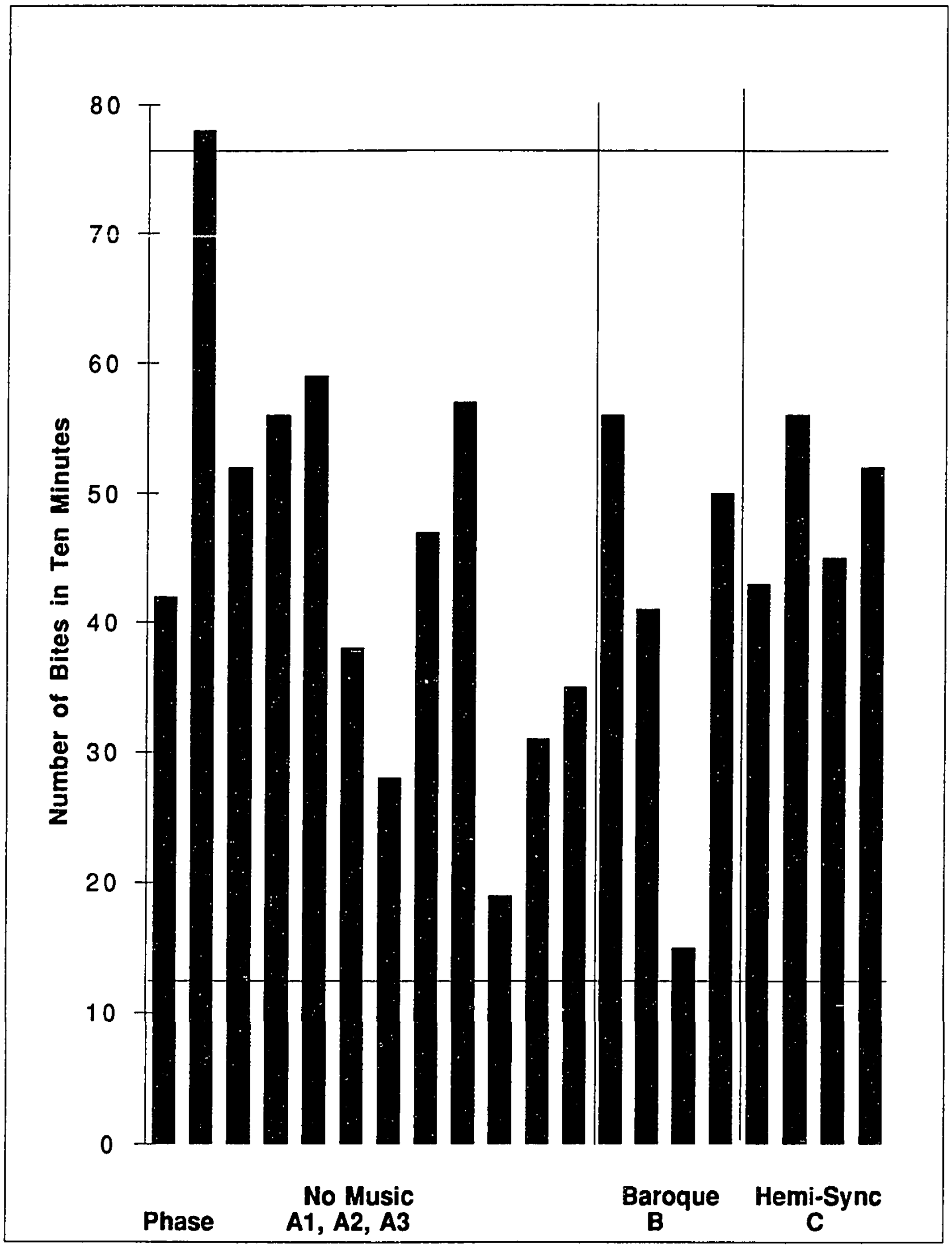


Figure 13. Two standard deviation band analysis.
Bites Taken, Subject J.



<u>Figure 14.</u> **Two standard deviation band analysis. Bites Taken, Subject A.**

