COGNITIVE PREREQUISITES AND OTHER CONSIDERATIONS INVOLVED IN THE SELECTION OF AUGMENTATIVE/ALTERNATIVE COMMUNICATION SYSTEMS FOR SCHOOL AGED SEVERELY MULTIPLY HANDICAPPED CHILDREN

BY

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In the mid 1970's, Bill 58 was introduced in the Manitoba Legislature which pronounced that all children were to be given the opportunity to enjoy an education in the least restrictive environment. This was to have an enormous impact on most schools, since many special needs children had previously not experienced school at all, or had attended in health care institutions, specialized schools and segregated classrooms. The effects were felt throughout the entire educational system in the Province of Manitoba as preparations were made to accommodate the impending legislation. PL94-142 had recently been enacted in the United States, and the effect of this legislation, in addition to widespread parental support for integration at the local school level, meant many children with very unique challenges would be attending their neighborhood schools. Although Bill 58 was never proclaimed, it created a platform for re-evaluating special education and provided new direction for the provision of services.

As a result of these new directions, educators today are therefore faced with the task of serving an increasing number of students who have significant handicapping conditions including severe and profound mental retardation, motor, physical and sensory limitations, limited communication skills, and fragile health conditions. The role of the school and it's staff is to provide an appropriate educational program for these students just as they do for all others. Unlike the others however, the prescribed programs for these very special needs children do not fall into a neat package of recommended curriculum, materials and supports. Because of the challenging needs, it is desirable that educators enter into partnerships with parents and other professionals to identify the childrens' needs, to discuss and plan their programs accordingly, to evaluate them regularly and modify when necessary. The ramifications of this

extended service delivery model have had a considerable impact on Manitoban schools in that now most teachers and administrators in the mainstream are affected or will likely be at some point in their career. No longer will only those "specialized" few who have received special education training and accumulated educational experience over the years dealing with unique and complex students be involved in this complicated process.

This research paper will examine issues that are inherent in the delivery of such specialized programs. More specifically, it will address the very foundation of effective educational programs for nonverbal, multi-handicapped students; that being the development of effective communication systems. Alternative and augmentative communication systems provide the key to educational success for many but come with complex and intriguing issues. A careful investigation of the necessary cognitive prerequisite skills, considerations and decision matrices put forth by numerous researchers will therefore be undertaken.

DEFINITIONS

Nonverbal

Defined by the American Speech and Hearing Association in Augmentative Communication: An Introduction (1986) as nonspeaking individuals who may be able to vocalize (make sounds) but not articulate and phonate so that they can be understood.

Multi-handicapped:

Webster's Dictionary (1988) defines - multi as "having many" and handicap as "disadvantage". For the purposes of this study, the term will refer to those who have motor, physical and sensory limitations, are nonverbal, nonambulatory and have severe mental handicaps.

Prerequistes:

Defined in Webster's Dictionary (1988) as required as an antecedent condition, necessary to something that follows. In this study, prerequisite skills will be used in reference to initial training strategies that will facilitate learning of higher level communication skills.

Augmentative Communication Systems:

The American Speech-Language-Hearing Association in Augmentative Communication: An Introduction (1986) defines this term as all communication that supplements or augments speech. Augmentative communication represents an area of clinical practice that attempts to compensate for the impairment and disability patterns of individuals with severe expressive communication disorders through the use of both special and standard augmentative components. These include communication aids, signs, gestures, graphic symbols, and special selection techniques such as scanning, encoding and direct selection.

Alternative Communication:

Defined by the American Speech-Language-Hearing Association as the term used in conjunction with augmentative communication to address the needs of individuals without any vocal ability. This includes any communication method other than speech.

Augmentative and alternative communication systems fall into two major categories (Lloyd, 1985). Unaided systems are those in which the child uses some system of hand motions such as sign language or gestures, arm or leg movements, facial expression, or other types of body language as their primary mode of communication. They do not use any sort of adaptive communication aid. Aided systems are those in which the child uses a word or picture board, a notebook or any other type of electronic,

mechanical or computerized aid to deliver his message.

These types of communication systems are becoming increasingly accepted and effective in the nonverbal multi-handicapped population. The terms augmentative and alternative are usually used simultaneously and the systems are referred to as AAC (Augmentative and Alternative Communication) or generally as ACS (Augmentative/alternative communication system).

PURPOSE OF STUDY

The importance of communication cannot be exaggerated. It is vital to cognitive, academic and social-emotional growth, for it is through this process that individuals acquire knowledge about the world around them, initiate and sustain interpersonal relationships and influence their environment. It is through communication that individuals impact on their world to make their wants and needs known and share their interests and ideas.

Unlike other populations that have been studied however, multi-handicapped children are not only largely nonverbal, but due to the severity of their handicapping conditions speech is often not possible because they lack the motor, linguistic, and/or cognitive skills necessary to produce sounds in a manner that can be understood by others. These are children for whom the conventional channels of communication are not accessible and for whom speech will be inadequate as a principle means of communication. They are severely limited in their ability to explore their environment and to express their emotions, needs and thoughts. Because of these limitations, they are often isolated from life's normal flow of interaction and socialization; from full or satisfactory participation in community and family life and from education and vocational experiences (Light, 1985).

Developing effective educational programs for children with both physical

and cognitive handicaps is a difficult task and one that depends upon the development of an effective mode of communication. If an accurate, consistent, reliable means of communication can not be established, the success of any intervention program will be in doubt (Vanderheiden & Harris, 1977). Without effective communication the overall potential for development in the child will also be seriously reduced.

For these reasons, the development of communication early in an individual's life is essential. Yet severe physical and cognitive impairments can preclude or hamper the development of any functional vocal communication in some children. For such children, educators and parents often need to consider developing and teaching methods that effectively augment any existing oral skills the child may have or provide alternative means of communication.

