THE UNIVERSITY OF MANITOBA

PLAY BEHAVIOURS OF HEARING IMPAIRED AND NORMAL HEARING PRESCHOOL CHILDREN WITH SELECTED TOY MATERIALS

by

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ABSTRACT

The play behaviours of 16 matched pairs of hearing impaired and normal hearing preschool children, 3 to 4 years of age, were compared in response to toy materials selected on the basis of their auditory-related properties. Toy categories included toys which children use to produce sounds, toys with which children associate sounds or language, and toys that do not produce sounds or are not associated with sounds. Children were tested individually during three 15-minute play sessions by separately presenting them with toys from each of the categories for a maximum time of 5 minutes per toy. Play responses were examined in terms of durations of play and types of play including manipulative, make-believe, and cognitive-perceptual behaviours relative to the toy categories. Results indicate that although the hearing impaired as a group show some differences in play as compared to their normal hearing peers, many of their play behaviours are similar. The two groups play for similar lengths of time with sound producing and sound associated toys, and for different lengths of time with nonsound toys. However, for hearing impaired children, the greater their hearing loss, the less they play with sound producing toys, while the more educational experience they have, the longer they play with nonsound toys. In relation to types of play, the

hearing impaired as a group show similar play behaviours in terms of sound manipulation, listening behaviours, make-believe responses, and cognitive-perceptual behaviours as the normal hearing, whereas those children with greater hearing losses appear to be adversely affected in all types of play. The play of the hearing impaired is also influenced to a lesser extent by age, education, and socioeconomic variables. It would appear, therefore, that it was those children with the greater hearing losses who showed differences in play in the directions hypothesized.

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CHAPTER 1

Children acquire general organized knowledge about the nature of their environment through sensory stimulation and active interaction with the surrounding world (Caplan and Caplan, 1973). Thus, an environment rich in visual, auditory, and tactile experiences tailored to a child's information-processing abilities is important in challenging cognitive growth.

In the young child, exposure to perceptual stimuli and active interaction with the environment is accomplished through the behavioural medium of play, with play regarded as an important cognitive activity and the basis of all higher forms of intelligence (Furth, 1969; Piaget, 1962). Through play a child expresses gains in cognitive understanding based on his or her interpretation of perceptual experience. In this regard, a child who is sensorially handicapped, i.e., receiving reduced or no stimulation through one or more sense organs, could be expected to play differently than a child whose senses are intact. Specifically, children who are deaf or suffer from hearing impairments may show possible differences in those play behaviours dependent upon auditory stimulation and/or language for their expression in comparison to normal hearing peers.

Literature Review

Play as a Cognitive Activity

Play, as the predominant activity of young children, has long been recognized by educators, philosophers, and psychologists alike. Indeed, over the past century, there have been several theories about the functions of play in the growth and development of children. For example, Piaget (1953) has looked at play primarily as it relates to the logical structures of knowledge, while Erikson (1940) has seen play as having prime importance in the mastery of emotional needs. While extended reviews of theories of play are available in the literature (Gilmore, 1966; Millar, 1968), the focus of the present study is on play within the framework of a cognitive processing system.

Only in recent years has play been formally recognized as the child's natural medium of learning and an essential part of intellectual development. As Ellis (1973) notes, educators are beginning to realize that playful behaviour is often motivated by an intense desire to learn accompanied by positive feelings of enjoyment. Thus, a child who is curious and interested in exploring the surrounding environment attempts to understand his or her world through play, which is regarded as the primary vehicle for the expression of thought in a young child. In this regard, an important function of play is cognitive functioning, with play serving as the child's exploratory and evaluational approach to environmental stimuli (Neumann,

1971).

Jean Piaget (1962) has been the main exponent of the relationship between play and cognitive development. According to his theory, play is "the activity by which a child assimilates external reality to his own internal life" (Miller, 1970, p. 113). Thus, in play, Piaget views the child as incorporating experience into his own psychological processes, i.e., assimilation, rather than adapting his sense of reality to external forces as is the case in imitative behaviour. Piaget regards the development of play behaviours as corresponding to cognitive development, with sources of thought found in the preverbal sensorimotor actions performed and experienced in the first early years of a child's life. In summarizing the importance of play in Piagetian terms, it is seen as the basis of all higher forms of mental activity, and as intellectual by nature in leading a child from activity to symbolic representation.

Another important researcher in the area of cognitive development and play is Jerome Bruner, whose studies have been highly influenced by Piaget (Bruner, Olver, and Greenfield, 1966). Bruner stresses that learning takes place most readily in an atmosphere of playfulness, and like Piaget, stresses the importance of a personal experience or sensation as being the foundation for perception and thinking. Experiments of Bruner on levels of awareness and intelligence in infants indicates a powerful

information processing ability in infants that responds to environmental stimuli, i.e., their brain is programmed for actions and skills that are elicited by sensory stimuli and environmental interaction (Bruner, 1973).

Closely related to research on play and cognitive development are those studies relating play and creativity. Since creativity is regarded as an important facet of cognitive processes, there is an underlying relationship between creativity, cognition, and play. Sutton-Smith (1967) has particularly emphasized the function of play as one of creative expression, and defines play as exploratory behaviour which transforms environmental information by playfulness. Omwake (1963) and Almy (1968) similarly emphasize the exploratory nature of play and the consequent imaginative transformation of reality. They note that self-initiated or spontaneous play allows a child to give full reign to curiosity and imagination. Omwake regards a unique feature of play as the possibility of endowing objects and events with desired features and functions. Thus, researchers indicate an important relationship between creative behaviours and learning and identify both processes in the play of children.

In addition to emphasizing the cognitive value and characteristics of play, investigators of child development, through extensive observation, have provided descriptive lists of stages of growth in children's play (Hurlock, 1942; Gesell, 1949; Piaget, 1962). For example,

Hurlock lists different kinds of play, emphasizing that the degree to which children engage in these various kinds of play differs according to individual preference and age. Her list of play behaviours include free spontaneous play which is mostly exploratory in nature, dramatic play which reaches its peak at about $5\frac{1}{2}$ years as a child becomes more realistic, constructive play, and music play, all of which follow certain developmental patterns.

Throughout the literature on cognitive development, intrinsic motivation has been regarded as a primary force in development and play (Neumann, 1971). In this regard, Ellis (1973) regards the activation of play behaviour as dependent upon environmental stimulation and interaction between organism and environment. Play is viewed by Ellis as a vehicle with which the child can mediate the amount of stimulation available to achieve a balance at an optimal level of arousal. Research on cognitive development has also emphasized that the child must be in control of the learning situation, enabling the child to select the type and direction of transaction with the environment to match his own level of complexity (Sackett, 1965). Play experiences in particular provide the child with opportunities to assume control.

While nearly all theories of play account for it in terms of inner contingencies or reinforcers, there has been evidence to show that some play behaviours are related to external reinforcers, with cultural and family

environments important in eliciting certain types of play. For example, Smilansky (1968) found that imaginative and dramatic play behaviours are not as common in children from lower socioeconomic backgrounds as in those from higher level backgrounds. She attributes this to home environments which do not provide the materials for, or the reinforcement of, imaginative play. Exploratory play behaviours are also reported to increase in stimulating environments where there is a variety of toys and play materials, and where adults reinforce such behaviours and teach children to interact with their environments (Mussen, Conger, and Kagan, 1963).

In summary, then, according to the theories relating play to cognitive development, the process and objectives of play vary over time, within and between children. Although different terminology tends to be used, there is much agreement on the description of play stages reached by children in the work of Piaget (1962), Gesell (1949), and Herron and Sutton-Smith (1971). Play appears to be a process similar to that of cognitive functioning with play behaviours increasing in complexity with age depending upon the cognitive level of the individual, and upon the quality and quantity of environmental stimulation. Thus, the potential activity of play is inherent in children, but since they play within a specific environment, the form and content of their play are learned or acquired within and according to the sociocultural context of their environment.

Play Behaviour of Hearing Impaired Children

While much information is available in the literature concerning the normal development of play, there is very little on the development of play in children who are sensory-impaired, specifically those with hearing deficits. Michelman (1974) provides some insight into the importance of play experiences for the intellectual growth of deficit children, i.e., children with sensory or physical handicaps. He views sensation as the foundation for perception and cognitive development in that children learn about their environment through exploratory play by combining visual, auditory, tactile, and kinesthetic sensations. Michelman stresses the critical importance of providing a deficit child with rich and varied sensory inputs, with such experiences providing enriching cues about reality, and discriminating one thing from another. According to Michelman, any knowledge which deficit children gain through their intact senses helps them to process and interpret information from the surrounding world which is internalized through play.

Unfortunately, the role of poor sensory input, specifically auditory deprivation or deafness, in relation to children's play development is not well documented.[1] Indeed, the paucity of research studies focusing on play behaviours of deaf and hearing impaired children points to

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[1]Deaf children refers to those in whom the sense of hearing is non-functional for the ordinary purposes of life, whereas the hearing impaired are those children in whom the sense of hearing, although defective, is functional with or without a hearing aid.

the critical need for more empirical data in this area. The studies which are relevant to the present investigation will be discussed.

In a study by Heider and Heider (1941) of hearing impaired children 3 to 6 years of age, it was found that in play, limited communication restricted social relations amongst the children, and that hearing impaired children more frequently came into conflict with others than hearing children. These researchers noted that hearing impaired children were handicapped in dealing with qualities of objects and abstract relations, and were therefore largely limited to concrete aspects of the present situation, and were unable to make specific meanings clear. In addition, they added that hearing impaired children were unable to anticipate the next step in a situation, as well as being limited in imaginary play. Heider and Heider concluded that these behaviours all contribute to the reduced social interaction of hearing impaired children, and consequently, an increased incidence of individual play in such children.

In comparing the play of hearing impaired children with that of hearing children, Kendall (1953) found the greatest difference to be in dramatic play and the least difference in free muscular play. With regards to dramatic play, he notes that among hearing impaired children, such play occurred almost as frequently as among hearing children, but that the dramatic play of the hearing impaired children was seldom woven into consistent or long

patterns of fantasy as occurred in hearing children. Kendall believed that lack of language in hearing impaired children was related to a deficit in dramatic play, particularly at the preschool level.

Vygotsky (1966) studied hearing impaired children with varying degrees of delayed speech development and found that those who possessed poor oral language could not substitute one object for another in play as easily as those who had relatively good levels of speech acquisition. He stressed the need for hearing impaired children to be taught skills such as those involved in subject substitution in play-like situations.

Heilitzer (1962) investigated the effect that frustration had on doll play of handicapped and non-handicapped children. A total of 75 children were examined, and included those with hearing impairments, those with orthopedic disabilities, and those with no handicaps. Assessing play before and after a frustrating task resulted in emotionally inappropriate behaviour as a more common response in handicapped subjects than normal subjects (although the incidence of emotionally appropriate behaviour was below that found in other studies). The amount of thematic doll play engaged in by non-handicapped children was greater than that for handicapped children, with frustration tasks having a negligible effect on the non-handicapped group, and an adverse effect on the thematic play of the hearing impaired group. In addition, the play

of the hearing impaired group was found to be characterized by a general clumsiness such as dropping toys and other play equipment.

One of the most extensive studies of the play behaviour of aurally handicapped children was conducted by Kretschmer (1972). A sample of 71 pairs of preschool hearing impaired and normal hearing children was used and their individual play behaviour and social interaction styles were compared. The first phase of the study indicated differences in the play between the two groups of children. Kretschmer reports that the hearing impaired were more active in the test situation, moving about the room more, with fewer "goal directed" movements, i.e., movements from one specific object to another, as compared to the normal hearing children. Differences were also reported in handling of objects, with the hearing impaired picking up, transporting, and setting objects down more frequently. The hearing impaired were reported to engage in more self-exploratory activities, i.e., handling their clothes, hair, etc. In regards to the amount of behaviour noted in all areas of actual play behaviour, i.e., mechanical, classification, dressing up, setting up, pretending, and problem solving, the normal hearing children exceeded the hearing impaired. However, it was found that for both groups, the more mechanical aspects of the situation such as physical activity and manipulation seemed to predominate over interaction with the toys on a creative basis as in pretending

and problem-solving. Kretschmer also reports that the hearing impaired employed more generalized and "immature" methods of exploration and scanning behaviours with toy materials, i.e., using gustation, ambient vision, and ambient taction, as compared to the normal hearing who were more selective in exploratory efforts using focal point vision and specific intentional taction. When the communicative behaviours of both groups were examined, the hearing impaired used more gesturing, babbling-like noises, and distressful sounds, while the normal hearing children used more speech and sound effect utterances when playing with certain toys, e.g., cars, as well as more humming. In summarizing his research findings, Kretschmer concluded that the play of the hearing impaired children was "immature" in comparison to that of the normal hearing, indicating a need for more direct guidance in the play activities of hearing impaired children. The second phase of the study focused on social interaction, and results indicated that the hearing impaired were less cohesive as a group, produced fewer successful social contacts, and used gesturing as a communication device more frequently than vocalizing as compared to normal hearing children.