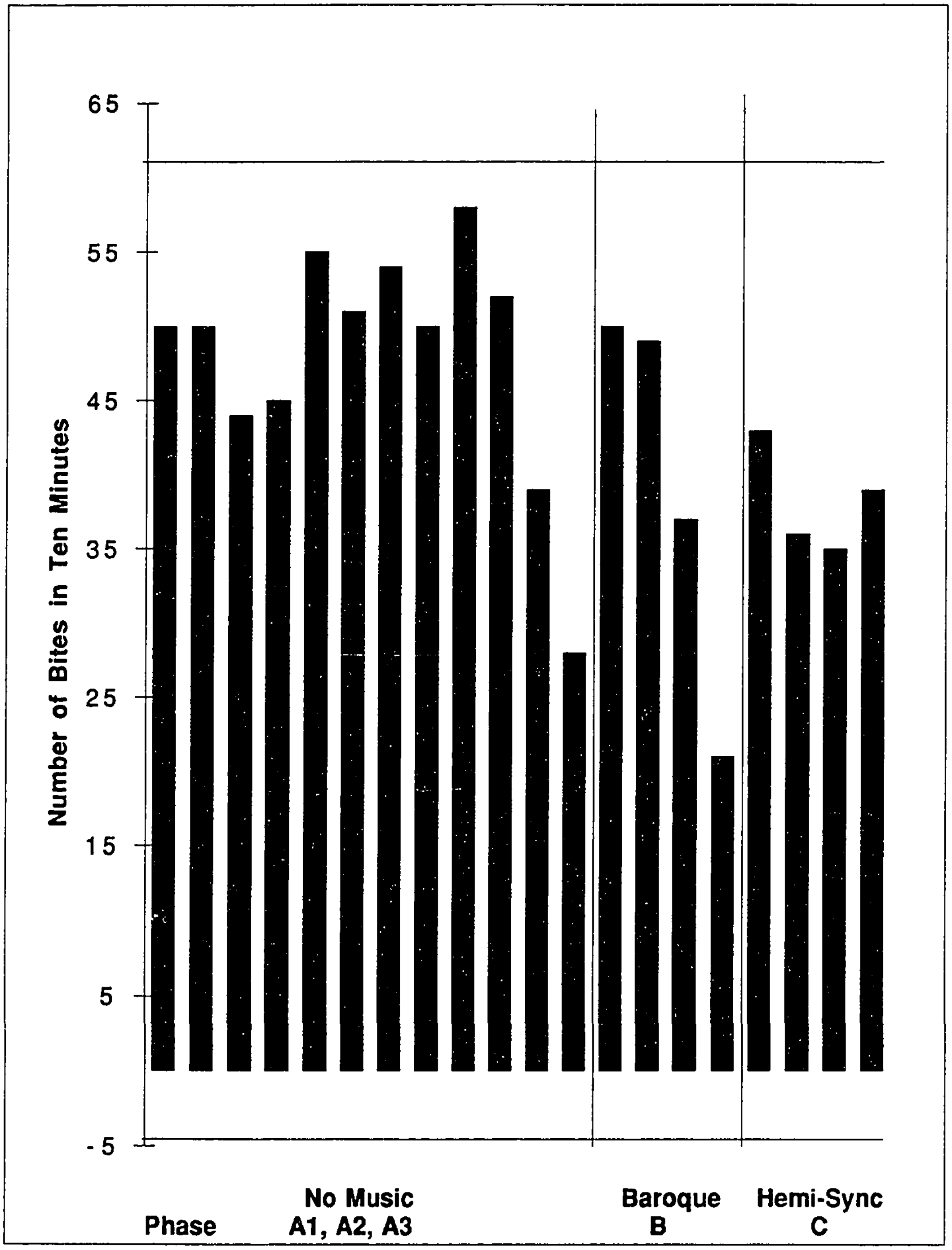


Figure 15. **Two standard deviation band analysis. Bites Taken, Subject R.**

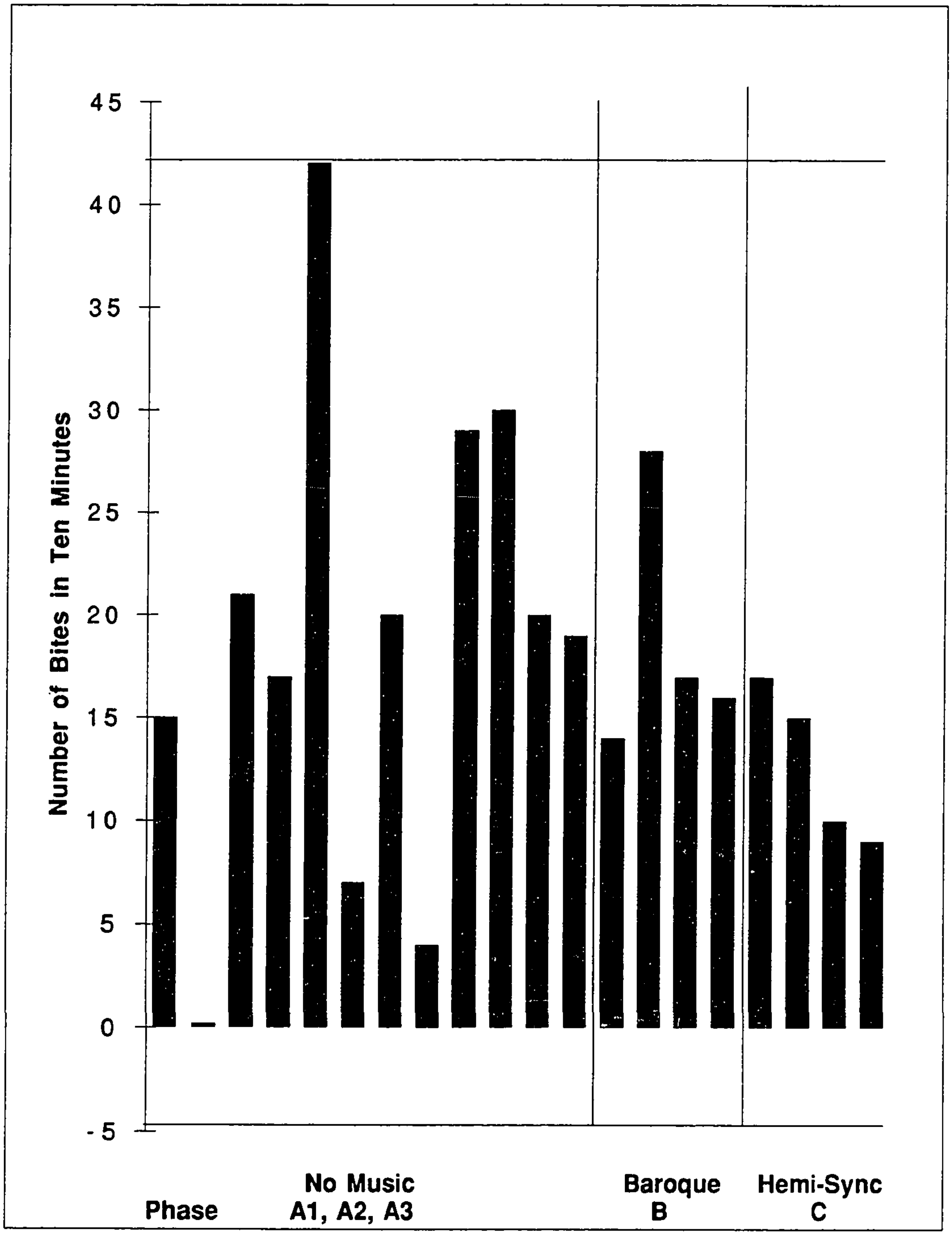


Figure 16. Two standard deviation band analysis.
Bites Taken, Subject T.

band during any of the five phases. In Figure 14, Subject A demonstrated one data point above the two standard deviation band during baseline phase A1, which did not reach statistical significance. The number of bites taken by Subject R remained within the two standard deviation band during all five phases of the experiment (Figure 15). The two standard deviation band analysis for number of bites taken by Subject T is shown in Figure 16, and did not demonstrate data points above the two standard deviation band in any of the five phases.

In Figure 17, Subject J demonstrated one data point above the two standard deviation band in communication during experimental phase B, which did not reach statistical significance. Figure 18 illustrates the two standard deviation band for communication for Subject A, who demonstrated increased communication twice during intervention phase B, with data points well beyond the two standard deviation line; however, they are not sequential, which is necessary to support statistical significance. Subject R (Figure 19) demonstrated data points well within two standard deviations, except on one occasion in baseline phase A2. In Figure 20, Subject T demonstrated no statistically significant changes in communication, using the two standard deviation band method of analysis.