An augmentative mode of communication is one that serves as a supplement to whatever oral communication the child may have or may develop. Augmentative modes or techniques may be used appropriately both with the child who is not expected to develop functional speech and also with the child who may develop functional speech at some point in the future, but who has only limited intelligible speech at present. The term alternative communication system acknowledges that there are some individuals whose speech is so impaired that they must rely completely on standard and special augmentative techniques ... which for them do not augment speech but are alternatives to speech. It is this area of nonoral language acquisition that has been chosen for closer examination because, for many of the students entering schools today, it is central to their educational program. A wealth of information is available on normal children and normal language development but few studies have dilineated the issue of nonoral communication, it's developmental stages, its cognitive prerequisites and its impact on education with multi-handicapped children.

COGNITIVE HYPOTHESIS

The term "cognitive hypothesis" has been used to refer to the supposition that a particular conceptual achievement or mental age is necessary to a linguistic achievement (Bloom, 1970; Brown, 1973; Chapman & Miller, 1980; Cromer, 1974, 1976). Many researchers feel that determining a student's cognitive level and incorporating cognitive skill development into his or her communication training program will assist the child in developing the critical aspects of the communication process, its function, and ultimately will aid the achievement of the overall educational objective.

Recent developments in the study of the acquisition of communication behaviours have demonstrated that language acquisition cannot be adequately understood apart from achievements in the areas of cognitive, social and motor skills (Vincent & Branston, 1979). A review of the literature which examines this relationship between cognitive development and meaningful language acquisition supports the contention that there are strong parallels between cognition and language acquisition (Bates, 1979; Johnston, 1980; Leonard, 1978; Rice, 1982; Westby, 1980). Rice (1983) suggests that there are different versions of this cognitive hypothesis, which holds that language is predicated on cognitive development (Snyder-McLean, McLean & Etter, 1988).

Strong versions of the cognitive hypothesis purport that specific cognitive attainments are necessary for the acquisition of specific language skills; that cognition causes language to develop. That is, cognition is necessary before linguistic development, and that linguistic development will follow from the cognitive development. The weak cognitive hypothesis states that certain cognitive attainments always occur prior to the acquisition of correlated language skills, and thus may provide necessary, but not fully sufficient support for the attainment of these skills

(Cromer, 1976). This position recognizes the established evidence that language requires a certain amount of cognitive knowledge, but posits that such knowledge alone is insufficient for language to develop (Finch-Williams, 1984). In other words, language cannot progress without the necessary cognitive base, however, achieving the appropriate cognitive levels does not necessarily mean that the expected language skills will emerge (Kangas & Lloyd, 1988).

Theorists such as Bates, (1979), and Bates, Benigne, Bretherton, Camaioni & Volterra, (1977), propose that cognitive and correlated linguistic skills tend to appear at the same time, although not in an invariant order and are derived from a common origin in the underlying human system that is biased neither toward sensorimotor attainments nor language attainment (Snyder-McLean, McLean & Etter, 1984). Other versions include the homologies hypothesis which predicts simultaneous emergence of parallel cognition and language skills but states that the two do not depend on each other for development and the interaction hypothesis which states that the influence between the two domains is mutual and bidirectional with cognition supporting language and language supporting cognition (Miller, Chapman, Branston and Reichle, 1980). The cognition-anchored-in-language hypothesis states the cognitive concepts are unstable until they can be anchored with linguistic forms and, therefore language supports cognition (Rice & Kemper, 1984).

While some controversy exists in the field of child language regarding the exact nature and extent of the relationship between cognition and language there is general agreement that a strong relationship does indeed exist. Rice and Kemper (1984) concluded that it is very complex and no single model is adequate to characterize it. Perhaps the most basic questions in the ongoing effort to understand the link between cognition and language are those about the relationships that exist at the earliest

levels of development in both domains; namely the one that exists between sensorimotor attainments, as described by Piaget (1953), and the development of early communication skills.

This research paper will therefore use Piaget's sensorimotor theory and its relevant contributions to address the issues of assessment and educational practices for multi-handicapped children. It will also examine some of the concerns that surround the selection of appropriate augmentative and alternative systems for this population and will review the research which has studied the prerequisites to AAC selection. These issues are educationally relevant and timely as an increasing number of educators are faced with the task of establishing appropriate programming for multi-handicapped children and often have little or no experience in this specialized area, and limited access to specific guidelines and professional expertise. The extraordinary amount of time and money that go into planning and programming might be better directed if educators knew more about these children's cognitive abilities and the relationship to language acquisition. The educators need direction and the children deserve informed decisions to be made on their behalf. These issues, therefore, form the "raison d'etre" of this study.

LITERATURE REVIEW

Historical Perspective

Most learning theories emphasize learning as a source of development. More specifically, they propose that development is a result of a series of discrete learning experiences. Children learn to grasp, to walk, to talk and to read and to write; because of these accomplishments, they develop. Piaget and his Genevan colleagues' theory focuses on development as the essential process of growth, and postulates that what children are capable of learning depends on the level of development they have

attained. Learning and development, therefore, are considered to be interrelated but distinct. By development the Genevans refer to a spontaneous process that is linked to the child's total growth. This process is biological as well as psychological, in that it concerns changes in the body, in the nervous systems and in intellectual functions (McCarthy, Gallagher & Reid, 1981).

Like other theorists, the Genevans emphasize the roles played in children's growth by physiological maturation and by learning. Learning is defined as the information and abilities children derive from experience of which there are two types; those in which children learn from objects in the environment (physical experiences), and those in which they learn from other people (social experiences) (McCarthy, Gallagher & Reid, 1981).

Piaget argues there is another factor to be considered, one that balances and integrates the effects of maturation and learning. That factor is equilibration. The child can learn from specific experiences only when his or her cognitive structures are mature enough to be able to assimilate the experience (Uzgiris & Hunt, 1975).