In a more recent study by Darbyshire (1977), dramatic, constructive, and motor aspects of play of 45 hearing impaired children between 3 and 8 years of age were observed in classroom and out-of-classroom situations. Based on the observations of an experienced play therapist,

as well as questionnaires completed by teachers, counselors and parents, Darbyshire concluded that "the evolution of play in young hearing impaired children seems to follow the pattern described by Piaget but slows down with age in relation to normally hearing subjects" (p. 25). In regard to constructive and dramatic play, games, social development and communication, the hearing impaired children were reported to develop more slowly than the normal child. This was most obvious in social development where more solitary and parallel play was observed rather than associative or cooperative play, as well as in games, i.e., those forms of play activities involving rules and a fairly high degree of verbal conceptualization. For many of the hearing impaired children, dramatic play was less imaginative or elaborate, consisting almost of straight imitation with little object substitution utilized. Constructive play, e.g., colouring, painting, drawing, as well as activities involving water, sand, clay, were found to be relatively well developed in the hearing impaired child with the exception of block building, i.e., many hearing impaired children at about 7 years of age built towers, copied designs, or lined blocks up for no specific purpose rather than using them for structural ends. When the hearing impaired children were observed in their pre-school settings, they were reported to do a considerable amount of aimless wandering, not knowing how to occupy their time. To summarize Darbyshire's findings, the

playing of games was the area in which the hearing impaired child was the most retarded, particularly if speech and language were not well developed and children were unable to follow rules. Motor play was the area in which they were least retarded, i.e., the majority of children were normally active in their motor play. Relatively "mature" play patterns of the hearing impaired were related to several factors including the acquisition of hearing aids at a young age, an early start of training and/or therapy, as well as high socioeconomic backgrounds. Thus, higher socioeconomic status was associated with greater skill in constructive, and dramatic play. The length of time a child had been wearing a hearing aid and received therapy was positively related to the degree of social development. In addition the degree of hearing loss was found to adversely affect certain types of play including motor play, dramatic play, and games.

A further series of short experiments by Darbyshire (1977) examined the play of nine matched pairs of hearing impaired and normal hearing children. The behaviour patterns of the hearing impaired were reported as less mature, being characterized by needless laughter and purposeless moving about, finger sucking, and exaggerated staccato gestures. In addition, object substitution and make-believe play were relatively common in normal hearing children but not in those with auditory deficits. The hearing impaired children also showed some fear behaviours,

with a few refusing to participate unless accompanied by a known adult. Darbyshire concluded that most of the hearing impaired children in his studies were retarded in their play development, rating lowest on games and most highly on motor play, as well as being retarded in dramatic and constructive play. Basing a general comparison on the normative data for hearing children, Darbyshire notes that the hearing impaired were delayed, on the average, by about 18 months in their general play development.

In overview, the literature and research on the play behaviours of deaf and hearing impaired children indicates that generally their play is less developed than that of normal hearing children. There is evidence that, with intervention, play behaviours of children with auditory deficits need not be delayed as they often are if such children are given more direct guidance in their play by parents and teachers.

In this regard, Furth (1973) maintains that experience, of which play is a large part in childhood, is the greatest deficit of the hearing impaired child, and emphasizes the importance of play as a non-verbal symbolic system in developing a child's cognitive abilities. Thus, cognitive deficits shown by deaf and hearing impaired children may be viewed as due to experiential deficits rather than to a lack of verbal language abilities <u>per se</u>. Indeed, as Watts (1979) points out, "The fact that most deaf children are denied to a large extent the ready-made symbol system of

the hearing world, not only for communication, but also for thinking, suggests that thinking cannot find its base in verbal behaviour or these children could not think at all" (p. 47). It is noteworthy that historically, studies of conceptual development began by finding large differences between hearing impaired and normal hearing children (Oleron, 1953). However, due largely to the work of Furth and his associates (Furth, 1964), linguistic requirements of tasks were reduced and understanding of tasks assured, resulting in only minimal differences between deaf and hearing subjects (Darbyshire and Reeves, 1969). Similarly, data on intelligence scores and cognitive abilities of hearing impaired children indicate a normal range of abilities when nonverbal tests are administered individually and steps are taken to ensure that the child understands the instructions (Hiskey, 1956; Vernon, 1968).

In sum, the importance of play as a means of developing cognitive abilities and symbolic thinking in young children with auditory deficits cannot be overstated (Harris, 1971, 1975). As Darbyshire (1973) notes, "There appears to be a marked lack of understanding among adults who work with hearing impaired children that play is as important in learning as formal instruction, particularly in the years of infancy and early childhood" (p. 33). Thus, play has particular importance for a child with communication disorders in making experience more than just simple exposure. In this regard, Schlesinger and Meadow (1972)

blame the immaturity of hearing impaired children partly on the schools they attend in their early years which often restrict mobility and motor activity, placing undue stress on a child and inhibiting learning. The importance of free play as a learning experience has also been emphasized by McDermott (1970) who believes that hearing impaired children should attend a normal nursery school program before entering first grade. She stresses that appropriate integration is conducive to developing language and providing accurate models for social habits and play patterns.

It is evident from a review of the literature that little systematic research has been conducted in the area of play and the hearing impaired. Clearly, there is a need for additional studies to more accurately assess differences in the way the deaf and hearing impaired play in comparison to their normal hearing peers. In this regard, the quality and quantity of sensory information, in particular auditory stimulation, is of special interest in assessing how cognitive development may be facilitated through play behaviour. Since none of the studies have examined play of aurally handicapped children in relation to stimulus properties of toy materials, this area of research is open to many investigatory possibilities for a more meaningful interpretation of experimental results.

Statement of Problem

This study was designed to investigate play behaviours of hearing impaired children which are described in the literature as "delayed" or immature." If the eliciting of so-called "mature" play is associated with the perception of auditory stimulation or the use of language, the problem becomes one of determining whether the child responds "immaturely" simply as a consequence of not receiving the necessary auditory stimulation. In an attempt to discern whether a lack of auditory information is a relevant factor in "immature" play behaviours, the play stimuli for this study were specifically selected on the basis of their auditory-related properties. Three categories of toys were included: (a) toys children use to produce sounds, i.e., sound producing, (b) toys with which children associate sounds or language, i.e., sound associated, and (c) toys that do not produce sounds or are not associated with sounds or language by children, i.e., nonsound.

It was, therefore, hypothesized that hearing impaired and normal hearing children play differently with toys that produce or are associated with sound but similarly with toys not directly related to sound.

For purposes of this study, durations and types of play were the dependent measures relative to the three categories of toys. Accordingly, the specific hypotheses

were as follows:

1. Normal hearing and hearing impaired children play with sound producing and sound associated toys for different lengths of time, and with nonsound toys for similar durations.

2. Normal hearing and hearing impaired children manipulate for sound and listen to sound producing toys for different lengths of time.

3. Normal hearing and hearing impaired children differ in their make-believe responses to sound associated toys.

4. Normal hearing and hearing impaired children respond with similar cognitive-perceptual behaviours to nonsound toys.

In addition, the communicative behaviours, i.e., vocalizations and gestures, interaction with mother, and durations of nonplay of normal hearing and hearing impaired children were examined.

CHAPTER 2

METHOD

Subjects

Subjects in the present study included 16 hearing impaired preschool children[2] (nine boys and seven girls), 3 to 5 years of age, and 16 normal hearing children[3] individually matched with the hearing impaired group (see Table 1). The normal hearing children were chosen from a preschool which offered a similar educational environment as the hearing impaired preschool in terms of play materials and program, i.e., free play and structured activities.

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[2]The hearing impaired children attended the Preschool for the Hearing Impaired at the Society for Crippled Children and Adults of Manitoba, Winnipeg, Manitoba.

[3]The normal hearing children attended the Fort Richmond Lutheran Church Nursery School, Winnipeg, Manitoba.

Table 1

Characteristics of Normal Hearing (NH) and Hearing Impaired (HI) Children

Subject	NH		HI	
Variable	Mean	SD	Mean	SD
Total N	16		16	
Boys	9		9	
Girls	7		7	
Age (mos.)	49.0	7.01	49.1	7.37
Education (mos.)[a]	8.3	4.99	11.6	7.22
Socioeconomic status	2.3	.68	2.6	.96
Family size	2.1	.93	1.9	.77
Birth order	1.3	.60	1.6	.73
Hearing loss[b] (db)				
Minimum[a]	-	-	69.1	12.36
Maximum	-	-	73.5	10.42
Mos. of amplification[c]	-	-	19.3	10.95

[a]All children attend preschool on a daily (half-day) basis.

[b]For three subjects, hearing loss in the right and left ear differed. Thus, the minimum mean was calculated using the ear with the lowest loss and the maximum mean using the highest loss.

[c]Based on information obtained from the preschool which the hearing impaired attend, the number of months of amplification is closely related to the start of individual therapy or auditory habilitation.

The subjects were selected using the following matching variables listed in order of priority.

Age. The ages of the members of a pair were matched within 3 months of one another. A subject's age was considered in terms of the number of months of age at the time of participation in the study. Ages of the subjects ranged from 38 to 61 months (see Appendix A for distribution of ages).

Sex. The sex of members of a pair was the same in all cases.

Socioeconomic status. The socioeconomic status of members of a pair was matched as closely as possible according to Darbyshire's socioeconomic classification scale (see Appendix A).

Additional information was collected on other variables including preschool educational experience, family size, and birth order (see Appendix A). Intellectual potential was not included as a matching factor because of the difficulty in obtaining valid measures of intelligence from a young child with impaired hearing.

The hearing impaired children were required to meet the following selection criteria. All of the children were fitted with hearing aids, had moderate to profound sensory-neural losses (Tables 2 and 3), had no obvious secondary handicap such as a behavioural disorder, motor handicap, or

Table 2

Range of Hearing Loss (db) Relative to Degree and Difficulty with Speech

Range of hearing loss (db)[a]	Degree	Difficulty with
0 - 25	Very mild	Faint speech
25 - 40	Mild	Low intensity speech
40 - 55	Moderate	Normal speech
55 - 70	Moderately severe	Loud speech
70 - 85	Severe	↕
85+	Profound	Deafness for speech

Note. Based on the above information obtained from the preschool attended by the hearing impaired children, hearing losses for this study were represented by the following values:

Moderate loss	48 db
Moderate to severe loss	55 db
Moderately severe loss	63 db
Severe loss	70 db
Severe to profound loss	80 db
Profound loss	85+ db

[a]Without amplification.

Table 3

Number of Hearing Impaired Children According to Degree of Hearing Loss

Degree of hearing loss[a]	Number of Children	
	Maximum loss	Minimum loss
Moderate	1	2
Moderate to severe	0	1
Moderately severe	3	4
Severe	3	2
Severe to profound	7	6
Profound	2	1

[a]Without amplification.

visual impairment which significantly interfered with their functioning. Supplemental information obtained from the mothers of the hearing impaired indicated that 14 of the children had congenital hearing losses, whereas only two suffered postnatal losses (one at 3 months of age and the other at 2 years). With the exception of one child who usually wore a hearing aid, 15 children wore hearing aids all of the time. In addition, the mothers indicated how long amplification had been used and rated the child's level of communicative abilities. (See Appendix A.) The preschool which the hearing impaired children attended did not use or encourage parents to use manual communication with the children, but rather, focused on the development of auditory-oral language skills.

Parents of normal hearing and hearing impaired children were contacted by telephone regarding their willingness to participate and were then mailed letters and consent forms with stamped self-addressed return envelopes. (See Appendix B.) Although no remuneration was given for participation in the study, transportation was provided to and from the testing sessions if it was desired.

Testing Materials

Play materials were chosen for the sound producing, sound associated, and non-sound toy categories following extensive pretesting with normal hearing and hearing impaired children (Table 4). The criteria for the

Table 4.

Toys Selected for Each Category of Play Stimuli with Assigned Designations for Counterbalanced Orders

Toy category	Order categories		
	A	B	C
SP[a]	Xylophone (piano)[a]	Boxes	Record player
SA	Vehicles	Animals	Finger puppets (hand puppets 1) (hand puppets 2)
NS	Puzzles	Nesting blocks (seriating sticks)	Geometric shapes (form box)

[a]SP: Sound producing toys

SA: Sound associated toys

NS: Nonsound toys

[b]Alternate toys in parentheses.

selection of toys included (a) developmental appropriateness, (b) general appeal to both girls and boys, (c) familiarity, i.e., toys similar to those found in the nursery schools which the sample children attended, and (d) the likelihood of eliciting specific behavioural responses (i.e., manipulative, make-believe, and cognitive-perceptual behaviours). Because of individual differences in toy preferences, alternate toys were selected to ensure that such preferences would not interfere with the total duration of play in a session.

The toy categories used for testing were as follows. (See Appendix C for detailed description of toys.)

Sound producing toys. Toys in this category included a xylophone with a tapping stick and a toy piano as an alternate, (b) a set of six square boxes, three of which contained bells, and (c) a record player with records.

Sound associated toys. This category consisted of (a) toy vehicles including a car, fire engine, dumptruck, and airplane with a garage and stoplight, (b) miniature animals including a sheep, pig, dog, cow, and lion, with a barn and water trough, and (c) a set of two finger puppets, and alternates including two pairs of hand puppets.

Non-sound toys. This category included (a) eight wooden picture puzzles, some open- and others closed-figure types, (b) a set of nine nesting blocks and an alternate toy consisting of 10 rectangular sticks of seriated lengths, and (c) geometric shapes (circles, squares,

triangles, rectangles, and hexagons) of different colours (yellow, blue, and red), sizes (large and small), and thicknesses (thick and thin), with a box containing corresponding geometric partitions.

Rapport materials consisted of a teletrainer kit with two actual telephones wired to a central control unit.[4] The telephones allowed interaction between the experimenter and child and provided time to establish rapport. One of the phones was equipped with lighted buttons, two of which flashed, while the other phone rang.

In addition to the toy materials, other equipment included (a) a stopwatch for accurate timings during testing, (b) a large chart on a bulletin board in view of the experimenter to display the order of toys for presentation, and (c) a movable locker used to store toys out of a child's view that was situated within the experimenter's reach.

Procedure

To enable the children to become acquainted with the experimenter, she spent two days in each nursery school prior to the beginning of testing.