Two standard deviation band analysis of the data

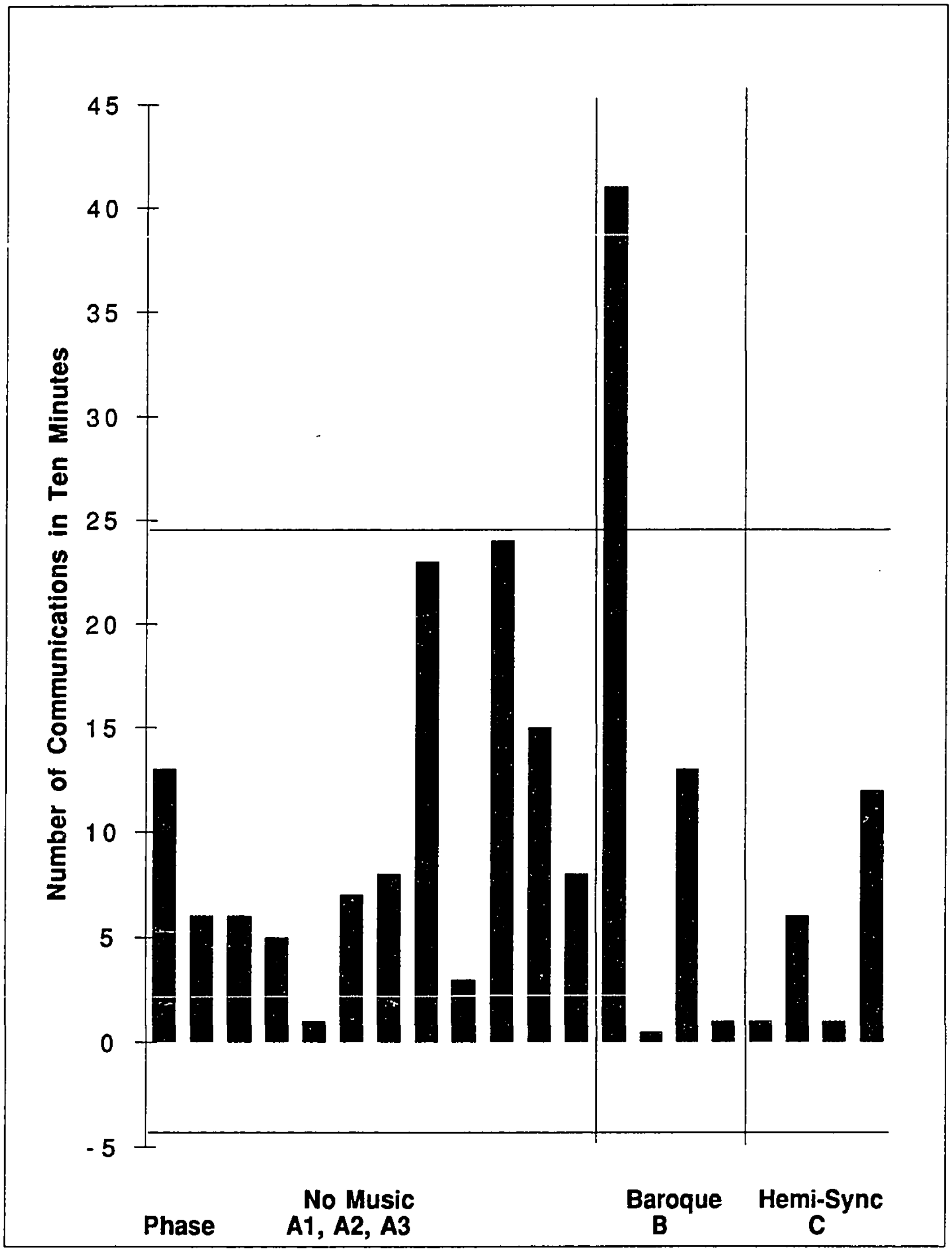


Figure 17. Two standard deviation band analysis. Communciations, Subject J.