The Genevans see cognitive development as the result of the interplay of 4 factors: psychological maturation, physical experience, social experience, and equilibration. All four are necessary for development to take place. Nearly all theories of cognitive development recognize the roles played by maturation and experience. What is unique about this genetic epistemology theory is that equilibration is seen as the major factor in development. Therefore, genetic epistemology sees knowledge as stemming not from maturation or experience alone but as a new construction arising from the interaction between the child and his or her environment (McCarthy, Gallagher & Reid, 1981).

In his theory, Piaget identified four major periods of cognitive development:

sensorimotor, preoperations, concrete operations and formal thought (Snyder, McLean & Etter, 1988). As seen in figure I, each stage has an approximate age of appearance and characteristic behaviours.

	Stage and Approximate Age	Characteristic Behavior
1.	Sensorimotor Operations	
	A. Reflexive (0-1 month)	Simple reflex activity. Example: kicking
	B. Primary circular reactions (1-4.5 months)	Reflexive behavior becomes elaborated and coordinated. Example: eye follows hand movement
	C. Secondary circular reactions (4.5-9 months)	Repeats chance actions to reproduce an interesting change or effect. Example: kicks crib, doll shakes, so kicks crib again
	D. Coordination of secondary schema (8-12 months)	Act become clearly intentional. Example: reaches behind cushion for ball
	E. Tertiary circular reactions (12-18 months)	Discovers new ways to obtain desired goal. Example: pulls pillow nearer to get toy resting on it
	F. Invention of new means through mental combination (18-14 months)	Invents new ways and means. Example: uses stick to reach desired object
II.	Preoperational	
	A. Preconceptual (2-4 years)	Capable of verbal expression, but speech is repetitious; frequent egocentric monologues
	B. Intuitive (4-7 years)	Speech becomes socialized; reasoning is egocentric, "to the right" has one meaning - to the child's right
III.	Concrete Operations (7-11 years)	Mobile and systematic thought organizes and classified information; is capable of concrete problem-solving
IV.	Formal Operations (11 years and up)	Can think abstractly, formulate hypotheses, engage in deductive reasoning and check solutions

Adapted from J. H. Favell, (1963)

Figure I. Piaget's Stages of Intellectual Development

This research paper will address Piaget's revolutionary ideas about the sensorimotor stage of development as it is this period which is most pertinent to the present discussion because there is evidence that a very large proportion of profoundly retarded individuals function within this stage (e.g., Kahn, 1976; Rogers, 1977; Woodward, 1959).

Piaget's first revolutionary idea was that the growth of intelligence begins long before language is used (Piaget, 1952). Language, according to Piaget is based on the symbolic function which enables the infant to represent (bring to mind) absent persons or objects. When discussing the period of sensorimotor development, it is necessary to stress that even though language is not present, it is during this time (birth to approximately 18 months) that infants construct all the cognitive substructures that represent the foundation for later perception and intellectual development (Uzgiris & Hunt, 1975). His second revolutionary idea was that knowledge is based on activity and not on what is perceived or observed. According to Piaget, what the infant feels, touches, sees, hears, etc. is filtered through structures, that is action schemes. Such action schemes are simple practical structures of knowing. These action schemes increase in complexity through the 6 stages of the sensorimotor states (Dunst, 1980). Figure II denotes the selected characteristics of the attainments of the sensorimotor period.

Stages (age in months)	Domains of sensorimotor development						
	Purposeful problem-solving	Object permanence	Spatial relationships	Causality	Vocal imitation	Gestural imitation	Play □
I. Use of reflexes (0-1)	Shows only reflexive reaction in response to external stimuli	No active search for objects vanishing from sight	No signs of appreciation of spatial relationships between objects	No signs of under-standing causal relationships	Vocal contagion: cries on hearing another infant cry	No signs of imitation of movements he/she performs	No signs of intentional play behavior
II. Primary circular reactions (1-4)	First acquired adaptations, coordination of two behavioral schemes (e.g., hand-mouth coordination)	Attempts to maintain visual contact with objects moving outside the visual field	Reacts to external stimuli as representing independent spatial fields (e.g., visual, auditory) rather than as a spatial nexus	Shows signs of precausal understanding (e.g., places thumb in the mouth to suck on it)	Repeats sound just produced following adult imitation of the sound	Repeats movements just made following adult imitation of the action	Produces primary circular reactions repeatedly in an enjoyable manner
III. Secondary circular reactions (4-8)	Procedures for making interesting sights last: repeats actions to maintain the reinforcing consequences produced by the action	Reinstates visual contact with objects by (a) anticipating the terminal position of a moving object, and (b) removing a cloth placed over his/her face. Retrieves a partially hidden object.	Shows signs of understanding relationships between self and external events (e.g., follows trajectory of rapidly falling objects)	Uses "phenomenalistic procedures" (e.g., generalized excitement) as a causal action to have an adult repeat an interesting spectacle	Imitates sounds already in his/her repertoire	Imitates simple gestures already in his/her repertoire that are *visible* to self	Repetition of intersting actions applied to familiar objects
IV. Coordination of secondary circular reactions (12-18)	Serializes two heretofore separate behaviors in goal-directed sequences	Secures objects seen hidden under, behind, etc. a single barrier	Rotates and examines objects with signs of appreciation of their three-dimensional attributes, size, shape, weight, etc.	Touches adult's hands to have that person instigate or continue an interesting game or action	Imitates novel sounds but only ones that are similar to those he/she already produces	Imitates (a) self-movements that are invisible (e.g., sticking out the tongue), and (b) novel movements comprised of actions familiar to self	During problem solving sequences, he/she abandons the terminus in favor of playing with the means. Ritualization: applies appropriate social actions to different objects
V. Tertiary circular reactions (12-18)	Discovers "novel" means behavior needed to obtain a desired goal	Secures objects hidden through a series of *visible* displacements	Combines and relates objects in different spatial configurations (e.g., places blocks into a cup)	Hands an object to an adult to have that person repeat or instigate a desired action	Imitates novel sound patterns and words that he/she has not previously heard	Imitates novel movements that he/she cannot see self perform (i.e., *invisible* gestures) and that he/she has not previously performed	Adaptative play: begins to use one object (e.g., doll cup) as a substitute for another (e.g., adult size cup) during play objects
VI. Representation and foresight (18-24)	"Invents" means behavior, via internal thought processes, needed to obtain a desired goal	Recreates sequence of displacements to secure objects: secures objects hidden through a sequence of *invisible* displacement	Manifests the ability to "represent" the nature of spatial relationships that exist between objects, and between objects and self	Shows capacity to (a) infer a cause, given only its effect, and (b) foresee an effect, given a cause	Imitates complex verbalizations. Reproduces previously heard sounds and words from memory; deferred imitation	Imitates complex motor movements. Reproduces previously observed actions from memory; deferred imitation	Symbolic play: uses one object as a "signifier" for another (e.g., a box for a doll bed). Symbolically enacts an event without having ordinarily used objects present