Each child was tested in a small playroom at the University of Manitoba. (See Appendix C for a diagram of the playroom.) Testing was conducted during the morning and

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[4]The teletrainer kit was supplied courtesy of the Manitoba Telephone System.

afternoon with the same time period for members of a matched pair. All children were tested individually during three 15-minute sessions, with a 3- to 5-minute break between sessions. The entire session was videotaped through a one-way mirror.

A child was brought to the playroom by the mother who remained in the room during the test sessions.[5] During a session the mother was asked not to encourage interaction with her child and was given one part of a 3-part questionnaire to fill in concerning general background information on her child.(See Appendix D for a sample questionnaire.)

Rapport was established with the child by presenting the two telephones. After gesturing to the child to sit down, the experimenter said, "Here are two phones for you to play with." While pointing to the phones, the experimenter remarked, "See, watch me." Then, after demonstrating possible play behaviours using both phones simultaneously, the experimenter instructed the child, "Now you can play."

As soon as the child touched one of the phones, the experimenter manipulated the control unit levers so that either (a) the lighted buttons on one phone flashed for approximately 3 seconds, or (b) the other phone rang two

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[5]In two cases, the fathers of one normal hearing and one hearing impaired child (both girls) accompanied their children to the sessions when the mothers were ill and unable to attend. Both fathers reported spending much time at home with their children.

consecutive times. For as long as the child continued to play with a phone, the experimenter gave the corresponding sound or light reinforcement at 5-second intervals. If the child stopped playing with the phones, the experimenter encouraged further play for a possible 5-minute period with a maximum of three prompts by saying, "You can play longer if you want to," and if necessary demonstrating possible play behaviours again.

After a maximum of 5 minutes of play with the rapport toys, the experimenter removed the telephones and presented the first experimental toy, saying while gesturing, "Here is a_____. You can play with it." (See Appendix C for individual method of presentation of toys.) As soon as the child touched a toy, i.e., began to play, the experimenter began timing with a stopwatch. If the child either (a) terminated a play session by gesturing or vocalizing, or (b) ceased playing with the toy for 5 seconds, the experimenter prompted the child to play by saying, "You can play longer if you want to," or "You can play more if you like." A maximum of three prompts was given for a toy and then for its alternate. When the child did not respond within 5 seconds following the prompt, the experimenter ended the session. On the other hand, if a child continued to play with a toy for a maximum of 5 minutes, the experimenter removed it and simultaneously presented a toy from a different category. The experimenter instructed, "Here is another toy for you to play with," and then reset the

stopwatch as before.

The same procedure was used for presenting toys from each of the three toy categories for the first session. The experimenter then told the child, "Your Mom is going to take you for a walk now. You can come back and play with more toys later." The mother then took the child out of the testing room for a 3- to 5-minute break. The second and third play sessions followed the same procedural format as the first session.

During each experimental session, the order of presentation of the three categories of toys was counterbalanced across hearing impaired children (see Appendix C). Each matched hearing child received the same counterbalanced order as his or her counterpart. Within toy categories, the three toys representative of each category were also counterbalanced across children.

Although play with each toy category was allotted equal time in all sessions, each category contained different numbers of toys since alternates were included in an attempt to maximize a child's interest for a possible 5 minutes. The alternate toys were presented if play with the principal toy was terminated before 4 minutes. In regard to the puppets, it was possible for a child to play with all three sets if he or she ceased playing with the finger puppets and first set of hand puppets before 4 minutes.

In the case of the geometric shapes, free-form sorting

was encouraged first. If a child showed (a) no classification behaviour during the first 3 minutes of play, (b) other types of behaviours predominated over classification during the first 3 minutes, or (c) play was terminated before 4 minutes, then the form box was presented by saying, "You can put the shapes in here," while gesturing toward the box.

During play with some of the toys the experimenter assisted a child under certain conditions. If a child simply requested help by gesturing or vocalizing, the experimenter pointed to the toy and said, "You try." However, if a child was having difficulty while playing with a toy and became frustrated or distressed, i.e., made distressful sounds or gestures, pushed the toy away or left the toy, and play was interrupted, the experimenter assisted by (a) showing a child the position or correct placement of part of a toy required for seriation, classification, or spatial placement behaviours, saying "Try this" or "See," while pointing, (b) demonstrating the operation of a toy, i.e., helping a child work the record player by either winding it up, placing a needle on a record, or turning the switch on, or (c) otherwise helping a child as appropriate, e.g., assisting in putting a set of puppets on a child's fingers or hands.

In addition, the experimenter reinforced a child for making a play product through seriation, classification, spatial placement, or constructive-building behaviour with

verbal praise such as "That's nice," or "Good for you." Other play behaviours were acknowledged, if necessary, by smiling or nodding and saying "Oh" or "Uh huh." Otherwise, the experimenter attempted to limit verbal exchanges with a child, and spoke only when necessary, e.g., when making the toy presentations and ending a session or answering a child's question, etc.

Coding and Scoring

The behaviours investigated were recorded from the videotape in the form of a running record (see Appendix E for sample record). The time of onset of specific behaviours was coded within 2 seconds accuracy throughout a session. As well, the type of behaviours shown by a child were coded in the running record as they occurred in a session. The duration of a behaviour was calculated or the frequency of occurrence counted across a toy or a session as appropriate.

The types of behaviours considered for coding and scoring were defined as described in Table 5.

Durations of Play

Behaviours were defined as play when a child was actively involved in behaviours pertaining to the toy presented. A child's duration of play with a particular toy was calculated by first determining from the running record the start of play in a session, i.e., when a child physically contacted or touched the toy, as well as the termination of play, which was either (a) the maximum of

Table 5

Scoring of Behavioural Measures

Relative to Applicable Toys

Behavioural measures	Applicable toys	Scoring
Durations of play	All toys	Duration (total secs.) i) Across all toys ii) Across each toy category
Types of play:		
Manipulative behaviours		
1. Sound manipulation	Xylophone, piano, boxes	Duration (total secs.) (xylophone & piano & boxes)
2. Other manipulation	SP toys	Duration (total secs.) i) Across all SP toys ii) Xylophone & piano & boxes iii) Record player
2. Listening behaviours	Record player	Duration (total secs.) (record player)
Make-believe behaviours		
1. Animated gestures	All toys	Duration (total secs.) i) Across all toys ii) Across SA toys

Table 5 (continued)

Behavioural measures	Applicable toys	Scoring
2. Pretend vocalizations (nonspeech & speech)	All toys	Frequency (total occurrence) i) Nonspeech & speech / all toys ii) Nonspeech & speech / SA toy category
Cognitive-perceptual behaviours		
1. Classification (a) Free-form	Geometric shapes	Classification scores i) Highest matching score ii) Highest no. of dimensions used simultaneously
(b) Structured	Geometric shapes with form box	Mean secs. / 1 piece by size and shape, or 2 pieces by shape only
(c) Total classification	Geometric shapes, boxes, nesting blocks, seriating sticks	Sum of highest matching scores / applicable toys
2. Seriation	Nesting blocks, seriating sticks, boxes, animals	Seriation scores i) Highest score / blocks ii) Highest score / sticks iii) Sum of highest scores / applicable toys

Table 5 (continued)

Behavioural measures	Applicable toys	Scoring
3. Spatial placement	Puzzles	Spatial placement scores i) Sum of scores / all puzzles ii) Mean secs. / piece
4. Constructive-building	Geometric shapes, boxes, nesting blocks, seriating sticks	Construction score (Sum of highest scores / applicable toys)
5. Diversity of behaviours	Geometric shapes, boxes, nesting sticks / seriating sticks	Diversity score (Frequency of classification, seriation, constructive-building / 3 toys)
Communicative behaviours		
1. Gestures	All toys	Frequency (total occurrence) (across all toys)
2. Vocalizations	All toys	Frequency (total occurrence)
(a) Nonspeech: Humming, singing Random sounds Laughing Nonintelligible vocalizations		i) Nonspeech / all toys ii) Nonspeech /each toy category iii) Nonspeech type: Humming and singing / random / laughing / nonintelligible / all toys
(b) Speech: Stimulus-related Stimulus-unrelated		iv) Speech / all toys v) Speech /each toy category vi) Speech type: Stimulus-related / stimulus unrelated / all toys

Table 5 (continued)

Behavioural measures	Applicable toys	Scoring
Interaction with mother	All toys	Frequency (total occurrence) (Across all toys)
Nonplay	All toys	Duration (total secs.) i) Across all toys ii) Across each toy category

5 minutes allowed for a toy presentation, or (b) when the child indicated the end of play by gesture or speech, or ceased playing for at least 5 seconds, even after being prompted. The number of seconds of play with each toy was then calculated and entered in the data tables. A child's duration score was the total number of seconds of play across all toys and within each toy category.

Types of Play. The major types of play investigated included the following:

Manipulative behaviours. Three kinds of behaviour were considered as manipulative.

1. Sound manipulation. Play behaviours were coded as sound manipulation when a child handled a toy in a manner that produced sound. These behaviours were applicable only to the musical instruments and boxes in the sound producing toy category. When playing with the boxes, a child had to shake, kick, or otherwise handle the boxes to jingle the bells for the behaviour to be coded as sound manipulation. In order to be coded, such behaviour had to be repeated or be accompanied with vocalizations, facial expressions, or gestures, indicating that the bells were heard. The sound manipulation score was the total number of seconds a child engaged in this behaviour with the boxes and musical instruments together.

2. Other manipulation. Play behaviours were coded as other manipulation when a child handled an object in ways not defined by other types of behaviours, i.e., cognitive-

perceptual behaviours. Although other manipulation was applicable to all toy categories, a child received scores based on the total number of seconds of such behaviour across all sound producing toys, as well as for the instruments and boxes considered together.

3. Listening behaviours. Since listening was the relevant behaviour associated with the sound produced by the record player, it was coded instead of sound manipulation, which was not distinguishable from other types of manipulation. A child could show listening behaviours by (a) keeping time with the music, e.g., swaying, tapping a finger or foot, dancing, etc., (b) vocalizing, e.g., talking about the music, humming, or singing, or (c) making facial expressions, or gesturing to indicate that the music was heard. A child's listening score was the total number of seconds engaged in such behaviour while playing with the record player.

Make-believe behaviours. Two types of make-believe play were distinguished.

1. Animated gestures. Behaviours were coded as animated gestures if a child endowed a toy with real or actual qualities by making movements with the toy, e.g., flying the plane through the air, moving the vehicles along the floor, hopping the animals along, making motions with the puppets' heads, arms, and mouths, or mouthing themselves while moving the puppets' mouths. A child could also show make-believe play by pretending an imaginary

object or person was present through bodily movements, e.g., wriggling a finger along the floor like a snake, making finger movements up the ladder of the fire engine. Although animated gestures were applicable to all toy categories, they were observed primarily with sound associated toys. A child received two scores for animated gestures based on the total number of seconds of such play across all toy categories and for the sound associated category only.

2. Pretend vocalizations. Responses were coded as pretend vocalizations which included pretend speech, e.g., calling a stick a 'car', making the puppets talk, etc., or pretend non-speech sounds, e.g., making animal or vehicle sounds, such as a siren-like noise when playing with the fire engine. Though such vocalizations were codable for all toy categories, they were recorded primarily with sound associated toys. Each distinct occurrence of speech with a make-believe reference was coded as a vocalization. For example, if a child said, "Here's a house and here's a car" while pointing to structures made with the sticks, two speech pretend vocalizations were coded. Non-speech sounds that were not discrete were coded as one vocalization, e.g., roaring noise made with the lion. A child's pretend vocalization scores were based on the frequency of occurrence of (a) both types of pretend vocalizations considered together across all toys and for each toy category, and (b) each type of pretend vocalization across all toys.

Cognitive-perceptual behaviours. Four types of cognitive-perceptual behaviours were considered.

1. Classification. The principal toy for eliciting classification was the set of geometric shapes. Free-form and structured classification with the aid of the partitioned form box were coded separately.

i) Free-form classification was coded if a child, without the aid of a box, matched or sorted geometric shapes into groups by colour, size, shape, or thickness. A child was scored for classifying a minimum of 20% of any of the four dimensions. (a) Colour. A score of 1 was given for grouping three shapes together of the same colour, and a score of .5 for each additional colour added to the appropriate group. A child could receive a possible total score of 23.5 by matching shapes on colour alone, i.e., scores of 7.5, 8 and 8 for separately grouping the yellow, blue and red shapes respectively. (b) Size. If a child matched five shapes in terms of either all large or all small, a score of 1 was given. Each additional size added to the appropriate group was given a score of .5. A child could receive a possible score of 22 for matching on size, i.e., 11 points for grouping all the large or all the small shapes. (c) Shape. A child received a score of 1 for two pieces grouped on the basis of shape, and a score of .5 for each additional shape added to the appropriate group. In this way, a possible score of 25 was given for classifying on the dimension of shape alone, i.e., 5 points

for separately grouping each of the five shapes in totality. (d) Thickness. If a child matched either six thick or four thin shapes, a score of 1 was given. Each additional piece added to the appropriate group was allotted a score of .5. A possible score of 13 was given for grouping all thick pieces and a score of 9 for grouping all thin pieces.