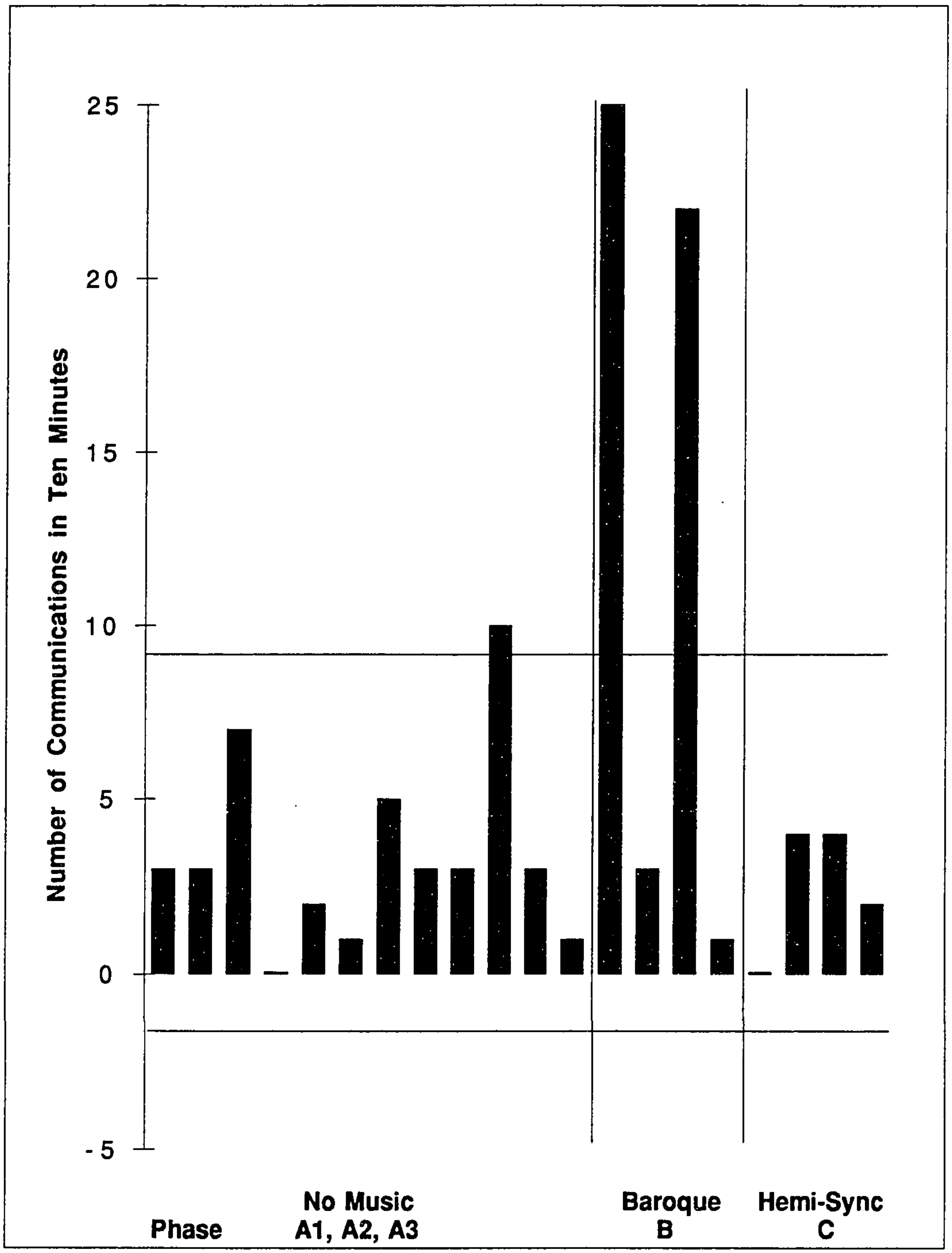


Figure 18. Two standard deviation band analysis. Communciations, Subject A.

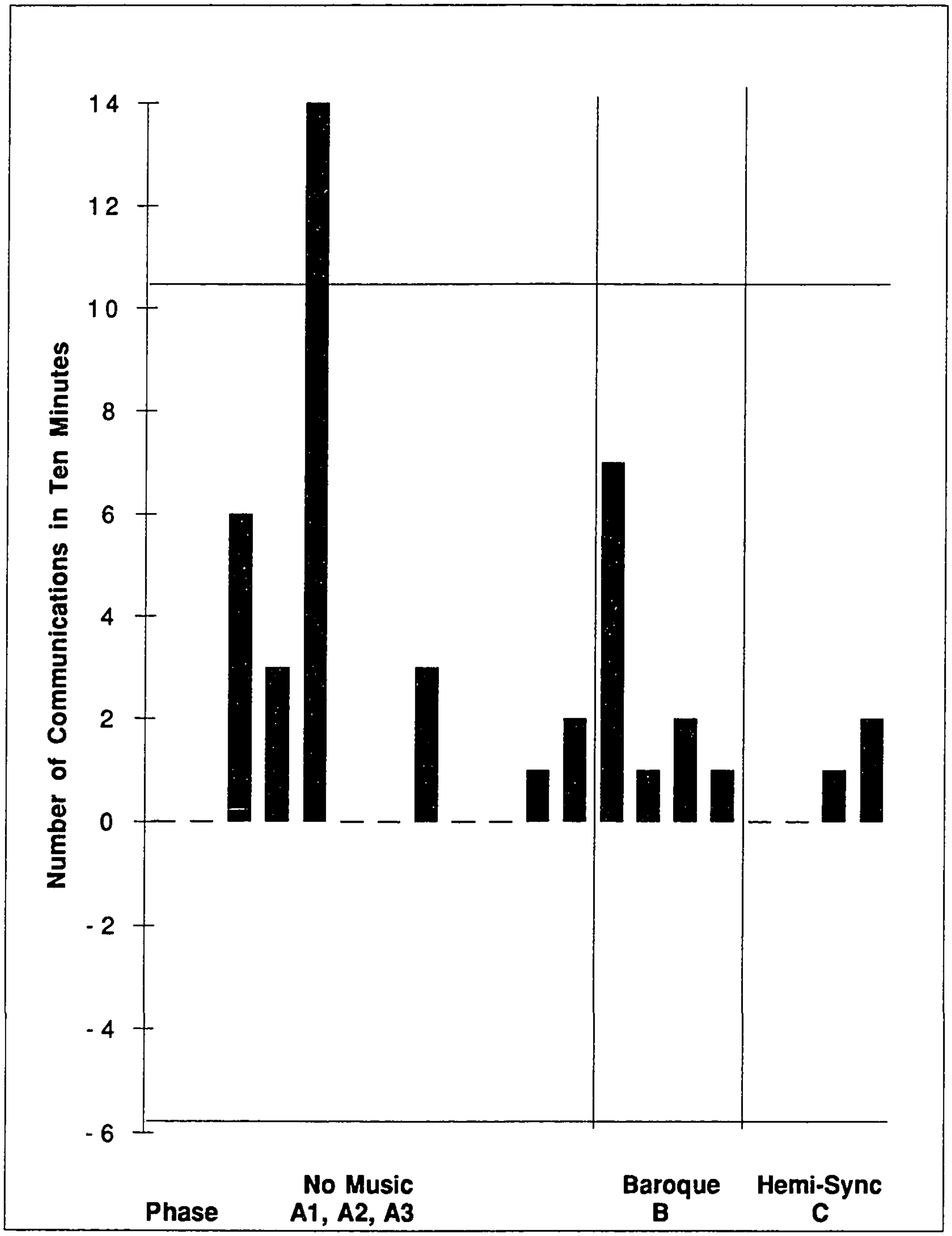


Figure 19. Two standard deviation band analysis. Communciations, Subject R.