□ The Schemes for Relating to Objects scale on the Uzgiris and Hunt assessment instrument parallels the achievements of the Play domain as explicated by Piaget (1945).

Figure 2. Selected Characteristics of the attainments of the sensorimotor period as delineated by Dunst (1980).

Piaget's theory contends that learning is preceded by appropriate cognitive structures. He hypothesizes that there are cognitive structures which are necessary, though not sufficient, for the acquisition of meaningful language (Finch-Williams, 1984). He has further hypothesized (1951, 1963) that the cognitive structures necessary for the development of meaningful expressive language are not present until the individual is functioning at Stage VI of the sensorimotor period. During this period, the infant is almost continually interacting with or exploring the environment. Eventually the infant learns that objects endure or remain the same even though they are perceived from different angles or are temporarily out of sight. The concept of object permanence is held to mark the beginning of a process by which the infant assimilates and organizes new events with those that have been previously learned. Because these events are the referent of communication behaviour, this period is seen by Piaget as critical for language training (Guess, Sailor, Wilcox and Brown, 1980). Therefore, according to Piaget's Theory a child should not be expected to exhibit speech until he has attained this level of functioning (Kahn, 1975).

Although Piaget's own work has been with individuals of average or above average intelligence, there exists a large body of literature which has focused on demonstrating the concordance of Piaget's theory with mentally retarded persons (Kahn, 1977). These studies such as Inhelder, 1968; Stevens & McLaughlin, 1974; Woodward, 1961, 1962; Stephens, McLaughlin and Mahoney, 1972 have dealt almost exclusively with mildly retarded children and adolescents and have demonstrated that mildly retarded children develop cognitively in the same order and manner as non-retarded children, though at a slower rate (Kahn, 1979).

Several studies have attempted to demonstrate ways in which Piaget's theory, in particular his sensorimotor period, can be of use to those working with both severely

and profoundly retarded adults. Kahn (1979) suggests it appears from much of the research that Piaget's theory of cognitive development can not only be applied to mildly retarded children but also to severely and profoundly retarded individuals, in that they too develop cognitively in the same order and manner as nonretarded children, though at a considerably slower rate (e.g. Inhelder, 1968; Stevens & McLaughlin, 1974; Woodward 1961, 1962; Stephens, McLaughlin & Mahoney, 1972). The mildly retarded generally reach concrete operations and the moderately retarded generally reach preoperations, but the severely retarded are unable to advance beyond the sensorimotor stage (even in adulthood) (Inhelder, 1968; Woodward, 1959, 1961, 1962). Kahn (1979) also suggests that the application of Piaget's Theory can be used to develop a better understanding of certain behaviours and also help to determine the level of a child's cognitive functioning .

Woodward (1959) demonstrated that many profoundly retarded children could be identified as functioning at one of the six stages of Piaget's sensorimotor periods. This was the first study since Inhelder's research in 1943 which suggested the applicability of Piaget's cognitive theory with retarded children. Woodward (1959) found that since many of these profoundly retarded children were functioning below Stage VI, that it should be expected that many profoundly retarded children will not have developed speech or ever be ready to develop speech (Kahn, 1975). He also suggested that what often appear to be random behaviours in the severely retarded actually follow the sequence of substages of the sensorimotor period (Woodward, 1959). The severely retarded don't seem to be able to acquire language until they are able to perform at the level described as substage VI of the sensorimotor period, which confirms Piaget's contention that the development of certain cognitive structures is prerequisite to language development (Kahn, 1975). Woodward's findings extended

Inhelder's research indicating Piaget's sensorimotor period is as relevant to the assessment of low functioning retarded children as Inhelder had indicated the higher stages of Piaget's theory were relevant to moderately and mildly retarded individuals (Kahn, 1979).

Kahn (1975), took Woodward's (1959) study one step further and researched the same hypothesis as it applied to nonverbal profoundly retarded individuals. His is the first reported study in which an attempt was made to demonstrate a relationship between Piaget's sensorimotor period and the acquisition of speech with low functioning retarded children.

Twenty-four profoundly retarded children who exhibited no demonstrable form of expressive communication (i.e., speech, sign language, Bliss symbols, etc.) participated in his study. The etiologies of the children were mixed, but all were functioning within the sensorimotor period as measured by the Uzgiris & Hunt (1975) Scales. The children were able to control at least one arm well enough to perform the tasks required of them. They were matched according to age, etiology, and scores on the Uzgiris & Hunt (1975) Scales and assigned to one of three groups.

Each child was assessed at the beginning of the study using Uzgiris & Hunt (1975) Scales as well as Bayley's (1969) Scales of Infant Development. Although this latter test was developed as an infant intelligence test, because of its developmental characteristics, it was often used with older severely and profoundly retarded people who function cognitively below approximately 30 months of age.

The third assessment used in Kahn's study was the behavioral probes devised to be used with the Bricker et al (1976) language training program. This program consisted of 26 phases of training, from establishing sitting and eye contact to training three-word phrases.