A child's free-form classification score was based on the finished play product, and not on the selection process. Shapes that were matched on two dimensions were scored by the dimension yielding the highest score, e.g., five large red shapes were scored in terms of colour rather than size. If a child classified the geometric shapes, then destroyed the grouping and classified again, perhaps using a different dimension, only the highest level achieved, i.e., the highest score, was entered as the free-form classification score. When the experimenter assisted a child in classifying, no score was given for the specific behaviour assisted.

ii) Each play product scored on free-form classification was also scored for the number of dimensions used simultaneously in matching. For example, if red shapes were grouped regardless of size or shape, a score of 1 was given; if red circles were grouped together regardless of size, a child received a score of 2; and if large red circles were grouped, a score of 3 was given. Although all play products were scored, only the highest number of

dimensions used simultaneously was entered as the child's representative score.

iii) Classification was considered structured when a child placed the geometric shapes into their correct positions in the form-box by matching for both shape and size, or shape alone. A child received a score of 1 for each piece correctly placed by shape as well as size, and a score of .5 for each piece correctly placed by shape, but incorrectly by size. If a child was assisted by the experimenter in matching a piece with the appropriate one in the form box, the piece was not scored. In addition, a lower score of .5 was given for each piece placed in the same pile as the prompted piece. Since the children spent varying lengths of time classifying with the form box, they were scored for the mean number of seconds required to (a) classify one piece correctly by size and shape, or (b) to classify two pieces by shape only. In this way, the structured classification scores of the normal hearing and hearing impaired groups were made comparable by accounting for differences in play times with the form box.

iv) Several other toys also elicited classification behaviours, i.e., matching or sorting objects into groups with a common descriptive property such as colour, size, shape, thickness, or sound vs. non-sound. Scoring was completed as follows.

The boxes could be scored on three dimensions. (a) Colour. A child received a score of 1 for each colour

grouped in totality, and a possible total score of 2 if all three blue and three yellow boxes were grouped separately. (b) Size. A score of .5 was given for each similar-sized pair of boxes grouped, and a possible total score of 1.5 if all six boxes were matched by size in three groupings. (c) Sound vs. non-sound. If a child scored the boxes in totality on the basis of either sound or non-sound, a score of 1 was given. A score of 2 was given if all boxes were grouped by their sound vs. non-sound properties.

The nesting blocks were scored on the dimension of colour. If a child grouped a pair of blocks of the same colour, a score of .5 was given, and if all colour pairs were grouped separately, i.e., orange, yellow, blue, and white blocks, 2 points were allotted.

The seriating sticks were scored on the dimension of colour. A child received a score of 1 for grouping either three red or three yellow sticks, and a score of .5 for each additional stick added to the appropriate group. A possible score of 4 was given if all five red and five yellow sticks were grouped separately.

Classification scores for the boxes, nesting blocks, and seriating sticks were based on the finished play products. Any specific matching behaviours that were assisted were not scored. When more than one instance of classification was observed, i.e., a child matched objects, detroyed the grouping and then matched again, only the

highest level or score achieved was entered as the classification score for a toy. Based on a child's scores obtained from classifying with the boxes, nesting blocks, seriating sticks, as well as the geometric shapes, a total classification score was derived by summing the scores across all of these toys.

In sum, a child received four possible classification scores. The geometric shapes yielded three scores including (a) a free-form classification score, (b) a classification dimension score, and (c) a structured classification score (shapes and form box). A total classification score was also given based on the sum of individual scores across applicable toys, i.e., geometric shape, boxes, nesting blocks and seriating sticks.

2. Seriation. Behaviours were coded as seriation if a child ordered toys through positioning adjacent sizes. Only finished play products were scored for seriation, with the highest score obtained used as the seriation score. Specific seriating behaviours that were assisted were not scored. Seriation was elicited primarily by the nesting blocks and seriating sticks.

With the nesting blocks, a child received a score of 1 for every two blocks seriated, and a score of 1 for each additional block seriated as a group. Blocks could be seriated one inside the other, one on top of the other, or one beside another in a line. A total possible score of 8 was given if all blocks were seriated in one grouping,

while separate sets were allotted a lower total score.

The seriating sticks were scored by giving a score of 1 for every two sticks seriated of adjacent sizes, and a score of 1 for each additional stick seriated in one grouping. If a child seriated all of the sticks, i.e., alternating red and yellow sticks, he or she received a score of 8. On the other hand, if the sticks were seriated in separate colour groups, a score of 1 was given for every three red or three yellow sticks seriated, and a score of 1 for each additional stick of appropriate colour and length added. In this way, a child received a possible score of 3 for seriating either the red or yellow sticks separately, and a score of 6 if both colours were seriated as separate groups.

Other toys could also elicit seriation behaviours, which were scored as follows.

With the boxes, a child received a score of 1 for any three boxes ordered by increasing or decreasing size, and a score of 2 for either two sets of seriated boxes, or one set of six boxes double seriated, i.e., lined up in size pairs in order of size. A score of 1.5 was given for double seriation when at least five out of six boxes were seriated correctly.

In regard to the animals, for every three seriated a score of 1 was given, and for every additional animal ordered, one point was added to a child's score. A child could receive a possible score of 4 if all six different-

sized animals were seriated.

In sum, a child could receive separate seriation scores with the nesting blocks and with the seriating sticks, as well as a total seriation score based on the sum of individual scores across all applicable toys, i.e., nesting blocks, seriating sticks, boxes, and animals.

3. Spatial placement. Behaviours were coded as spatial placement if a child placed a piece into the correct position in a puzzle. A score of 1 was given for every piece correctly positioned. If the experimenter assisted a child in the correct placement of a piece, the piece was not scored. A child's spatial placement score was the sum of the scores obtained on the individual puzzles, i.e., the total number of pieces correctly placed across all puzzles. When the varying lengths of time required by the children to complete the puzzles was considered, an additional spatial placement score, namely, the mean time required to correctly position one piece, was entered.

4. Constructive-building. Behaviours were coded as constructive-building if a child made or built a structure or form with play objects. This type of play was scored for the boxes, nesting blocks, seriating sticks, and geometric shapes, and was applicable to those behaviours not codable as seriation or classification. If there was more than one instance of constructive-building behaviour during a session, the highest level achieved was taken as a

child's score. A child received a score of 1 for building a simple linear structure, i.e., making a horizontal or vertical line with toys such as building a tower out of the nesting blocks. A score of 2 was given for tridimensional and more extensive structures, i.e., making an enclosed structure with height such as a building with the seriating sticks, making a design other than a straight line with toys, constructing a recognizable form out of the toys such as making the form of a person with the geometric shapes, or a circle with the nesting blocks. If the only instance of a child's constructive-building behaviours were observed during classification or seriation, a score was given for the highest level of such behaviour shown. The score entered as the constructive-building behaviour was the sum of individual scores obtained across all applicable toys, i.e., boxes, nesting blocks, seriating sticks, and geometric shapes.

5. Diversity of cognitive-perceptual behaviours. A child received a score based on the total number of different cognitive-perceptual behaviours, i.e., classification, seriation, and constructive building, shown while playing with three toys. The specific toys scored for diversity of behaviours included the boxes, geometric shapes, and either the nesting blocks or the seriating sticks, whichever of the latter toys elicited the most diverse behaviours.

In addition to these major types of play, other

behaviours of interest were coded and scored.

Communicative behaviours. Two types of communicative behaviours were coded including gestures and vocalizations.

Behaviours were coded as communicative gestures when a child displayed intentional bodily movement as a means of expression such as pointing. This behavioural category included all gestures except animated gestures, and was coded across all toy categories. A child received a score for the total number of communicative gestures shown across all toy categories.

Responses were coded as either speech or non-speech vocalization across all toy categories. Speech vocalizations were coded as stimulus related, stimulus unrelated, or nonclassifiable. Non-speech vocalizations were coded as random sounds (other than pretend sounds), nonintelligible vocalizations, distressful sounds, humming, singing or laughing. Vocalizations were coded separately when they were heard as discrete, i.e., a word, sound, phrase, or sentence was coded as one vocalization. A child's vocalization scores included the frequency of occurrence of (a) all types of speech and all types of nonspeech across all toys and for each toy category, and (b) humming and singing, laughing, related speech and unrelated speech, considered separately across all toy categories.

Non-play. Behaviours were defined as non-play when a child lost physical touch with a toy and displayed behaviours that were unrelated to the toy, e.g. walking or

looking about the room, going over to his or her mother. Nonplay behaviours were applicable to all toys and were coded only if a child engaged in such activity for periods of at least 5 seconds. A child's nonplay score was the total number of seconds of such behaviour across all toy categories, and across each toy category.

Interaction with mother. This class of behaviours was coded when a child interacted with his or her mother by eye contact, vocalizations, gestures, or by actual physical contact, either during play or nonplay. Such behaviour was coded across all toys. A child's score was the total number of such interactions occurring across all toy categories.

In addition to investigating behaviours with the experimental toy categories, behaviours elicited by the rapport toys were recorded. The duration of a child's play with the telephones was noted in seconds in relation to total play with both phones, and play with each of the phones. As well, the total number of (a) communicative gestures, (b) speech, nonspeech and pretend vocalizations, and (c) interactions with mother was recorded, as well as (d) the total duration of nonplay.

Reliability

Reliability measures obtained between the experimenter and a trained observer are shown in Table 6. Data collection was initiated after a correlation of .90 was obtained (Fox, 1969). Interobserver reliabilities were also

Table 6

Correlations for Interobserver Reliability Obtained Prior to, at Midpoint, and at end of Data Coding

Behaviour Category	Measure[a]	Prior		Midpoint		End	
		HI	NH	HI	NH	HI	NH
Play behaviour	Total duration (secs.)/toy	.99	.99	.99	.99	.99	.99
Manipulation (all types)	Total frequency of occurrence	.92	.95	.97	.90	.94	.96
Vocalizations (all types)	Total frequency of occurrence	.97	.99	.98	.99	.98	.99
Gestures (all types)	Total frequency of occurrence	.96	.93	.93	.87	.96	.93
Interaction with mother	Total frequency of occurrence	.91	1.00	1.00	.93	.93	.98
Nonplay	Total frequency of occurrence	.93	.92	1.00	1.00	1.00	1.00

Note: The appropriate behavioural measures were taken for each toy and correlations between coders were calculated for the duration or frequency of behaviours shown across all toys.

determined at the midpoint and upon completion of data coding. Reliabilities obtained ranged from r = .87 to 1.00.

Data Analysis

Data obtained on the duration and types of play responses of normal hearing and hearing impaired children was analyzed using a correlated t-test. Other behavioural responses of interest were also analyzed in the same manner. The Pearson product-moment correlation coefficient was used to correlate subject characteristics and behavioural measures. The accepted level of probability was $p < .05$. Tendencies, though nonsignificant, were reported at the $p < .10$ level.

CHAPTER 3

The results of the play sessions are presented in two parts: (a) between group comparisons of behavioural measures, and (b) correlations between subject characteristics and behavioural measures.

Between Group Comparisons

Results of the major analyses provide comparisons of normal hearing and hearing impaired children in terms of their durations and types of play with sound producing (SP), sound associated (SA), and nonsound (NS) toy categories.

Durations of play. Across all toy categories the total durations of play of the two groups of children are not different (Table 7). However, within toy categories, children with normal hearing play longer with the nonsound toys than children with impaired hearing, $t(15) = 2.29$, $p < .05$. With sound producing and sound associated toys, both groups play for similar durations.

Types of play. Comparisons of the types of play behaviours between normal hearing and hearing impaired children are presented separately (Table 8).

1. Manipulative behaviours. The groups are compared in relation to three kinds of manipulation. Normal hearing

Table 7

Between Group Comparisons of Play Durations (Secs.) for Normal Hearing (NH) and Hearing Impaired (HI) Children

Play durations (secs.)	NH		HI		
	Mean	SD	Mean	SD	*t*-ratio
Across all toys	1914.9	376.55	1823.2	394.67	.87
SP toys	576.4	197.63	598.4	176.87	.39
SA toys	553.4	152.05	507.1	172.90	.96
NS toys	784.9	68.39	717.6	102.17	2.29*

*$p < .05$

Table 8

Between Group Comparisons of Types of Play Behaviours

for Normal Hearing (NH) and Hearing Impaired (HI) Children

Behavioural measure	NH		HI		
	Mean	SD	Mean	SD	t-ratio
Manipulative behaviours					
(total secs.)					
1. Sound manipulation (xylophone &piano & boxes)	191.4	77.96	150.6	89.50	1.70
2. Other manipulation (across SP toys)	182.8	90.38	262.7	83.07	2.50*
3. Listening behaviours (record player)	102.6	56.25	91.1	49.74	.69
Make-believe behaviours					
1. Animated gestures: (total secs.)					
Across all toys	303.8	137.28	239.6	138.14	1.26
Across SA toys	289.2	135.14	217.3	141.82	1.42

*$p < .05$

Table 8 (continued)

Behavioural measure	NH Mean	NH SD	HI Mean	HI SD	t-ratio
2. Pretend vocalizations (total occurrence)					
Across all toys	51.6	52.78	21.9	29.99	1.79
Across SA toys	42.2	42.97	20.4	28.74	1.55
Cognitive-perceptual behaviours					
(scores)					
1. Classification:					
Free-form highest score	5.4	5.38	8.8	7.79	1.71
Free-form dimension score	3.9	.62	3.9	.72	.00
Structured score (n=12)[a]	6.3	1.48	8.6	5.63	1.49
Total score across toys	7.4	5.95	11.6	8.39	1.93
2. Seriation:					
Highest score / blocks	7.3	1.45	7.3	1.54	.00
Highest score / sticks (n=12)[b]	1.3	1.82	2.8	2.14	1.99
Total score across toys	9.2	2.90	10.3	3.42	1.13
3. Spatial placement:					
Total score / all puzzles	33.4	7.19	28.3	9.86	1.98
Mean secs. / piece	7.1	1.54	9.4	4.74	1.87

Table 8 (continued)

Behavioural measure	NH		HI		
	Mean	SD	Mean	SD	t-ratio
4. Constructive-building (total score across toys)	4.2	1.17	4.3	1.13	.17
5. Diversity of behaviours (frequency / 3 toys)	6.4	1.15	6.8	1.39	.95

[a]Only 12 pairs of children are compared for structured classification since one of the normal hearing and three of the hearing impaired group were not given the form box when playing with the geometric shapes.