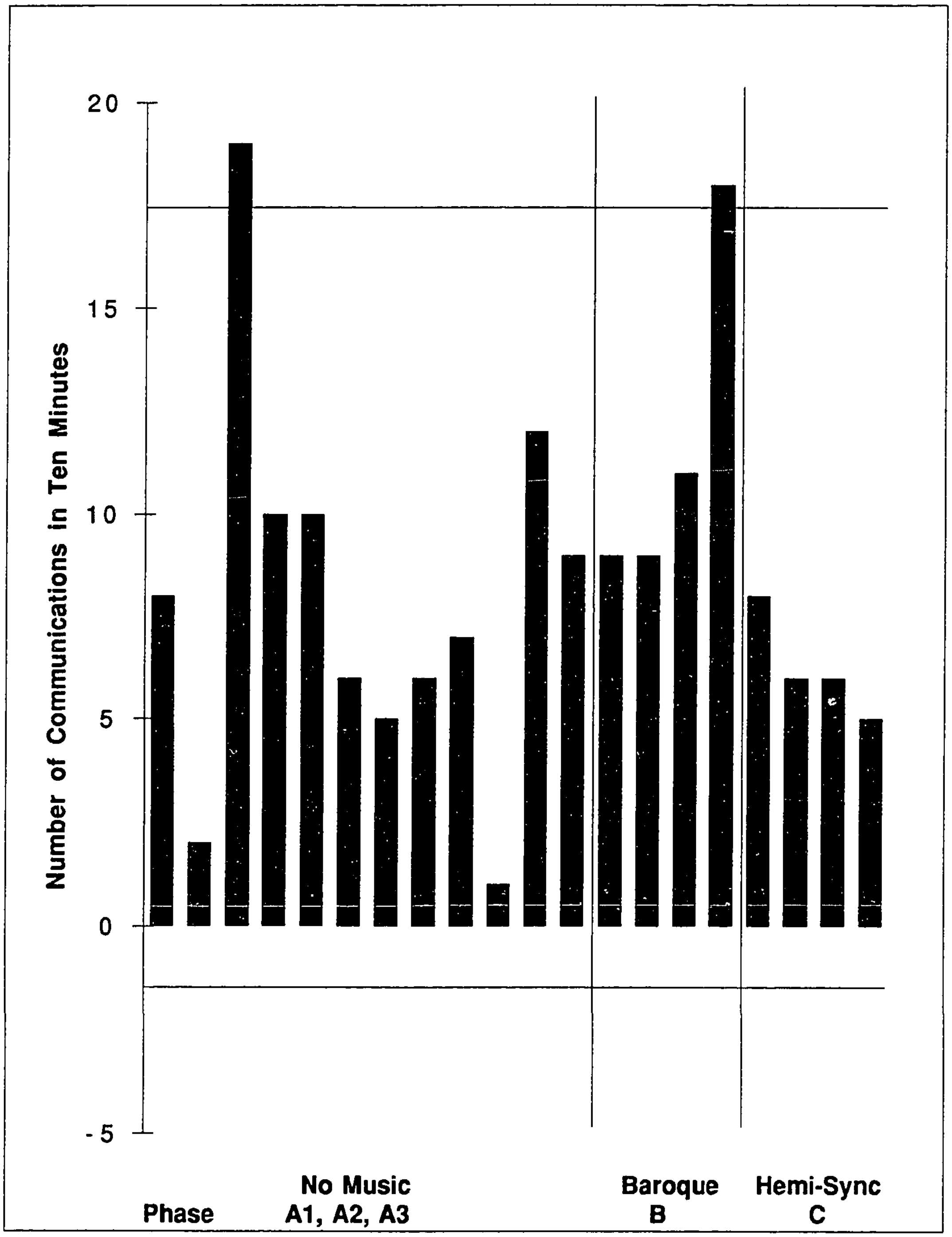


Figure 20. Two standard deviation band analysis. Communciations, Subject T.

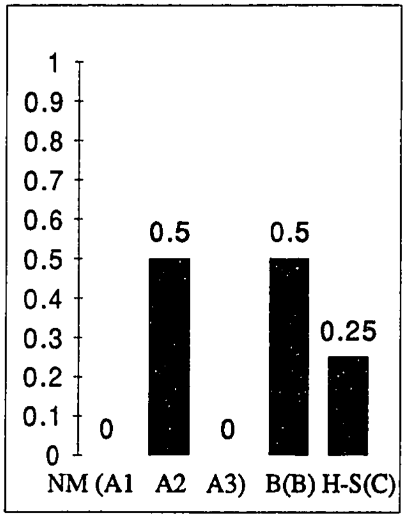
for the four subjects revealed that statistical significance could not be established for frequency of communication, eye contact, number of bites taken, or out of seat behavior. Although out of seat behavior occurred only during phase A for two of the subjects, it did not reach a level of statistical significance.

Data from the four areas of attending behavior were plotted on bar graphs to assess change in the average behavioral occurrences across phases A1, A2, A3, B, and C, to help evaluate clinical significance of behavior changes of the four subjects.

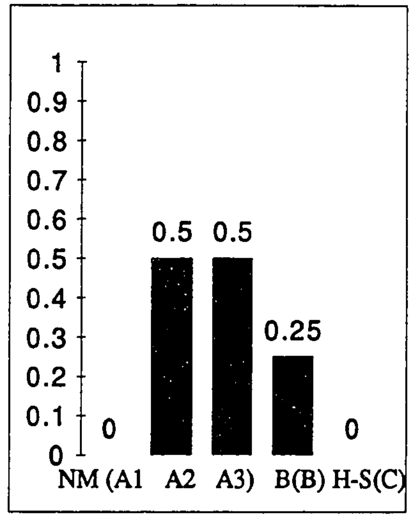
Subject J (Figure 21) demonstrated the highest average out of seat behavior during experimental phase B and baseline phase A2. In Figure 22, Subject A demonstrated the highest average out of seat behavior during baseline phase A2. Subject R demonstrated highest average out of seat behavior during baseline phase A3 (Figure 23). The average out of seat behaviors for each of the five phases are shown for Subject T in Figure 24, and demonstrated the highest level of out of seat behavior in baseline phase A1. It was noted that Subject T did not exhibit out of seat behavior during experimental phases B and C, during which music was played in the background.

Average eye contact for Subject J is shown in Figure 25, and although little variation was observed across phases A, B, and C, the highest average occurred during

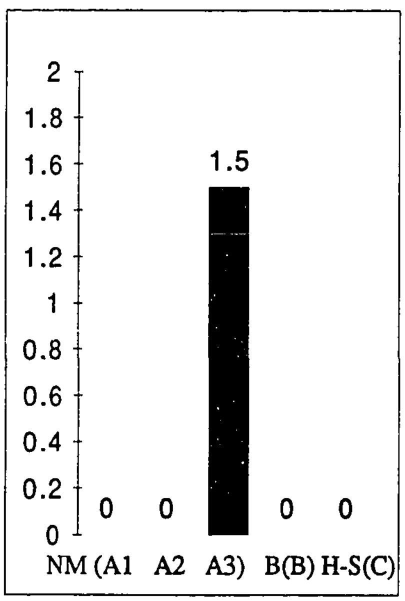
Mean number of times out of seat in ten minutes.



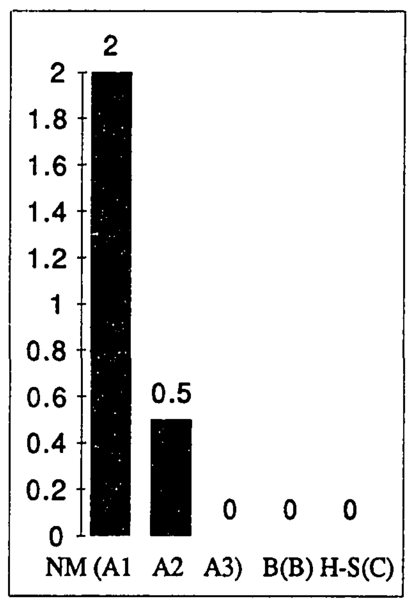
<u>Figure 21.</u> **Subject J.**



<u>Figure 22.</u> **Subject A.**



<u>Figure 23.</u> **Subject R.**



<u>Figure 24.</u> **Subject T.**

Mean number of eye contacts in ten minutes.