There were three groups of eight children. Two groups received one of two different cognitive training programs: object permanence or means-end. Cognitive training was then followed by language training. The third group, however, received language training only. Each child received individual training for twenty minutes a day, 5 days a week for two years. If repeated efforts to train a child in a given step were unsuccessful, overlearning of the preceding step was implemented. The procedures for both object permanence and means-end training were developed by Kahn for his study .

Kahn (1984) found that all eight children who received object permanence training demonstrated successful performance on the highest item of the Uzgiris & Hunt (1975) Scales for which they received direct training and continued their training through the language program. Five of the children achieved some of the language goals ranging from two to fifteen words spoken without a model or a prompt. Only six of the eight children who received means-end training achieved the goals of this training program and continued with the language program. However, the speech learned by these six successful children exceeded that learned by the children who received training in object permanence. None of the eight children who received language training only progressed to training on any of the linguistic or language phases.

Kahn (1984) concluded from this study that both of the cognitive training procedures were successful not only in teaching the children the cognitive skills but also speech. The language only group did not change on the post-test of the Uzgiris & Hunt (that is, improve in their cognitive functioning) nor learn speech. He followed up with a study one year later and supported his earlier findings; that training in object permanence and means-end before speech training appeared to be a better approach with regard to its long range effect on language development in children who function

below stage 6 of Piaget's sensorimotor period than the provision of language training alone (Kahn, 1984).

Kahn's (1984) findings indicated a strong relationship between the development of meaningful expressive language and Stage VI of Piaget's sensorimotor period. They also supported the concept of readiness for learning meaningful expressive language. Kahn, (1984) suggested that his research indicates that Stage VI functioning is a necessary, though not sufficient, prerequisite for learning meaningful expressive language.

It appears from Kahn's (1984) study that Piaget's view of acquisition of expressive language had been supported. According to his view, language begins to be acquired during Stage 6 of the sensorimotor period. Piaget's explanation of the transition from perceptual-motor to verbal behaviour is based on his theory of the development of mental images. Piaget states that "During stages I-V of Sensorimotor imitation there are no mental images. In Stage VI, imaged representation makes its appearance!" (1951, p. 74). This means that during Stage VI, the child acquires the ability to represent to himself objects and events which he is not directly perceiving. In other words, he has developed the necessary cognitive structures for representation and therefore is capable of acquiring meaningful language (Kahn, 1975).

Other researchers have also looked at this relationship between cognition and language and found, like Kahn, that children learn speech and language functions better once Stage VI of sensorimotor development is attained. These studies also support the applicability of Piagetian theory to the profoundly mentally retarded (Lobato, Barrera & Feldman, 1981; Greenwold & Leonard, 1979; Dihoff & Chapman, 1977; Smith & Van Tetzcher, 1978; Woodward & Stern, 1963; Poulton & Algozzine,

1980; Sailor, Guess & Baer, 1973).

There has been relatively little analysis of the relationship between retardation and language development at the pre-linguistic, gestural levels at which severely and profoundly retarded people frequently function (Lobato, Barrera & Feldman, 1981). However, research with "normally" developing infants (Bates, Benigni, Bretherton, Camaioni and Volterra, 1977) and with language delayed children (Snyder, 1978) have demonstrated that certain nonverbal, gestural forms of communication are associated lawfully with Piagetian sensorimotor Stages V and VI. Greenwald and Leonard (1979) examined the communicative behaviour of children with Down Syndrome and found that their behaviour is generally in accordance with their sensorimotor level of functioning, but that they prefer to use gestures rather than vocalizations. Kahn, (1975) reported similar results for profoundly retarded children. Early sensorimotor gestures such as eye contact, physical tugging, showing and pointing sequentially precede non-retarded childrens eventual use of spoken words during sensorimotor Stage VI. Lobato, Barrera and Feldman (1981) examined this relationship and found it consistent with previous research. From this study they developed initial and intermediate prerequisite goals for communication with retarded people.

Dihoff and Chapman (1977) reported a close correspondence between comprehension of words for objects not immediately present in the visual field and Stage VI levels of performance on 3 dimensions: play with objects, object permanence and means-ends. Stage V children all failed while Stage VI children all passed the comprehension item.

Smith and Van Tetzchner, (1977) studied children with Down Syndrome who had reached Stage V or VI. They found that the children who reached Stage VI

performed significantly better in language reception and expression than those children in Stage V.

Woodward and Stern (1963) investigated the locomotor, language and social development of severely retarded children classified as functioning within the sensorimotor stages of development. They found that no child in Stages III or IV comprehended language, only 4 out of 29 comprehended language at Stage V and that all of the children at Stage VI demonstrated evidence of comprehension (Snyder-McLean, McLean & Etter, 1988). With respect to language production, Woodward and Stern (1963) reported that no meaningful words were produced by children in Stages III and IV. Jargon with some meaningful words was produced by some children in Stage V, while a few meaningful and relevant word combinations were produced only by children in Stage VI (Finch-Williams, 1984).

In a comprehensive review on manual communication, Poulton and Algozzine (1980) warn of an inherent danger for the child who does not bring the "prelanguage skills" that are necessary for the language learning task. They suggest that regardless of the symbol set used, a number of "minimum cognitive skills" are necessary. Many of these minimum cognitive skills have been identified and include sensorimotor Stage VI functioning on the Piagetian based Uzgiris and Hunt Scales of Development (Uzgiris & Hunt, 1975) and 1-1 correspondence. Other cognitive achievements which language researchers have hypothesized to be prerequisite or related to aspects of language development in the second year of life include a general capacity for representational thought (Brown, 1973); the specific attainment of object permanence, variously operationalized (Bloom, 1973; Sinclair-de-Zwart, 1974; Corrigan, 1978); the recognition that other people can serve as agents of action (Bates, 1976); and the ability to use novel actions in the service of familiar goals (Bates, et al, 1977). Most of these

predictions have concerned the relationship between cognitive characteristics and language production - items such as talking about location (Brown, 1973); use of referential words (Bloom, 1973); increase in vocabulary (Ingram, 1974) and the use of requesting (Bates, 1976). Comprehension, perhaps because it is less often studied, has less often been explicitly related to cognition in these predictions although the logic of the arguments for the necessity of representational thought or object permanence to language use applies just as stringently to comprehension of words as to their production (Finch-Williams, 1984).