[b]Seriation scores with the sticks are compared for only 12 pairs of children since four of the normal hearing children and two matched hearing impaired children did not receive the seriating sticks.

and hearing impaired children manipulate for sound with musical instruments and boxes, and listen to the record player for similar durations. However, hearing impaired children engage in other manipulative behaviours with all sound producing toys for longer durations than normal hearing children, $t(15) = 2.50$, $p < .05$.

2. Make-believe behaviours. Make-believe behaviours include animated gestures and pretend vocalizations. The durations of animated gestures and the frequencies of pretend vocalizations during play across toy categories and across sound associated toys are similar for normal hearing and hearing impaired children.

3. Cognitive-perceptual behaviours. Classification, seriation, spatial placement, and constructive building scores are considered separately. Classification, when scored across toys, tends to be higher among hearing impaired children, $t(15) = 1.93$, $p < .10$, although the groups do not differ when free-form and structured classification scores with geometric shapes are compared. On seriation, total scores and scores for nesting blocks do not differ for the groups, but hearing impaired children tend to score higher with seriating sticks, $t(11) = 1.99$, $p < .10$. On the other hand, normal hearing children tend to score higher on total spatial placement, $t(15) = 1.98$, $p < .10$, and also tend to require less time to correctly

place a piece in a puzzle, $t(15) = 1.87$, $p < .10$. Constructive building scores of normal hearing and hearing impaired children are similar.

In addition to the major types of play, other behavioural responses (communicative behaviours, non-play, and interaction with mother) of interest are presented in Table 9.

Communicative behaviours. Gestures, as one form of communication, are used more frequently across all toys by hearing impaired children than normal hearing children, $t(15) = 2.81$, $p < .05$. Vocalizations, as another form of communication, include speech and non-speech. Across all toys, the normal hearing use speech vocalizations more frequently than the hearing impaired, $t(15) = 3.97$, $p < .01$. These speech vocalizations of normal hearing children are more frequently stimulus-related, $t(15) = 3.99$, $p < .01$, and tend to include more stimulus unrelated vocalizations as compared to hearing impaired children, $t(15) = 1.87$, $p < .10$. Even within toy categories, more speech is used by the normal hearing with sound producing toys, $t(15) = 2.66$, $p < .01$, sound associated toys, $t(15) = 4.92$, $p < .001$, and nonsound toys, $t(15) = 4.00$, $p < .01$. Non-speech vocalizations, on the other hand, are used more frequently by hearing impaired children across all toys, $t(15) = 2.17$, $p < .05$, as well as with sound associated, $t(15) = 2.38$, $p < .05$, and nonsound toys, $t(15) = 2.14$, $p < .05$. In comparison

Table 9

Between Group Comparisons of Other Behavioural Measures

for Normal Hearing (NH) and Hearing Impaired (HI) Children

Behavioural measures	NH		HI		t-ratio
	Mean	SD	Mean	SD	
Communicative behaviours					
1. Gestures (total frequency / all toys)	28.5	19.77	57.8	34.75	2.81*
2. Vocalizations: (total frequency / all toys)					
All speech	131.2	94.28	28.1	40.88	3.97**
i) Stimulus related	123.8	88.05	26.8	39.74	3.99**
ii) Stimulus-unrelated	7.1	11.87	1.3	2.41	1.87
All nonspeech	26.2	27.70	70.8	74.03	2.17*
i) Humming and singing	2.3	3.64	.4	.89	1.80
ii) Nonintelligible vocalizations	4.5	7.10	26.2	33.22	2.39*
iii) Laughing	6.0	11.25	4.1	6.64	.66
iv) Random sounds	14.0	17.96	37.1	67.62	1.27

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

Table 9 (continued)

Behavioural measures	NH		HI		
	Mean	SD	Mean	SD	t-ratio
Speech:					
Across SP toys	34.4	32.33	10.2	11.51	2.66**
Across SA toys	36.1	24.04	6.4	10.05	4.92***
Across NS toys	60.7	44.17	11.4	22.09	4.00**
Nonspeech:					
Across SP toys	7.6	9.76	20.3	23.94	1.92
Across SA toys	7.6	8.19	22.5	23.00	2.38*
Across NS toys	11.0	11.93	28.0	29.50	2.14*
Nonplay					
(total secs.)					
Across all toys	21.9	11.38	41.6	25.59	2.79*
Across SP toys	6.2	5.31	13.7	16.33	2.39*
Across SA toys	9.8	9.85	13.6	11.79	1.08
Across NS toys	3.6	5.69	10.3	9.96	2.51*
Interaction with mother					
(Total frequency / all toys)	6.	6.53	11.8	8.88	1.96

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

to the normal hearing, the hearing impaired also tend to use more nonspeech with sound producing toys, $t(15) = 1.92$, $p < .10$. Specific types of nonspeech, namely humming and singing, tend to be used more often by normal hearing children across all toys, $t(15) = 1.80$, $p < .10$, while nonintelligible vocalizations are used more frequently by the hearing impaired, $t(15) = 2.39$, $p < .05$. The frequencies of other types of nonspeech, i.e., laughing and random sounds, are similar for both groups of children. Frequencies of distressful nonspeech vocalizations are not compared for the groups since occurrences were only recorded for one child.

Nonplay. Across all toys the total duration of nonplay is longer for hearing impaired children, $t(15) = 2.79$, $p < .05$. In relation to toy categories, the hearing impaired show more nonplay than the normal hearing with sound producing toys, $t(15) = 2.39$, $p < .05$, and nonsound toys, $t(15) = 2.51$, $p < .05$, while there are no differences in nonplay with sound associated toys.

Interaction with mother. Hearing impaired children tend to interact with their mothers more frequently across all toy categories than normal hearing children, $t(15) = 1.96$, $p < .10$.

In addition to comparing the behaviours of the two groups of children with the experimental toys, behavioural comparisons are also presented for the rapport toys (Table 10). Normal hearing and hearing

impaired children play for similar durations with both phones and with each phone separately. The frequency of pretend vocalizations during make-believe play are similar for both groups of children. Normal hearing children use speech vocalizations more often than the hearing impaired, $t(15) = 3.12$, $p < .01$, whereas the frequencies of nonspeech and communicative gestures are similar. The frequency of interaction with mother and the duration of nonplay are similar for normal hearing and hearing impaired groups.

Relationship of Subject Characteristics to Behavioural Measures

Correlations of normal hearing and hearing impaired children's educational experience, age, and socioeconomic status (SES) with behavioural measures are presented individually (Table 12).

Durations of play. The total length of time the normal hearing and hearing impaired play across all toy categories is not related to their educational experience, age or SES. Within toy categories, the more educational experience hearing impaired children have, the longer they play with nonsound toys, $r(14) = .55$, $p < .05$, and the longer they tend to play with sound producing toys, $r(14) = .43$, $p < .10$.

Types of play. Correlations of manipulative, make-believe, and cognitive-perceptual behaviours with education, age, and SES are presented.

1. Manipulative behaviours. The more educational

Table 10

Between Group Comparisons of Behavioural Measures with Rapport Toys for Normal Hearing (NH) and Hearing Impaired (HI) Children

Behavioural measure	NH		HI		t-ratio
	Mean	SD	Mean	SD	
Durations of play (total secs.)					
Across both phones	202.1	95.95	203.4	89.02	.04
"Sound" phone	104.2	68.63	105.4	56.88	.05
"Light" phone	108.1	84.10	122.0	74.61	.50
Communicative behaviours (total frequency / both phones)					
1. Gestures	3.1	3.96	3.3	3.36	.15
2. Vocalizations:					
Nonspeech	5.3	5.90	5.4	6.56	.08
Speech	10.3	11.50	1.0	1.41	3.12**
Pretend	1.0	2.76	1.3	2.63	.30
Interactions with mother (total frequency / all toys)	1.5	1.37	2.4	2.06	1.55
Nonplay (total secs. / all toys)	11.4	10.97	16.7	12.88	1.37

**$p < .01$

experience normal hearing children have, the longer they engage in listening behaviours with the record player, $r(14) = .50$, $p < .05$, and the less time they spend manipulating other than for sound production with musical instruments and boxes, $r(14) = -.60$, $p < .01$. Also, the older the normal hearing children are, the longer they tend to engage in listening behaviours with the record player, $r(14) = .43$, $p < .10$. For hearing impaired children, the lower their SES, the more time they spend in other manipulations with sound producing toys, $r(14) = .51$, $p < .05$.

2. Make-believe behaviours. For hearing impaired children, the older they are the more frequently they tend to use animated gestures when playing with all toys, $r(14) = .46$, $p < .10$, and with sound associated toys only, $r(14) = .47$, $p < .10$. The hearing impaired also use pretend vocalizations more frequently across all toys with increasing age, $r(14) = .59$, $p < .01$. For the normal hearing children, the more educational experience they have, the less they use pretend vocalizations across all toys, $r(14) = .53$, $p < .05$.

3. Cognitive-perceptual behaviours. The relationship of age, education, and SES with classification, seriation, spatial placement, and constructive-building scores are presented separately. The older the normal hearing children, the less time they require to score one point on the structured classification task, $t(13) = -.69$, $p < .01$. In addition, higher SES of the normal hearing is related to

Table 11

Correlations Between Characteristics of Normal Hearing (NH) and Hearing Impaired (HI) Children and Behavioural Measures

Behavioural measure	Characteristics of NH and HI Children					
	Educational experience (mos.)		Age (mos.)		Socioeconomic status	
	NH	HI	NH	HI	NH	HI
Durations of play: (total secs.)						
Across all toys	.04	.36	.22	.19	-.04	.32
SP toys	.05	.43	.22	.08	-.05	.12
SA toys	.01	.06	.30	.30	.08	.42
NS toys	.07	.55*	.07	.33	-.12	.11
Types of play:						
Manipulative behaviours (total secs.)						
1. Sound manipulation (xylophone & piano & boxes)	.10	-.27	.35	.39	-.19	-.12
2. Other manipulation (across all SP toys)	-.60**	-.26	-.40	-.34	-.28	.51*

*$p < .05$
**$p < .02$

Table 11 (continued)

Behavioural measure	Characteristics of NH and HI Children					
	Educational experience (mos.)		Age (mos.)		Socioeconomic status	
	NH	HI	NH	HI	NH	HI
3. Listening behaviours (record player)	.50*	-.14	.43	.15	.07	-.09
Make-believe behaviours (total secs.)						
1. Animated gestures (total secs.)						
Across all toys	-.06	-.09	.12	.46	-.05	.36
SA toys	-.02	-.03	.19	.47	-.03	.38
2. Pretend vocalizations (total frequency)						
Across all toys	-.53*	.07	.07	.59**	.11	.36
SA toys	.06	.06	.12	.34	.04	.40

*$p < .05$
**$p < .02$

Table 11 (continued)

Behavioural measure	Characteristics of NH and HI Children					
	Educational experience (mos.)		Age (mos.)		Socioeconomic status	
	NH	HI	NH	HI	NH	HI
Cognitive-perceptual behaviours						
1. Classification						
Free-form highest score	.13	-.02	.05	.39	-.53*	-.12
Free-form dimension score	-.38	-.07	-.37	.18	.08	.20
Structured score (NH:n=15/HI:n=13)	-.40	.08	-.69***	-.32	-.40	-.05
Total score / across toys	.11	.03	.09	.43	-.52*	.11
2. Seriation						
Nesting blocks score	.05	-.10	.38	.08	.19	-.35
Seriating sticks score (NH:n=12/HI:n=14)	.63*	.13	.13	.26	.32	.02
Total score / across toys	.20	.05	.25	.25	.42	-.19

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

Table 11 (continued)

Behavioural measure	Characteristics of NH and HI Children					
	Educational experience (mos.)		Age (mos.)		Socioeconomic status	
	NH	HI	NH	HI	NH	HI
3. Spatial placement behaviours						
Total score / all puzzles	.37	.21	.48	.72***	.33	-.06
Mean secs./piece	-.24	-.26	-.37	-.70***	-.32	.17
4. Constructive-building (total score across toys)	.17	.01	.09	.40	-.31	-.02
5. Diversity of behaviours (frequency / 3 toys)	.02	.01	.38	.31	.13	.34
Other behaviours:						
Communicative Behaviours (total frequency)						
1. Gestures (across all toys)	-.56*	.20	-.11	-.41	.01	.52*
2. Vocalizations:						
Nonspeech (all toys)	-.31	.13	.17	.01	.001	.77***
Speech / all toys	-.39	.29	.08	.33	-.01	-.24

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

Table 11 (continued)

Behavioural measure	Characteristics of NH and HI Children					
	Educational experience (mos.)		Age (mos.)		Socioeconomic status	
	NH	HI	NH	HI	NH	HI
Interaction with mother (total frequency / all toys)	-.50*	.18	-.27	.27	-.18	-.07
Nonplay (total secs. /all toys)	.02	-.15	-.11	.05	.03	-.26

*$p < .05$

higher total classification scores across toys, $r(14) = -.52$, $p < .05$, and also to higher free-form classification scores with the geometric shapes, $r(14) = -.53$, $p < .05$. For the hearing impaired, higher total classification scores tend to be associated with increasing age, $r(14) = .43$, $p < .10$. Higher seriation scores with the seriating sticks are related to more educational experience for normal hearing children, $r(10) = .63$, $p < .05$. Correlations obtained in relation to spatial placement scores indicate that the older the hearing impaired children are, the more pieces they correctly place across all puzzles, $r(14) = .72$, $p < .001$, the less time they tend to require to correctly place one piece in a puzzle, $r(14) = .70$, $p < .001$. Normal hearing children also tend to score higher on total spatial placement with increasing age, $r(14) = .48$, $p < .10$. Constructive-building scores of both groups are not related to educational experience, age, or SES. In addition, the number of different cognitive-perceptual behaviours shown with specific toys are not associated with children's education, age, or SES.