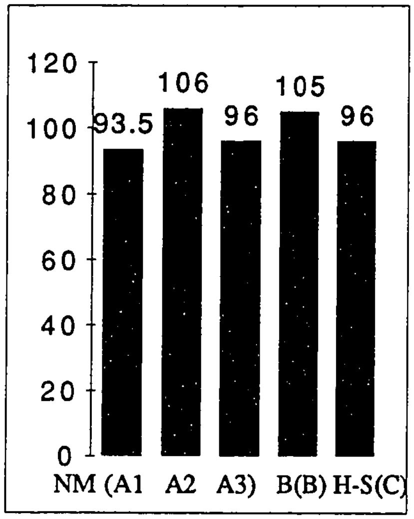


Figure 25. Subject J.

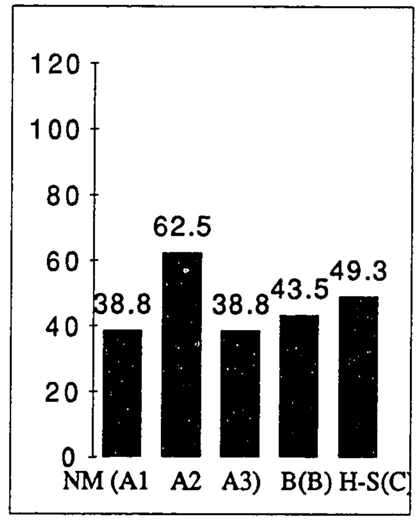


Figure 26. Subject A.

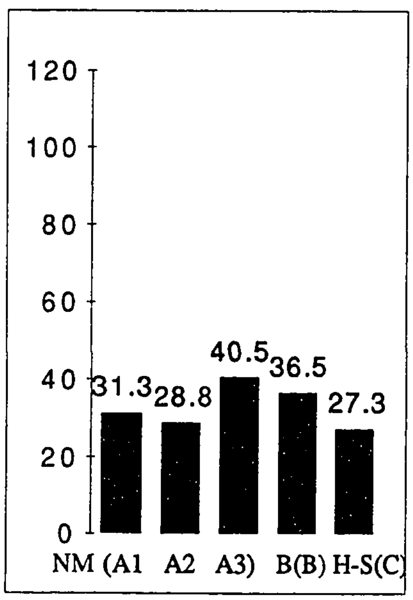


Figure 27. Subject R.

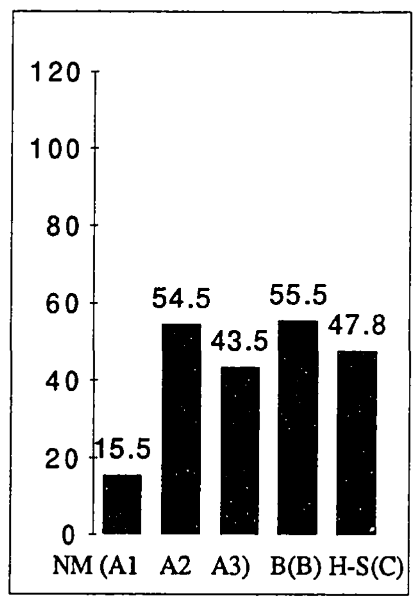


Figure 28. Subject T.

Mean number of bites taken in ten minutes.