Oral language acquisition is one very important curriculum area for low functioning retarded children in which Piaget's theory could play an especially important role. We know that Piaget (1904, 1970) contended that development must precede learning and that this concept of readiness is considered probably the single most important factor of his theory from an educators point of view (Kahn, 1984). Sailor, Guess and Baer (1973) reviewed the research where attempts have been made through operant conditioning to develop speech with severely and profoundly retarded children who had never exhibited any spoken language . They noted that one serious limitation was common to all these studies; generalization of speech and language skills did not occur after training. Although they suggested that this could be corrected through still more operant conditioning, Kahn (1979), points out that Sailor, Guess and Baer totally ignored the possibility that the reason these children did not generalize their skills was simply because they were not ready to develop speech.

It is widely accepted that referential speech does not develop until the last stage of the sensorimotor period (Bates, 1976; Bates, Camaioni & Volterra, 1975; Bowerman, 1976; Corrigan, 1979; Ingram, 1979; Kahn, 1975, 1979; Morehead and

Morehead, 1974; Piaget, 1970; Sinclair, 1971, 1975). Others including Moerk, 1975; Sinclaire de Zwart, 1973; & Moerk, 1976, have also indicated a relationship between sensorimotor period functioning and the acquisition of verbal skills (Kahn, 1979). These studies have all suggested that referential speech does not develop until the end of the sensorimotor period (Kahn, 1979).

Bates, Benigni, Bretherton, Camaioni & Volterra (1977) also discussed cognitive prerequisites to the development of language. They too concluded that Piaget's sensorimotor Stage V level of development was necessary for the use of gestural performatives or preverbal, intentional communication and that sensorimotor Stage VI development was necessary for the use of words (Kangas & Lloyd, 1988).

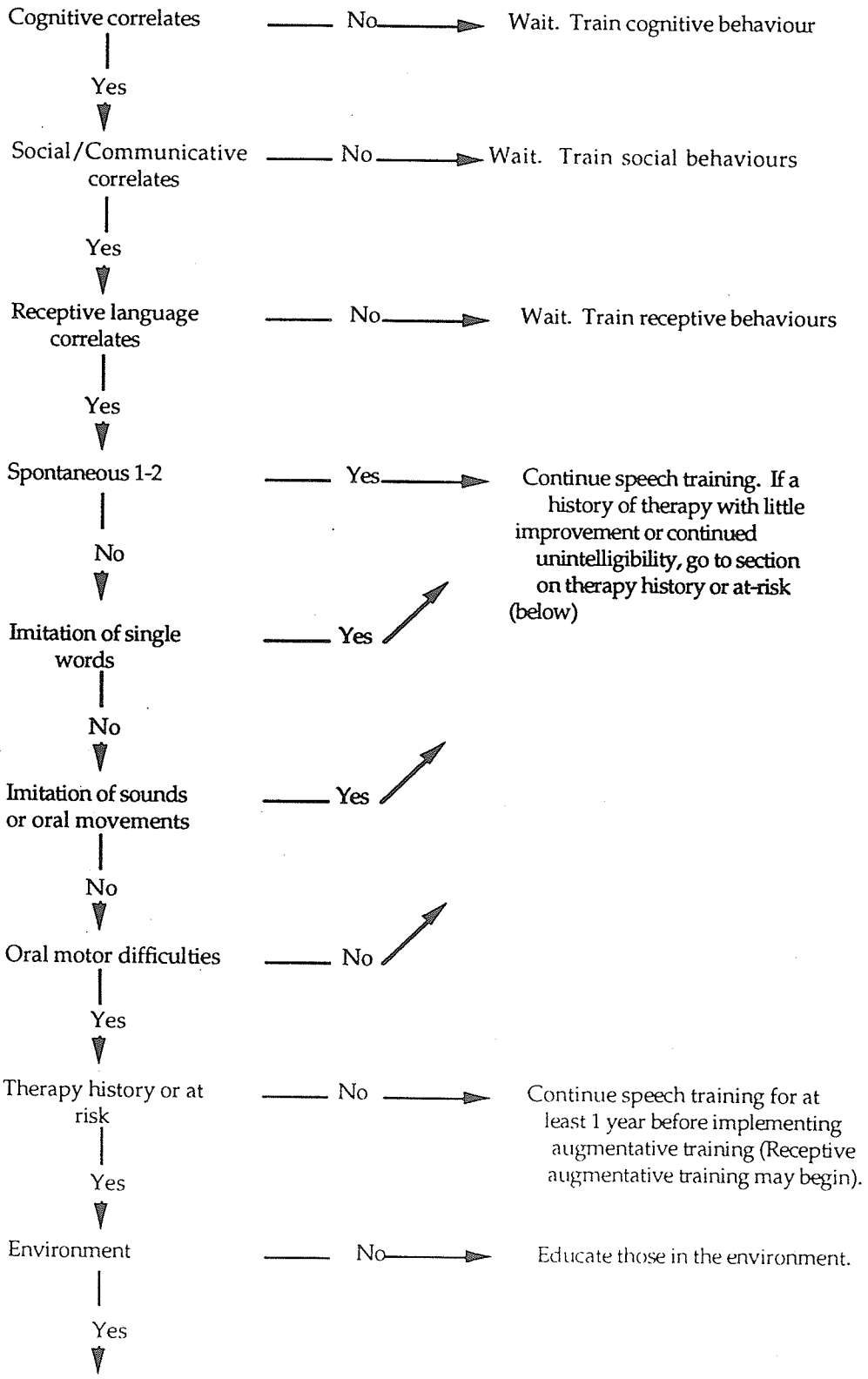
If, as these dozens of findings seem to indicate, the cognitive structures which develop during Stage VI of Piaget's sensorimotor period are necessary for the acquisition of speech, then Kahn, (1979) suggests that the training to develop these skills should begin with an assessment of the child's cognitive level. According to this position, those children who are at Stage VI could then reasonably be expected to learn language skills with relative ease and operant techniques would appear appropriate for training them (Kahn, 1979). Kahn (1979) suggests that those children who are not at Stage VI functioning would not be expected to learn to speak with any reasonable degree of efficiency and would probably benefit more from training activities directed toward accelerating their rate of cognitive development. After reaching Stage VI they could then reasonably be expected to learn meaningful expressive language with a much higher degree of effectiveness.