The correlations of other behaviours of interest with education, age and SES are presented.

Communicative behaviours. Normal hearing children gesture less frequently with all toys when they have more pre-school experience, $r(14) = -.56$, $p < .05$. For the hearing impaired children, the lower their SES, the more gestures they use in communicating, $r(14) = .52$, $p < .05$. In relation to vocalizations, the lower the SES of hearing

impaired children, the higher the frequency of nonspeech across all toys, $r(14) = .77$, $p < .001$.

Interaction with mother. The more educational experience the normal hearing children have, the less they interact with their mothers, $r(14) = -.50$, $p < .05$.

Nonplay. Education, age, and SES are not related to the duration of nonplay across all toys for either normal hearing or hearing impaired children.

For the hearing impaired children, correlations of the degree of hearing loss and the months of amplification, i.e., length of time they have worn hearing aids, with behavioural measures are presented separately (Table 13).

Durations of play. When maximum losses are considered, the greater the hearing losses of the children, the less they play with sound producing toys, $r(14) = -.53$, $p < .05$, and the less they tend to play across all toys, $r(14) = -.44$ $< .10$. Even for minimum losses, shorter play durations with sound producing toys tend to be related to greater hearing losses, $r(14) = .44$, $p < .10$. On the other hand, amplification experience is not related to play durations.

Types of play. The relationships of manipulative, make-believe, and cognitive-perceptual behaviours with children's degree of hearing loss and months of amplification are presented individually.

1. Manipulative behaviours. Correlations between the degree of hearing loss and duration of manipulative behaviours indicate that the greater the hearing loss,

Table 12

Correlations Between Characteristics of Hearing Impaired (HI) Children and Behavioural Measures

	Characteristics of HI Children		
	Hearing loss (db)		
	Maximum loss	Minimum loss	Mos. of amplification
Durations of play: (total secs.)			
Across all toys	-.44	-.34	-.28
SP toys	-.53*	-.44	-.24
SA toys	-.23	-.11	-.03
NS toys	-.41	-.37	-.42
Types of play:			
Manipulative behaviours (total secs.)			
1. Sound manipulation (xylophone piano boxes)	-.30	-.76***	-.29
2. Other manipulation (across all toys)	-.11	.27	.35
3. Listening behaviours (record player)	-.63***	-.50*	-.39

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

Table 12 (continued)

	Characteristics of HI Children		
	Hearing loss (db)		
	Maximum loss	Minimum loss	Mos. of amplification
Make-believe behaviours			
1. Animated gestures (total frequency)			
Across all toys	-.40	-.29	-.19
SA toys	-.43	-.52*	-.24
2. Pretend vocalizations (total frequency)			
Across all toys	-.28	-.09	-.27
SA toys	-.28	-.07	-.23
Cognitive-perceptual behaviours			
1. Classification			
Free-form highest score	-.44	-.29	-.16
Free-form dimension score	.08	-.17	-.16
Structured score (n=13)	-.35	.51	-.42
Total score / across toys	-.52*	-.33	-.21
2. Seriation			
Nesting blocks score	-.07	-.15	-.13
Seriating sticks score (n=14)	-.46	-.32	-.41
Total score / across toys	-.43	-.36	-.33

*$p < .05$

Table 12 (continued)

	Characteristics of HI Children		
	Hearing loss (db)		
	Maximum loss	Minimum loss	Mos. of amplification
3. Spatial placement			
Total score / all puzzles	-.60**	-.52*	-.36
Mean secs. / piece	.51*	-.57**	-.34
4. Constructive-building (total score / all toys)	-.65***	-.48	-.37
5. Diversity of behaviours (frequency / 3 toys)	-.42	-.25	-.28
Other behaviours:			
Communicative behaviours (total frequency)			
1. Gestures (across all toys)	-.12	-.22	-.04
2. Vocalizations:			
Nonspeech / all toys	.24	.32	.22
Speech / all toys	-.29	-.32	-.42
Interaction with mother (total frequency across all toys)	.19	.24	.03
Nonplay (total secs. across all toys)	-.05	-.07	-.05

*$p < .05$
**$p < .02$
***$p < .01$

(a) the less time the children engage in sound manipulation when minimum losses are considered, $r(14) = -.76$, $p < .01$, and (b) the less time they engage in listening behaviours in terms of either maximum hearing losses, $r(14) = -.63$, $p < .01$, or minimum losses, $r(14) = -.50$, $p < .05$. On the other hand, amplification experience is not related to durations of other kinds of manipulation.

2. Make-believe behaviours. The greater the hearing loss of the children, the less frequently they use animated gestures while playing with sound associated toys when minimum losses are considered, $r(14) = -.52$, $p < .05$, while the same relationship tends to occur for maximum losses, $r(14) = -.43$, $p < .10$. The frequency of animated gestures or pretend vocalizations is not related to the length of time children have worn hearing aids.

3. Cognitive-perceptual behaviours. Classification, seriation, spatial placement, and constructive-building scores are considered in relation to children's degree of hearing loss and amplification experience. Correlations between the degree of hearing loss and classification scores indicate that the greater the hearing loss the lower the total classification scores across toys for maximum losses, $r(14) = .52$, $p < .05$. In addition, children with greater hearing losses tend to require more time to score one point on the structured classification task, when minimum losses, $r(11) = .51$, $p < .10$ are considered. There is also a tendency for greater hearing losses to be

associated with lower free-form classification scores (i.e. highest scores) for maximum losses, $r(14) = -.44$, $p < .10$. On the other hand, months of amplification and classification scores are not related. Seriation scores also show no relation to months of amplification, but tend to be lower the greater the hearing loss (minimum losses) when scores with the seriating sticks $r(12) = -.46$, $p < .10$, are considered. Total spatial placement scores are lower for children with greater hearing losses, for either maximum losses, $r(14) = .60$, $p < .02$, or minimum losses, $r(14) = -.52$, $p < .05$. In addition, the greater the hearing loss, the more time the children require to place one piece correctly in a puzzle when maximum losses, $r(14) = .60$, $p < .02$, or minimum losses, $r(14) = -.52$, p .05 are considered. Lower constructive-building scores are associated with greater hearing losses in children when maximum losses are considered, $r(14) = -.65$, $p < .01$, with a tendency toward lower scores in relation to minimum losses, $r(14) = .49$, $p < .10$. Months of amplification and constructive-building scores are not related. The diversity of cognitive-perceptual behaviours is related neither to the degree of hearing loss nor to the length of time children have worn hearing aids.

Other behavioural measures of interest including the frequencies of communicative behaviours and interaction with mother, as well as the duration of nonplay show no relationship with children's degree of hearing loss or the

number of months they have had amplification.

CHAPTER 4

DISCUSSION

The concern of this study was in regard to the so-called immature or delayed play development of hearing impaired children. Assuming that auditory information and feedback provide important input for the play behaviours of normal hearing children, it was expected that children who receive reduced amounts or no auditory stimulation would play differently with sound related toys.

Though it was expected that the auditory feedback from sound producing toys and the sound eliciting properties of sound associated toys would maintain longer periods of play with normal hearing children, the hearing impaired children in this study also played for similar lengths of time. However, their degree of hearing loss was related to the length of time they played with the sound producing toys in that the greater their loss the less time these children played. This may have been a consequence of their hearing little or none of the sound they were making with such toys. On the other hand, the hearing impaired played for significantly less time with the nonsound toys, although the more educational experience they had the longer they played. This positive correlation may reflect the observed encouragement these children received in their nursery school for playing with this type of toy material. It

therefore appears that the degree of hearing loss does affect the amount of time hearing impaired children play with various types of toys, but that educational experience is also a relevant variable.

The manner in which children play with toys was also expected to be affected by the auditory variable. Among the types of play which were examined,[6] the hearing impaired showed more manipulation that did not produce sounds, with children from lower socioeconomic backgrounds showing more of this behaviour. Similarly, Kretschmer (1972) reported that the hearing impaired engaged in more play of a manipulative nature than children with normal hearing. More other manipulation was also shown by the normal hearing when they had less educational experience.

Though the hearing impaired as a group listened to the record player and manipulated for sound as much as the normal hearing, correlations with hearing status indicated that the greater their hearing loss the less of these behaviours they showed. On the other hand, the more educational experience normal hearing children had, the more they engaged in listening behaviours.

It therefore appears that degree of hearing loss, and to a lesser extent, socioeconomic status, affect the way in which hearing impaired children manipulate toys, whereas educational experience is the important variable among the

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[6]Types of play were scored in regard to specific toy categories as well as across all toys.

normal hearing.

Animated gestures and pretend vocalizations, as sub-categories of make-believe play, were shown equally by hearing impaired and normal hearing children while playing across all toys, and with sound associated toys chosen to elicit these behaviours. However, the amount of animated gestural behaviour decreased as the degree of hearing loss increased. The frequency of pretend vocalizations increased with age among the hearing impaired and decreased with more educational experience among the normal hearing children.

These relationships suggest that make-believe play of hearing impaired children was affected by their degree of hearing loss and age, whereas educational experience appeared to be a more relevant factor among normal hearing children. In this regard, Darbyshire's finding that the hearing impaired showed less dramatic play than normal hearing children should be reconsidered in relation to the hearing loss of his subjects, which averaged 87.94 decibels in the better ear, equivalent to a profound loss. In contrast, the average hearing loss of children in the present study was 69.1 decibels in the better ear, equivalent to a severe loss, which may have accounted for similarities in make-believe play between the groups in the present study. It would appear then, that children in the present study who have greater hearing losses, seem to be more similar in their amount of make-believe play to the

children in Darbyshire's study.

Similar frequencies of pretend vocalizations, including speech and sound effect utterances observed for the hearing impaired and normal hearing, contrast with Kretschmer's finding (1972) that hearing impaired children used fewer of these types of pretend vocalizations. However, as Kretschmer reported, the hearing impaired children which he sampled were not all directly guided or encouraged in their preschools for dramatic play abilities, in particular for pretend vocalizations, which contrasts with the preschool experience of the hearing impaired children in the current study. In this regard, Smilansky (1968) has shown that imaginative and dramatic play behaviours increase in environments that provide the reinforcement of, and the materials for, imaginative play. It is also possible that lower mean age may have been a variable related to the lower frequency of pretend vocalizations for the hearing impaired in Kretschmer's study, although only their age range, i.e., 3 to 6 years, rather than their mean age was reported. If age was a relevant variable, it would follow that children in the present study who were younger appear similar to the children Kretschmer sampled in their use of pretend vocalizations.

When the auditory variable was not essential to play, as for cognitive-perceptual behaviours, hearing impaired children and the normal hearing respond similarly. Thus, similar levels of classification, seriation, spatial

placement, and constructive-building behaviours may be related to the fact that performance was not directly dependent upon auditory information nor linguistic competence. The hearing impaired also showed the same behavioural flexibility as the normal hearing in playing with the toys in a variety of cognitive-perceptual ways. Such similarities in cognitive behaviours between hearing impaired and normal hearing children are in agreement with research findings of Furth (1964) who reported that when linguistic factors are controlled in cognitive tasks, deaf children perform as well as the normal hearing.

However, it is noteworthy that hearing impaired children in the present study who suffered greater hearing losses scored lower on spatial placement behaviours with puzzles, and on classification summed across toys. Other research has also indicated that hearing impaired children are notably retarded in their skills in handling puzzles (Darbyshire, 1973) and in classification behaviours (Kretschmer, 1972). It is possible that in their ability to do puzzles children in the present study with greater hearing losses were more similar to the hearing impaired in Darbyshire's study who also suffered greater hearing losses. In Kretschmer's research, mean hearing loss was not reported, so that possibly a higher degree of hearing loss among the children may have been a relevant variable associated with their limited classification behaviour. If this were the case, the hearing impaired children with the

greater hearing losses in the present study would appear to more closely resemble those children sampled by Kretschmer in relation to classification behaviour. It was also found that the greater the degree of hearing loss of children in the present research, the lower they scored on constructive-building. While Darbyshire (1973) reported that hearing impaired children were less developed in constructive behaviours, specifically block building, such differences were only evident at later ages, i.e., about 7 years of age, while no differences existed between hearing impaired and normal hearing children of preschool age. Although the children in Darbyshire's study suffered greater hearing losses, it appears that degree of loss did not adversely affect their classification behaviours, whereas a higher degree of hearing loss in the present study seemed to interfere with children's ability to classify.

In addition to their degree of hearing loss, increasing age of the hearing impaired was also related to their ability to do puzzles, whereas for the normal hearing, increasing age and higher socioeconomic status were associated with higher classification scores, with more educational experience related to higher seriation scores. It therefore appears that although cognitive-perceptual behaviours of the groups did not differ, the degree of hearing loss, and to a lesser extent, age, of hearing impaired children were variables affecting these behaviours,

while age, socioeconomic status, and educational experience were the relevant variables for children with normal hearing.