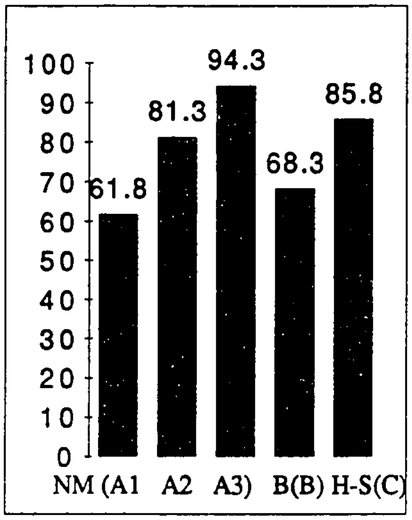


Figure 29. **Subject J.**

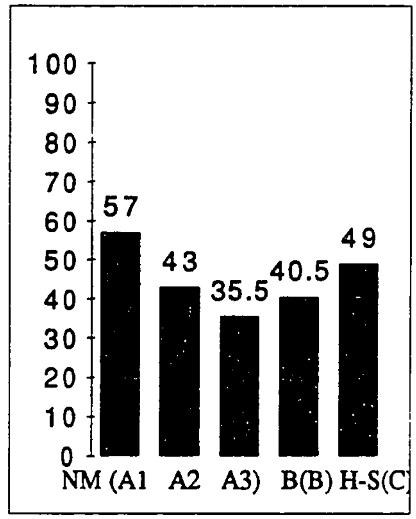


Figure 30. **Subject A.**

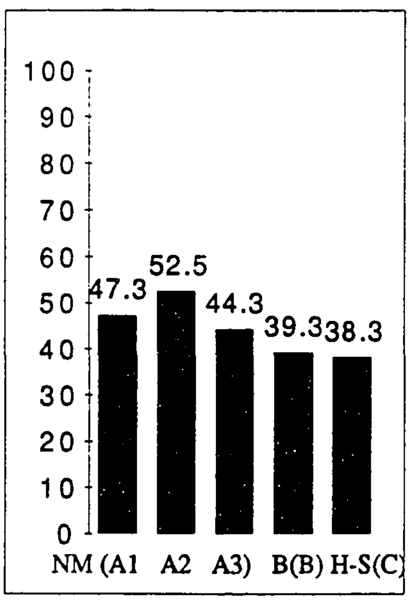


Figure 31. **Subject R.**

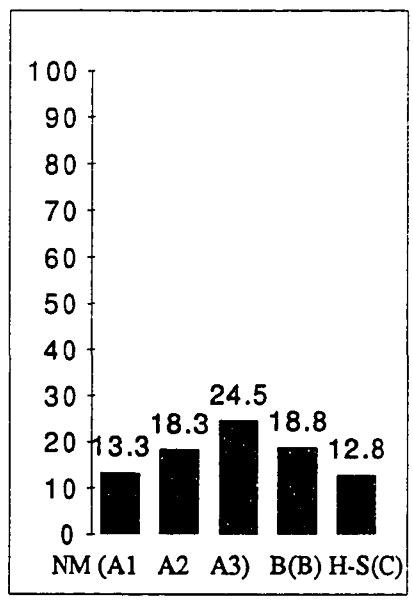
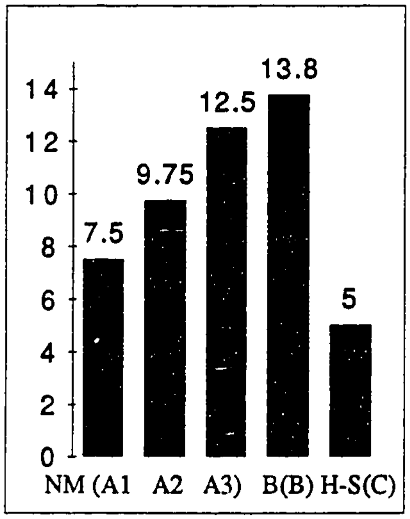
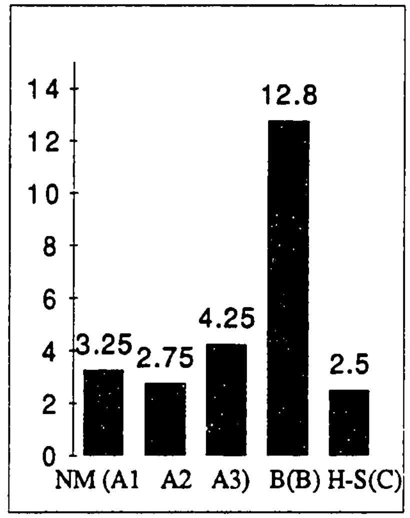


Figure 32. **Subject T.**

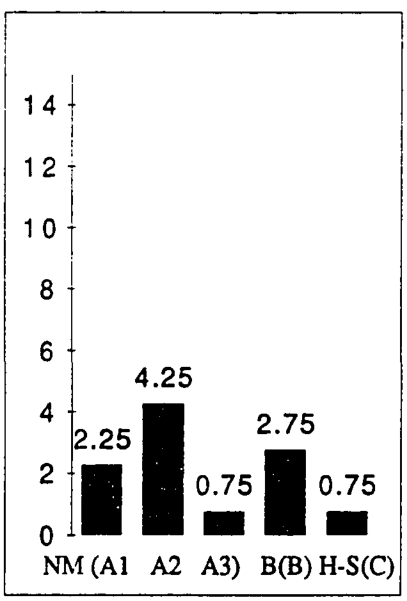
Average number of times communicated in ten minutes.



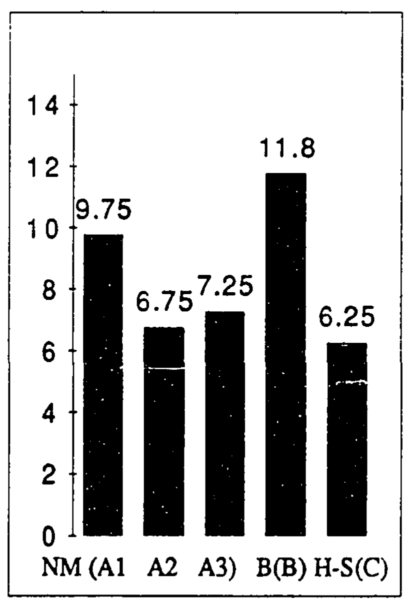
<u>Figure 33.</u> **Subject J.**



<u>Figure 34.</u> **Subject A.**



<u>Figure 35.</u> **Subject R.**



<u>Figure 36.</u> **Subject T.**

phase A3. Average eye contact for Subject A is shown in Figure 26 and demonstrates the highest average during phase A3. Subject R demonstrated the highest average eye contact during phase A3 (Figure 27). Subject T demonstrated the highest average amount of eye contact during phase B (Figure 28).

Subject J (Figure 29) demonstrated the highest average number of bites during baseline phase A3. Figure 30 demonstrates the average number of bites taken by Subject A, and shows little change across phases A, B and C, although the greatest number of bites were taken during baseline phase A1. In Figure 31, Subject R demonstrated the greatest average number of bites during phase A2. In Figure 32, Subject T demonstrated the greatest number of bites taken during baseline phase A3.

Subject J exhibited the greatest number of communications during phase B (Figure 33). Figure 34 demonstrates the average number of communications for Subject A, which is also highest during phase B. Subject R (Figure 35) demonstrated the highest level of communication during the baseline phase A2. In Figure 36, subject T exhibited the highest average communication during experimental phase B.

Findings

The research questions answered by the data were:

1) What effect will background music have on attending behavior of children with autistic-like syndrome?

The data show that there was a decrease in out of seat behavior for three of the four subjects during phases B and C, in which background music was played.

Subjects J, A, and R demonstrated highest levels of eye contact during baseline phase A. Subject T demonstrated most frequent eye contact in experimental phase B, during which Baroque music was played.

All four subjects demonstrated the greatest number of bites taken during baseline A phases.

Subjects J, A, and T demonstrated the highest frequency of communication during experimental phase B, and subject R demonstrated the greatest frequency of communication during baseline phase A2.

2) Will there be a difference between responses by children with autistic-like syndrome to Baroque or hemi-sync music?

Two subjects exhibited more out of seat behavior during Baroque music than with the hemi-sync music background. Two subjects demonstrated the same amount of out of seat behavior during both the Baroque and hemi-sync musical backgrounds.

Three subjects demonstrated a greater frequency of eye contact during experimental phase B, with the Baroque music background, than during phase C, with the hemi-sync background music. Two subjects demonstrated a greater number of bites taken during the Baroque music background, and two subjects took more bites during phase C, with the hemi-sync background music.

All four subjects demonstrated higher frequency of communication during experimental phase B, with the Baroque music background, compared to phase C, with a hemi-sync music background.

3) Will the child with autistic-like syndrome increase eye contact with others during exposure to the music background?

Three subjects demonstrated highest levels of eye contact in baseline phase A, during which no music was played in the background. One subject demonstrated most eye contact during experimental phase B, with the Baroque music background.

Results

Results of the data analysis suggest that background music had a measurable effect on two of the parameters of attending behavior investigated in this study, out of seat behavior and communication.

Three subjects demonstrated less average out of seat behavior during experimental phases B and C, in which music was played in the background.

Three of the four subjects demonstrated increased communication during experimental phase B, in which Baroque background music was played.