As augmentative communication systems are forms of meaningful expressive language, as is speech, it would be reasonable to assume that Kahn's line of reasoning would apply also to augmentative and alternative modes of communication. That is,

children who have not reached Stage VI functioning would benefit more from cognitive training than from specific AAC language training. Only after having attained Stage VI, would this type of language training (AAC) be appropriate and beneficial. Kahn (1984) advocates a total training program which delays the teaching of certain language skills (e.g., speech) until appropriate cognitive functioning is exhibited and which is designed to accelerate the rate of cognitive development. Following this line of reasoning it would seem justified then that one would then delay the introduction of an AAC as well, until the cognitive prerequisites were in place.

Many researchers agree with Kahn. Chapman & Miller (1980 suggest that the development of an appropriate data base for deciding who is a candidate should be dependent upon careful evaluation of the child's cognitive and communicative status. Comprehensive decision making matrices have been developed (Owen & House, 1984; Shane & Bashir, 1980; Musselwhite & St. Louis, 1984) as aids to clinicians who are evaluating nonspeaking individuals. While each considers different clusters of factors, they all provide decision process models for making major decisions regarding the development and implementation of an augmentative communication program.

Owens and House (1984) have developed a decision matrix to help teams make objective assessments of their students (and clients) and to determine augmentative communication appropriateness. They too suggest that if the prerequisite cognitive skills are not yet developed that the ACS decision making process be delayed until these skills are attained. As noted in the following table, the first criteria they consider necessary in the process of ACS election are cognitive prerequisite skills, or as they refer to them, cognitive correlates.



So far, so good! Go on to augmentative mode decision (Level II).

Figure 3. Owens and House's (1984) Augmentative Communication Decision Matrix.

Shane and Bashir (1980) also propose a preliminary decision-making process for determining an individual's candidacy for an augmentative system. According to their election criteria, decision making results from an evaluation of data arranged in levels of a branching type decision matrix. At the first level, the three interrelated cognitive factors of sensorimotor intelligence (Chapman & Miller, 1980), mental age and picture representation ability (Shane, 1980), are investigated. Noncompliance with any of these factors leads to a decision to delay the introduction of an AAC. They suggest that such a decision reflects the lack of cognitive prerequisites necessary for intentional communication (Reichle & Yoder, 1979; Chapman & Miller, 1980). When this situation arises, Shane and Bashir (1980) suggest facilitating cognitive growth, such as that advocated by Kahn, (1978). Shane and Bashir's Election Decision Matrix is presented below:

LEVEL 1 COGNITIVE FACTORS

At least Stage V sesnsorimotor intelligence?

At least 18 months mental age: or ability to recognize at least at photograph level?

YES ------ Go to II

NO ------- Delay

LEVEL II ORAL REFLEX FACTORS

Presistent (1) Rooting: (2) Gag: (3) Bite: (4) Suckle/Swallow: or (5) Jaw Extension Reflex?

YES ------- ELECT --- Go to X

NO ------- Continue to III

LEVEL III LANGUAGE AND MOTOR SPEECH PRODUCTION FACTORS

A. Is there a discrepancy between receptive and expressive skills?

YES ------- Go to III B

NO ------- Go to V

B. Is the discrepancy explained predominantly on the basis of a motor speech disorder?

YES ------- Go to V

NO -------- Go to III C

UNCERTAIN ------- Go to IV

C. Is the discrepancy explained predominantly on the basis of an expressive language disorder?

YES ------- Go to VII

NO -------- Go to VI

UNCERTAIN ------- Go to V

Figure IV. Shane and Bashir's election decision matrix

LEVEL IV MOTOR SPEECH - SOME CONTRIBUTING FACTORS

Presence of neuromuscular involvement affecting postural tone and/or postural stability?

Presence of praxic disturbance?

Vocal production consists primarily of vowel production?

Vocal production consists primarily of undifferentiated sounds?

History of eating problems?

Excessive drooling?

YES ------ Evidence to support motor speech involvement (Go to V)

NO ------- Evidence against motor speech involvement (Go to V)

LEVEL V PRODUCTION - SOME CONTRIBUTING FACTORS

Speech unintelligible except to family and immediate friends?

Predominant mode of communication is through pointing, gesture, facial-body affect?

Predominance of single word utterances?

Frustration associated with inability to speak?

YES ------ (Evidence to ELECT) Go to VII

NO ------- (Evidence to DELAY OR REJECT) Go to VII

LEVEL VI EMOTIONAL FACTORS

A. History of precipitous loss of expressive speech?

YES ------ Go to VIII

NO ------- Go to VI B

B. Speaks to selected persons or refuses to speak?

YES ------ Go to VIII

NO ------- Go to V

LEVEL VII CHRONOLOGICAL AGE FACTORS

A. Chronological age less than 3 years?

YES ------ Go to VIII A

B. Chronological age between 3 and 5 years?

YES ------ Go to VIII A

C. Chronological age greater than 5 years?

YES ------ Go to VIII A

LEVEL VIII PREVIOUS THERAPY FACTORS

A. Has had previous therapy?

YES ------ Go to VIII B

NO ------- Go to IX, weigh evidence - (DELAY with Trial Therapy or ELECT) Go to X

B. Previous therapy appropriate?

YES ------ Go to VIII C

NO ------- DELAY with Trial Therapy

C. Therapy progress too slow to enable effective communication?

YES ------ ELECT --- Go to X

NO ------- DELAY --- continue theraoy

D. Therapy appropriately withheld?

YES ------ ELECT --- Go to X

NO ------- DELAY with trial therapy

LEVEL IX PREVIOUS THERAPY - SOME CONTRIBUTING FACTORS

Able to imitate (with accuracy) speech sounds or words: gross motor or oral motor movements?