Comparisons of behaviours not specifically related to the toy categories indicated that in their communicative behaviours, the hearing impaired gestured more, used speech less, and used nonintelligible vocalizations more frequently. Humming and singing vocalizations were also less common among hearing impaired children. These findings are noteworthy considering that the preschool which these children attend maintains a purely oral educational approach. Interestingly, as the socioeconomic status of the hearing impaired changed from low to high, gesturing increased and nonspeech decreased, while among the normal hearing, the amount of gesturing decreased with educational experience. It appears then, that for the hearing impaired, socioeconomic status influenced the way in which they communicated, while for the normal hearing, educational experience was a relevant variable. Kretschmer (1972) and Darbyshire (1973) also found that children with hearing impairments used gestures more often and used speech less in communicating as compared to children with normal hearing. The results of the present study would also seem to support Furth's contention that if children with hearing deficits are unable to express themselves sufficiently through verbal language, they will invent their own personal system of gesturing as a means of communication

(Furth, 1973). However, the experimenter's unfamiliarity with the hearing impaired children may have been a discriminating factor in the recording of their vocalizations as nonintelligible, when in fact, such vocalizations may have been interpreted as speech by their teachers or parents. As Harris (1971) notes, the speech of the deaf is often less intelligible due to such factors as lack of inflection and monotonous tone. It is noteworthy that there was no difference between the groups in their use of distressful vocalizations, in contrast to Kretschmer's findings that hearing impaired children displayed more fear reactions including distressful vocalizations in a novel test situation than normal hearing children (Kretschmer, 1972). These different research findings may be related to the fact that in the present study the mothers remained with their children, while in Kretschmer's study, children were observed with no known adult present. Darbyshire (1977) observed that hearing impaired children would not enter an experimental setting without the presence of a known adult.

Comparisons of behaviours not specific to toy categories also show that although both groups of children played for similar durations across all toys, the play of the hearing impaired was interrupted more by periods of nonplay. Such a difference may be related to the minimal interaction encouraged by the experimenter or mothers with the children in the present study, which contrasted with the

individual guidance that the hearing impaired received from adults in their preschool. Normal hearing children, on the other hand, were observed to engage in less directed play in their preschool. Although the hearing impaired children seemed accustomed to more adult interaction during play in their preschool, they interacted with their mothers as often as the normal hearing, which may have reflected their mothers' discouragement of interaction in the present situation. Interestingly, normal hearing children with more educational experience interacted with their mothers less, suggesting that with increased preschool experience play becomes more independent.

This study was exploratory in nature in an attempt to specify some of the parameters related to play expressions in hearing impaired preschool children. Based on the results it may be concluded that the play behaviours of the hearing impaired as a group were generally similar to those of normal hearing children. However, closer examination of the data indicated that as the degree of hearing loss increased, the play behaviours of hearing impaired children were adversely affected. To a lesser extent, age, education, and socioeconomic status were variables which also affected the way in which the hearing impaired children played. It would appear, therefore, that it is those children with the greater hearing losses approaching the profound range who showed differences in play in the direction hypothesized, while children with lesser losses

showed no differences. These findings have important implications for future studies in the area of play and the hearing impaired, in suggesting a need for researchers to systematically examine play behaviours relative to childrens' degree of hearing loss. In addition, results of the present study raise questions as to the type of educational experience best suited to children with varying degrees of hearing loss. It appeared that children with greater hearing losses did not function as adequately as children with lesser losses in relation to their educational experience. Thus, in order to maximize benefits of educational programming for children with more profound auditory deficits, it is necessary to further research the relative effects of different types of educational environments.

A methodological problem encountered in the present study was in relation to the selection of toy categories to elicit specific behaviours. It was expected that toys selected for their sound producing properties would elicit sound manipulation and listening behaviours, that toys with sound associated properties would elicit make-believe behaviours, and that toys with nonsound properties would elicit cognitive-perceptual behaviours. However, it was found that spontaneous play behaviours expected to be characteristic of these types of toy materials were not limited to specific toy categories. For this reason, the original intent of scoring strictly within toy categories

for the types of play was altered to include behaviours as they occurred relative to designated toys as well as across all toys. Toys representative of the different categories which most reliably elicited play behaviours were the musical instruments, the vehicles, and the geometric shapes. It is recommended that such play materials be considered for future research to more effectively examine the role of auditory information and feedback for hearing impaired children with various hearing losses, and to test the possible benefits of types of toy materials for educational programming with the hearing impaired.

CHAPTER 5

SUMMARY

The literature and research on the play behaviours of hearing impaired children indicates that generally their play is "immature" or less developed as compared to normal hearing children. In an attempt to discern whether a lack of auditory information is a relevant factor in "immature" play behaviours of these children, the play stimuli for this study were specifically selected on the basis of their auditory-related properties. The three categories of toys selected included: Toys children use to produce sounds, toys with which children associate sounds or language, and toys that do not produce sounds or are not associated with sounds or language by children.

It was, therefore, hypothesized that hearing impaired and normal hearing children play differently with toys that produce or are associated with sound but similarly with toys not directly related to sound. More specifically, it was expected that normal hearing and hearing impaired children play with sound producing and sound associated toys for different lengths of time, and with nonsound toys for similar durations. In relation to types of play, it was expected that both groups of children manipulate for sound and listen to sound producing toys, for different lengths of time, as well as differ in their make-believe

responses to sound associated toys, while responding with similar cognitive-perceptual behaviours to nonsound toys. In addition, the communicative behaviours including gestures and vocalizations, interaction with mother, and durations of nonplay were examined.

The independent variables of the present study were auditory capacity, i.e., impaired hearing and normal hearing, and categories of auditory-related stimuli, i.e., sound producing, sound associated, and nonsound toys. The dependent variable, namely, the response of a child to a toy, was measured in terms of the durations of play and major types of play, including manipulative, make-believe, and cognitive-perceptual behaviours with each of the toy categories.

Subjects included 16 hearing impaired preschool children and 16 normal hearing children individually matched with the hearing impaired group on age, sex, and social status.

Each child was tested individually in a small playroom with the mother present, during three 15-minute sessions, with a 3- to 5-minute break between sessions. The entire session was vîdeotaped through a one-way mirror. Rapport was established with the child through the presentation of two telephones for a maximum of 5 minutes of play. Individual toys were presented from each of the three toy categories during a session allowing a maximum free play period of 5 minutes each. Although the experimenter

encouraged the child to play if necessary, verbal interaction was kept to a minimum and assistance was given only if a child's frustration was interfering with his play.

The behaviours investigated were recorded from the videotapes in the form of a running record as they occurred in a session. Inter-observer reliabilities in the coding of behaviours were generally high, ranging from r = .87 to 1.00. The durations of total play were calculated for each of the toy categories and across all toys. Types of play scored included manipulative behaviours consisting of sound manipulations, other manipulation, and listening behaviours with sound producing toys and across all toys; make-believe behaviours consisting of animated gestures and pretend vocalizations with sound associated toys and across all toys; cognitive-perceptual behaviours consisting of classification, seriation, spatial placement, and constructive-building with nonsound toys and across all toy categories. Across all toys, communicative behaviours consisting of gestures and vocalizations, nonplay, and interaction with mother were also coded and scored. Comparisons between hearing impaired and normal hearing children in relation to durations and types of play responses, as well as other behaviours of interest were analyzed using a correlated t-test. The Pearson correlation coefficient was used to correlate subject characteristics and behavioural measures.

The results obtained indicate that the play of hearing

impaired children as a group was generally similar to that of normal hearing children although some differences did occur. Contrary to the hypothesis on durations of play, both groups play for similar lengths of time with sound producing and sound associated toys and for different lengths of time with nonsound toys. However, for hearing impaired children, the greater their hearing loss, the less they play with sound producing toys, while the more educational experience they have, the longer they play with nonsound toys. In relation to types of play, the hearing impaired manipulate for sound and engage in listening behaviours for similar durations as normal hearing children, although as hearing losses increase less time is spent in such behaviours. Similar make-believe responses in terms of durations of animated gestures, and frequency of pretend vocalizations are shown for both groups, however, greater hearing losses are associated with fewer animated gestures. As expected, the levels of cognitive-perceptual performance of the groups are similar in relation to classification, seriation, spatial placement, and constructive-building behavioural scores. On the other hand, the greater the hearing losses of the hearing impaired children, the lower their scores on classification, spatial placement and constructive-building. In addition to the major influence of degree of hearing loss, other variables which influence the hearing impaired childrens' play are age, education, and socioeconomic status. Comparisons of behaviours not

specifically related to the toy categories indicated that in their communicative behaviours, the hearing impaired gestured more, used speech less, and nonintelligible vocalizations more frequently. As well, the play of hearing impaired children is interrupted more by periods of nonplay, although both groups play for similar durations across all toys.

Based on the results it may be concluded that the play behaviours of the hearing impaired as a group were generally similar to those of normal hearing children. However, upon closer examination of the data, increasing hearing losses appeared to adversely affect the play behaviours of hearing impaired children, while age, education and socioeconomic status are variables which also affected, to a lesser extent, the play of this group. It would appear, therefore, that it was those children with the greater hearing losses who showed differences in play behaviours in the direction hypothesized when auditory information and feedback are related to such play expressions. This study raises important questions for future research in relation to systematically examining play behaviours in terms of childrens' degree of hearing loss, and to examining different types of educational experience most suitable to children with varying degrees of hearing loss.

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APPENDICES

APPENDIX A

SUBJECT DESCRIPTION

Table A_1

Number of Normal Hearing and Hearing Impaired Children According to Age at Time of Testing

Age (mos.)	Hearing status	
	NH	HI
38 - 41	3	3
42 - 45	3	1
46 - 49	3	5
50 - 53	2	3
54 - 57	3	1
58 - 61	2	3

TABLE A_2

Measurement of Socioeconomic Status

The socioeconomic background of the children in the present study was assessed by the following classification compiled by Darbyshire.[1] This scale was based upon Blishen's (1967) "socioeconomic index" for Canadian occupations using the 1961 census data. Blishen attributed various occupations with numerical values based on income and education.

Each child was assigned a socioeconomic number value according to the father's occupation (listed in Table A3). In some cases, if there was no father (or no father substitute), the mother's occupation was applicable. Within pairs, normal hearing and hearing impaired children were matched as closely as possible on socioeconomic status in terms of their assigned socioeconomic number value (i.e., either code #1, 2, 3 or 4).

---

[1]Darbyshire, J., Personal communication, September 5, 1978.

Table A_3

Description and Examples of Socioeconomic Codes Used to Measure Socioeconomic Status[a]

Code	Description	Examples
1	PROFESSIONAL Positions now normally requiring university degrees or equivalent.	Lawyers, physicians, university faculty, public servants in administration, executives of large commercial enterprises, etc.
2	MANAGERIAL & CLERICAL White-collar positions now usually requiring high school education and some formal training.	Lesser qualified teachers, managers in business, secretaries, foremen in large concerns, sales people, owners, managers of small businesses, police constables, bank tellers, etc.
3	SKILLED Usually now requiring some form of recognized formal training.	Technicians, plumbers, foremen in small concerns, firemen, receptionists (if not secretaries), operators of complex industrial equipment, telephonists, etc.
4	SEMI-SKILLED Requires some basic training - usually on the job.	Mail carriers and sorters, bus drivers, railway workers, plasterers, stonemasons, shop assistants, etc.

Table A_3 (continued)

Code	Description	Examples
5	UNSKILLED No training required.	Farming, industrial labourers, trappers, hunters, fishermen, etc.

[a]By permission of the author.

Note. Personnel in the armed forces were assigned as follows: Commissioned ranks #1, non-commissioned ranks #2, other ranks #4.

Table A_4

Number of Normal Hearing and Hearing Impaired Children According to Socioeconomic Status[a]

Socioeconomic status code	Hearing status	
	NH	HI
1	1	1
2	11	9
3	3	2
4	1	4

[a]Information on parental occupation was obtained from the preschool which the children attended.

Table A_5

Number of Normal Hearing and Hearing Impaired Children According to Preschool Educational Experience (mos.)

Educational experience (mos.)	Hearing status	
	NH	HI
1 - 5	8	5
6 - 10	2	2
11 - 15	6	4
16 - 20	0	3
21 - 25	0	2

Table A_6

Number of Normal Hearing and Hearing Impaired Children According to Family Size[a] and Birth Order

Family size/ birth order	Hearing status			
	Family size		Birth order	
	NH	HI	NH	HI
1	4	5	12	9
2	9	7	3	5
3	1	4	1	2
4	2	0	0	0

[a]Where family size refers to the number of children in a family.

Table A_7

Number of Hearing Impaired Children
According to Months of Amplification

Months of amplification	Number of children
1 - 6	2
7 - 12	5
13 - 18	0
19 - 24	4
25 - 30	4
31 - 36	1

Table A_8

Number of Hearing Impaired Children According to Level of Communication Abilities as Rated by Mothers

Communication Skill	Rating			
	Excellent	Rather Good	Not good	Not at all
Understanding of oral speech	-	13	3	-
Use of oral speech	-	9	6	1
Understanding of manual communication or gestures	6	9	1	-
Use of manual communication or gestures	3	11	2	-

APPENDIX B

Sample Letter to Parents

With Consent Form

THE UNIVERSITY OF MANITOBA
FACULTY OF HOME ECONOMICS
WINNIPEG, CANADA R3T 2N2
TELEPHONE 204 474-9432

DEPARTMENT OF FAMILY STUDIES

October 12, 1978

Dear Parents,

During the past two months I telephoned you regarding some research we will be conducting with hearing impaired children at the University of Manitoba (Department of Family Studies).

This letter is to inform you of the nature of this project and to allow you to give written consent to your child's participation in this study. The study will be looking at the play behaviours of normal hearing and hearing impaired children in relation to different toy materials. As I described to you in our telephone conversation, we are specifically interested in whether hearing impairment affects the play behaviour of children. Since it is so often inferred that the play behaviour of hearing impaired children differs from that of normal hearing children, we believe that it is important to investigate whether this is, in fact, true, and if it is, in what ways their play behaviour differs. Studies such as the present one are important in order to understand how different types of play materials affect a child's play behaviours and how young children learn through play experiences.