All four subjects demonstrated the greatest number of bites of food taken during the baseline A phases, in which no music was played.

Two standard deviation band analysis of the data did not reveal statistically significant change in any of the four areas of attending behaviors which were examined.

CHAPTER 5

PROFESSIONAL IMPLICATIONS RECOMMENDATIONS AND SUMMARY

Professional Implications

The ability to attend is requisite to the successful performance of functional activities. The ability to stay seated is important during functional self-care activities, including self-feeding, and the ability to communicate and to make choices and needs known is essential for successful inter-personal interaction and for cognitive development.

The Occupational Performance frame of reference addresses the areas of work, play/leisure, and self-care through functional activities, and is the framework upon which the study was based.

Occupational therapists treat individuals with autism in a variety of settings, both educational and medical. Dysfunction is often observed in individuals with autism in all performance components, including sensory-integrative, psychological, social, cognitive, and motor functioning.

In the self-care activity of feeding, skills must be mastered, including concentration, the ability to remain seated at a table to complete a meal, adequate communication and dyadic interaction necessary to make choices, and the ability to enjoy the social experiences associated with eating. Music may be considered as an adjunct to treatment programs for selected individuals to assist in creating a milieu in which appropriate attending behaviors are facilitated. Music is diverse in its cross-cultural appeal to all ages and can easily be incorporated into therapeutic treatment programs in the home, as well as in clinical and educational settings.

Adequate attending behavior is necessary for independent performance of functional activities and is essential for successful participation in all areas of human occupation.

Increased communication and increased ability to remain seated at a table for 10 minutes were observed in three of the four subjects in this study when music was played in the background during mealtime.

The results of this study of the effects of music on attending behavior of children with autistic-like syndrome are inconclusive but they suggest that background music may facilitate desired attending behavior of individuals who demonstrate attention deficits suggestive of a high level of arousal of the reticular activating system.

Recommendations

Further research on the effects of music on attending behavior of children with autism is recommended. Future studies would benefit from a larger sample, as well as a longer duration of time in which to gather baseline and intervention information.

It is time consuming to count behaviors which require close attention and analysis by the observer, especially observation of eye contact and communicative interactions. Out of seat behavior can be counted most easily since it is readily observed and occurs with less frequency than the other parameters of attending behaviors which were examined in this study. It is also less open to interpretation by the observer, which is advantageous, especially in long-term studies in which multiple observers are employed to gather data.

The use of a videorecorder is recommended for data collection as it provides the opportunity for the observer to focus on one behavior at a time and also permits additional observations which can be helpful to assist students in the educational setting. For example, in the present study, the interpretation of the subjects' cues and types of communicative intents by a speech pathologist was possible, which allowed for suggestions for incorporation of appropriate augmentative

augmentative communication systems into educational programming.

Future studies would benefit from permanent placement of the videorecorder on a fixture mounted on a wall or ceiling, with the addition of a time switch to activate the camera automatically. This would relieve classroom personnel of the responsibility of gathering data and would be less distracting to the students in the classroom as well.

Summary

Children with autism have difficulty forming affective relationships, as well as difficulty attending to appropriate stimuli in the environment (Arnold, 1960; Demasio, 1978). This avoidance or decreased attention disturbs the child's relationship to his family, society, and world.

The review of literature explored neurophysiological theory in relationship to music and sensory processing of children with autistic-like syndrome. Several authors suggest that autism may be the result of brainstem dysfunction, creating attentional deficits and other sensory processing problems which lead to auditory and other perceptual impairments (Brain, 1958; Magoun, 1961; Ritvo, 1976). Other areas of sensory integrative functioning which may be affected include body schema, posture, body integration, visual-spatial relationships, and sensory-motor integration (King, 1978).

Morris (1987), in observational studies, noted that certain music had a calming effect and appeared to enable children with developmental disabilities to increase the ability to focus attention.

The purpose of this study was to explore the effects of music on attending behavior of children with autistic syndrome. The study analyzed the effects of background Baroque and hemi-sync music on four areas of attending behavior of four children with autistic-like syndrome, which included communication, eye contact, number of bites taken, and the number of times the subject was out of seat during the first 10 minutes of a meal.

The four subjects who participated in the study attend special classes through the Santa Cruz County Office of Education. An autism rating scale which is used by the Autism Society of America was used to determine whether the subjects were appropriate for the study. According to the scale, when seven or more behaviors suggestive of autistic symptomatology are present, the individual is considered to have an autistic-like syndrome. All four subjects in the study demonstrated eight or more autistic behaviors, according to the autism rating scale.

A single subject A-B-A-C-A research design was used in the study. In baseline A phases, no music was played in the background to establish a baseline, phase B consisted of Baroque music, and in phase C, hemi sync music was played.

The effects of the music on attending behaviors were evaluated to determine the feasibility of the use of music as an adjunct to therapeutic or educational intervention programs for children with autism.

The results of the study suggest that background music may be effective to facilitate attending behavior for selected clients. It can be an inexpensive adjunct to treatment in home, clinical, and academic settings, to facilitate attending behavior needed for the successful performance of functional activities of daily living. The results of this exploratory study suggest that music may have a positive effect on the ability attend to tasks and may also facilitate effective communication with others; however, further research in the area of music and attending behavior is indicated.

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APPENDIX A

Autism Rating Scale

AUTISM RATING SCALE

Adapted by Prof. J. Rendle-Short, University of Queensland, Brisbane Children's Hospital, Australia. Distributed by the Autism Society of America.

Autistic Symptomatology:

-Indifferent to human contact

-Communicates by moving adult's hand

-Interest in toys limited to arranging, spinning. Play shows lack of fantasy, imagination and role taking.

-Mute or limited functional speech.

-Echolalia, pronoun reversal.

-Abnormalities of speech rhythm, tone and inflection.

-Seeks out sensory stimulation by such things as tooth grinding, scratching, stroking surfaces, visual detail scrutiny, regarding hand movements, spinning objects.

-peculiar motility: hand flapping, toe walking, head swaying, whirling, circling, lunging.

-Lack of eye contact

APPENDIX B

Parameters For Measuring Attending Behavior

Parameters for Measuring Attending Behavior

1. Number of times subject is out of seat during the feeding activity and redirected to task by teacher (Out of Seat).

2. Number of times child looked at teacher or another child's face or upper part of body (Eye Contact).

3. Number of bites taken during the first ten minutes of the meal (Bites Taken).

4. Number of times the child engages in communication with another person, either verbal, with use of gestures, sign language, or communication board (Communication).