The study will entail only one visit to the University. We will ask you to accompany your child and to be present during the play sessions at which time we will ask you to fill out a short questionnaire regarding general background information on your child. The study will take place in a playroom at the University, and your child will be presented with a series of toys and allowed to play freely with each one. There will be three brief sessions lasting about 15 minutes each, with a five-minute break between sessions. We wish to ensure that we accurately observe and record your child's play behaviour. For this reason we intend to videotape the sessions. After I have obtained the necessary information from the videotape in coded form, I will erase the tape.

We will arrange a time that is convenient to both you and your child's schedules. The sessions will be either in the morning or afternoon, on a weekday or on a Saturday or Sunday (morning sessions will run from about 10:00 a.m. to 11:00 a.m, and afternoon sessions from about 2:00 p.m. to 3:00 p.m.) You can expect to participate in the study sometime within the next three to four weeks, and will be contacted shortly to arrange a time suitable to you and your child.

With respect to both the questionnaire information and the play sessions, strict confidentiality will be ensured.

Would you kindly complete the form on the following page to indicate whether or not you are willing to allow your child to participate in this project. Please return this form as soon as possible in the stamped, addressed envelope enclosed.

Should you have any questions, feel free to contact me at 475-1453 or my supervisor, Dr. Lois Brockman, at 474-9432.

Thank you for your interest in this research.

Yours truly

Gaye Jackson.

THE UNIVERSITY OF MANITOBA
FACULTY OF HOME ECONOMICS
WINNIPEG, CANADA R3T 2N2
TELEPHONE 204 474-9432

DEPARTMENT OF FAMILY STUDIES

STUDY OF CHILDREN'S PLAY BEHAVIOUR

Conducted by Gaye Jackson under Supervision

of Dr. Lois Brockman

Kindly check one of the following:

_____ We are willing to allow our child to participate in your research.

_____ We would prefer that our child did not participate in your research.

I understand that the videotaped record of our child's play will be used for no other purpose than data collection for this study.

_____
Signature

_____
Date

APPENDIX C

Description and Presentation of Toy Materials

Table C_1

Description of Toy Categories

Sound Producing Toys

1. Musical instruments. A xylophone mounted on a stand with varied coloured keys and a wooden tapping stick with a toy piano as an alternate.

2. Record player. A toy battery-operated record player equipped with an off-on switch, a wind-up button, and a slot for records with five plastic records that played popular children's songs.

3. Boxes. A set of six square boxes made of heavy cardboard and covered with bright blue and yellow paper (three yellow and three blue), of three different sizes (one blue and one yellow of each size), measuring 7 inches, 5 inches, and 3 inches square. Three of the boxes contained small bells suspended inside in order to minimize vibrations when they jingled (placed inside the middle- and small-sized blue boxes, as well as the medium-sized yellow box).

Sound Associated Toys

1. Vehicles. Small metal vehicles which included a car, an airplane with a propeller, a fire engine with a ladder, and a dumptruck with a movable loading platform. The vehicles were presented with a garage, constructed of heavy cardboard and painted brown, that was large enough to store the vehicles, and a small plastic stoplight with red, amber, and green lights.

2. Animals. Small animals of soft pliable plastic that included a sheep, pig, cow, dog, and lion. In addition, a barn, constructed of heavy cardboard and painted red, of proportionate size to the animals was presented with a red cardboard watering trough.

3. Puppets. A set of two plastic finger puppets which included Sesame Street characters "Bert" and "Big Bird." Alternate toys included a set of Walt Disney hand puppets consisting of "Donald Duck" and "Mickey Mo se" with plastic heads and cloth bodies, and a second set of larger hand puppets consisting of Sesame Street characters "Cookie Monster" (fuzzy cloth body and head), and "Ernie" (plastic head with fuzzy hair, floppy arms with plastic hands, and cloth body).

Nonsound Toys

1. Puzzles. The puzzles included eight wooden picture puzzles of five to seven pieces each that included the following in their presentation order: (a) closed-figure puzzles: tree puzzle with large knobs (6 pieces), ladybug puzzle with large knobs (5 pieces), tool puzzle without knobs (6 pieces), animal puzzle with small knobs (7 pieces), (b) open-closed figure vegetable puzzle (5 pieces), and (c) open figure puzzles: duck puzzle (5 pieces), elephant puzzle (5 pieces), gingerbread man (8 pieces).

2. Seriating toys. These included a set of nine plastic nesting blocks with one green block and two of each of the following colours: orange, yellow, blue, and white. The alternate toy was a set of 10 rectangular wooden sticks of seriated lengths, painted red and yellow with five sticks of each colour.

3. Geometric shapes. A set of 50 geometric shapes of (a) different sizes (25 large, 25 small), (b) colours (16 yellow, 17 blue, 17 red), (c) shapes (10 each of squares, rectangles, circles, triangles, hexagons), and (d) thicknesses (30 thick, 30 thin). Presented with the shapes was a plastic open-faced box with separate partitions that distinguished the pieces by shape and size (with 10 of the geometric shapes glued to the appropriate position in the bottom of the box to be clearly visible to the children for matching purposes).

Table C_2

Individual Method of Presentation of Toys by Category

Sound Producing Toys

1. Musical instruments. The experimenter presented the xylophone by setting it on the floor in front of the child, with the tapping sticks placed beside it. The piano was similarly presented by setting it on the floor in front of the child.

2. Boxes. The boxes were presented by dropping them from a paper bag in order to jingle the bells in some of the boxes. The boxes were then scrambled to mix the sizes and colours.

3. Record player. The experimenter presented the record player with the button wound, and placed the five plastic records beside it on the floor in front of the child.

Sound Associated Toys

1. Vehicles. The vehicles were presented by placing them with the stoplight on the floor beside the garage, in view of the camera and in front of the child. The airplane was placed on the garage roof.

2. Animals. The experimenter presented the animals by setting them up with the water trough beside the barn, in view of the camera, and in front of the child.

3. Puppets. The experimenter presented the finger puppets by placing them on a finger of each hand, and similarly presented the hand puppets by placing one on each hand. When giving a child the puppets, the experimenter held them up to the mirror and pointed to their reflection, saying, "See," in order to encourage a child to use the mirror while playing.

Nonsound Toys

1. Puzzles. A puzzle was presented by first showing it to the child and then dumping the pieces out, as well as turning them right side up on the floor beside the puzzle. All children were presented with the puzzles in a set order, beginning with the closed-figure puzzles with knobbed pieces and ending with the open-figure puzzles (see Table C_1 for the specific presentation order).

Table C_2 (continued)

2. Seriating toys. The experimenter presented the nesting blocks by taking them apart and placing them on the floor, and mixing up the sizes and colours. Similarly, the seriating sticks were placed in a scrambled manner on the floor in front of the child.

3. Geometric shapes. The shapes were presented to a child by scattering them on the floor out of a cardboard box, and mixing them up. In addition, the geometric form box was presented by setting it on the floor in front of the child and pointing to the shapes inset in the box.

Table C_3

Counterbalanced Orders for

Presentation of Play Stimuli

Across toy categories

(a)	(b)
SP / NS / SA	SP / SA / NS
SA / SP / NS	SA / NS / SP
NS / SA / SP	NS / SP / SA

Within Toy Categories[a]

(a)	(b)
A / B / C	A / C / B
B / C / A	B / A / C
C / A / B	C / B / A

Possible Orderings For

Experimental Sessions

(a)

(1) Session 1: SP (A) / NS (B) / SA (C)
Session 2: NS (B) / SA (C) / SP (A)
Session 3: SA (C) / SP (A) / NS (B)

(2) Session 1: NS (A) / SA (B) / SP (C)
Session 2: SA (B) / SP (C) / NS (A)
Session 3: SP (C) / NS (A) / SA (B)

(3) Session 1: SA (A) / SP (B) / NS (C)
Session 2: SP (B) / NS (C) / SA (A)
Session 3: NS (C) / SA (A) / SP (B)

Note. Each experimental and matched control subject within pairs was randomly assigned to one of the above orderings of stimuli presentation.

[a]Toy categories were subdivided as follows:
1. Sound producing toys: (A) xylophone, (B) boxes, (C) record player
2. Sound associated toys: (A) vehicles, (B) animals, (C) puppets
3. Nonsound toys: (A) puzzles, (B) nesting blocks, (C) geometric shapes.

Table C_3 (continued)

(b)

(4)	Session 1:	SP (A) / SA (C) / NS (B)
	Session 2:	SA (C) / NS (B) / SP (A)
	Session 3:	NS (B) / SP (A) / SA (C)
(5)	Session 1:	SA (A) / NS (C) / SP (B)
	Session 2:	NS (C) / SP (B) / SA (A)
	Session 3:	SP (B) / SA (A) / NS (C)
(6)	Session 1:	NS (A) / SP (C) / SA (B)
	Session 2:	SP (C) / SA (B) / NS (A)
	Session 3:	SA (B) / NS (A) / SP (C)

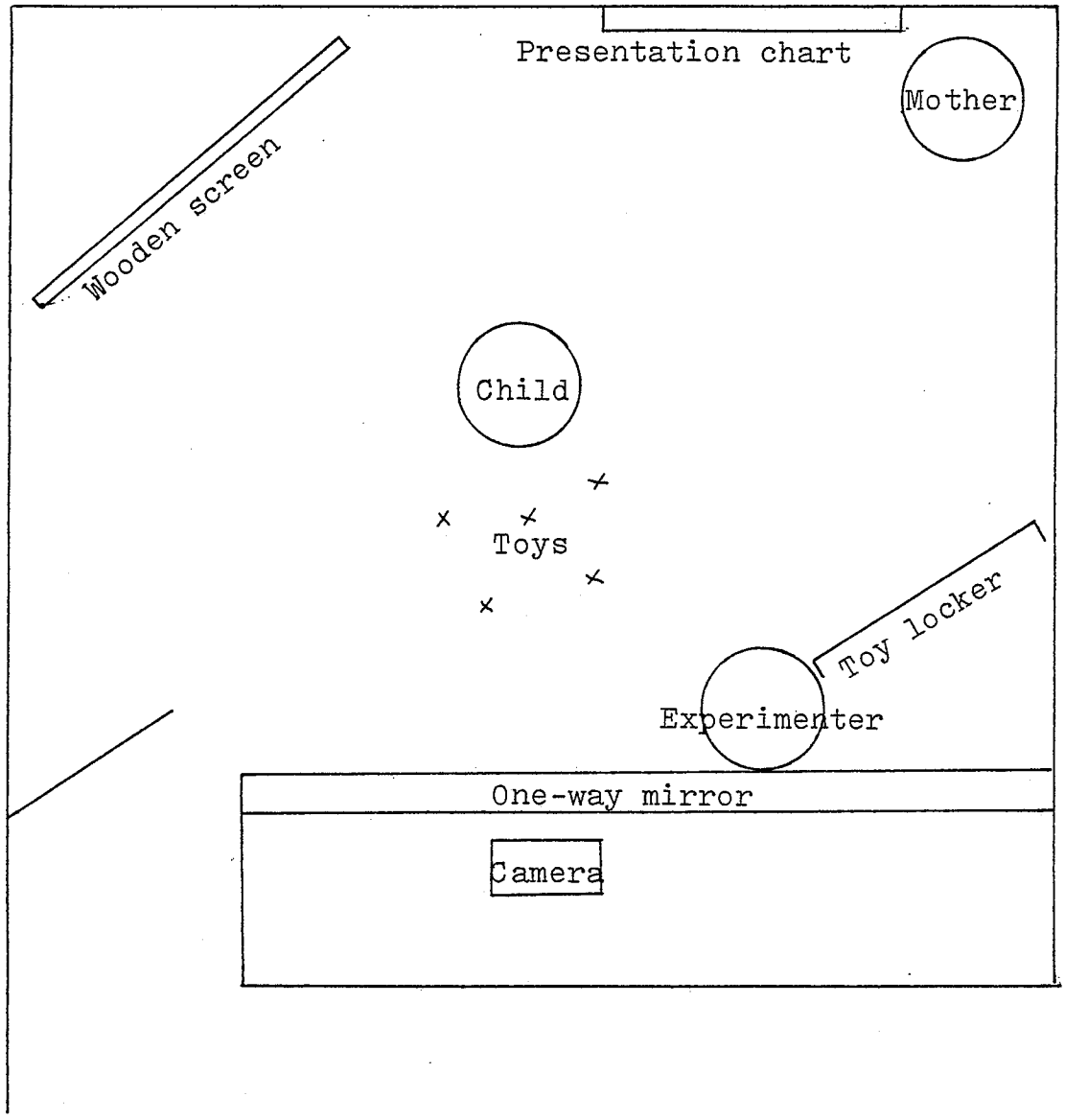

Figure C_4. Diagram of playroom.

APPENDIX D

Sample Questionnaire

Play Research Project

Questionnaire

Please fill in the following questionnaire[a] as best you can. Thank you for your help and co-operation.

_____
Name of child.

How long has your child been enrolled in a preschool program(s)? Please indicate type of program and length of time enrolled.

Does your child have any brothers or sisters at home? brothers_____ sisters_____ (Please indicate how many.)

If yes, please indicate whether your child was the first- or second-born, etc.

Part 1

1. How does your child choose to spend his/her free play time at home. Please describe briefly.

2. Does he/she have any favourite toys, games, or activities? Please describe briefly.

---

[a]Most of the questionnaire items were obtained from a questionnaire used by Williams, Darbyshire and Campbell, 1973.

3. Is he/she ever interested in smelling, mouthing, or feeling toys and objects when playing? _____
If yes, please describe briefly.

4. Does your child ever 'pretend' in his/her play? _____
If yes, describe briefly, giving one or two examples.

5. Does he/she ever pretend an object is something it is not? (e.g. pretending a block is a person) _____
If yes, please give one or two examples.

6. Does your child ever dramatize or put on simple plays with puppets? _____ If yes, please describe.

7. Does your child have imaginary playmates of which you are aware? _____ If yes, please describe.