YES ------ (Evidence to DELAY) Go to VIII

NO ------- (Evidence to ELECT) Go to VIII

LEVEL X IMPLEMENTATION FACTORS - ENVIRONMENT

Family willing to implement (use, allow to be introduced) Augmentative Communication System recommendation?

YES ------ IMPLEMENT

NO ------- COUNSEL

Shane and Bashir (1980)

The issue is complex, but seemingly logical. Kahn, Chapman & Miller, Owens & House, and Shane & Bashir, are all suggesting that cognitive functioning must be considered when expressive language training is to be undertaken. Therefore, the importance of looking closely at the assessment of the behaviours of the children is paramount. If educational programming is dependent upon a successful communication program, as we have established it may be, then we must assess children's cognitive and language levels and from there determine the appropriate action.

NEW DIRECTIONS

A new wave of researchers are also examining the language-cognition relationship and unlike the previous studies cited are finding little evidence that Stage VI functioning is necessary for language to develop. In the field of augmentative and alternative communication, these findings are in fact gaining momentum and are having a great impact on the practical aspects of implementing AAC in educational settings. The new wave of researchers in their studies have investigated the "cognitive prerequisites theory" and found convincing data that in fact contradicts much of what Kahn and his followers have suggested.

The relation between sensorimotor stage and production of two word combinations has been directly evaluated by Ingram (1977) for observations of overall sensorimotor stage, Corrigan (1978) for object permanence and Folger and Leonard (1978) for means end and schemes. These investigators report correspondence between linguistic and cognitive stages, but little evidence that the cognitive stage is prerequisite .

Corrigan (1978), in a longitudinal study, reported only a rough correspondence between the onset of Stage VI of object permanence and the onset of single-word utterances. Snyder-McLean, McLean & Etter (1988) administered the Uzgiris and Hunt

Scales to their subjects in order to identify any consistent relationship between measured levels of sensorimotor knowledge or stage attainments and observed levels of expressive communication and language. Their data indicated that for older, severely handicapped persons, the ability to demonstrate Stage VI criteria behaviour on measures of sensorimotor development is probably neither necessary nor sufficient, for initial language acquisition. They concluded from their data that since Stage VI was not demonstrated by all of their subjects, that this level of sensorimotor performance was clearly not necessary for the attainment of expressive language at the single word level. Their evidence of sufficiency was straightforward. Stage VI level of sensorimotor performance in and of itself, is not sufficient for language acquisition. They concluded that they could not predict any one client's communication level on the basis of his or her sensorimotor stage level (Snyder-McLean, 1988).

Miller, Chapman, Branston & Reichle (1980) in their study on cognitive prerequisites to language comprehension concluded that Stage VI levels of sensorimotor functioning are not necessary to the development of one and 2 word comprehension. Neither averaged across subscales nor taken by individual subscale did Stage VI scores present a pattern consistent with the view that ability to solve the cognitive problem at a Stage VI level is a necessary prerequisite to understanding the comprehension item. To the extent that Stage VI performance on these cognitive tasks is an appropriate operationalization of "representational thought" they concluded that it's emergence in the nonverbal realm is not consistent earlier than its emergence in the verbal realm of comprehension (Miller, Chapman, Branston, Reichle, 1980).

The emphasis on prerequisite skill hierarchy has been identified by Brown, Branston, Hamre-Nietupski, Pumpian, Certo and Greenwald (1979) as the "not ready for" hypothesis (Falvey, 1985). The only prerequisite behaviour that they deem

reasonable to consider before developing a communication training program for a student is that he or she be able to breathe, either independently or through artificial means. "No other prerequisite behaviours are reasonable or appropriate to the development of a communication training program for a student" (Falvey, 1985).

Historically, cognition in AAC has been primarily related to candidacy for AAC intervention; that is, the discussions of cognitive prerequisites. As a result, several researchers (Kangas & Lloyd, 1988; Reichle & Karlan, 1988; Romski & Sevcik, 1988) pointed out that there is no sound basis for cognitive prerequisite for communication intervention and supported a zero-reject model (Schlosser & Lloyd, 1991).

Kangas and Lloyd (1988) suggest that although there are no convincing data to support a strict cognitive prerequisites hypothesis, reliance on this assumption has shaped the development of language and communication interventions with individuals with severe disabilities over the last two decades. They examined some of the assumptions that have been made regarding cognitive prerequisites to both language use and augmentative communication and the logic of the decisions which have followed from those assumptions. They argued that descriptive data regarding child development have been overextended to a prescriptive sequence of precommunication and communication intervention with individuals with disabilities. Furthermore, they suggest that a model of normal child development (i.e., Piaget) may not be a sufficient framework from which to operate when dealing with the multi-handicapped population. Their research demonstrates that there are not sufficient reasons for delaying the start of communication programs for individuals with several disabilities and in fact that there are compelling reasons for beginning communication intervention at a young age even if certain cognitive skills have not

been attained (Kangas & Lloyd, 1988).

These ideas vary greatly from Kahn who found clear indications that children who were functioning at Stage VI learned far more in a language program than the children who were below Stage VI. He suggested it may not be in the best interest of the children or educators to spend time on language training unless Stage VI was attained. He did concede, however, that generalization of his study was precluded by the small number of subjects "among other problems" and promoted replication and expansion of his study.

Although the present study originally intended to examine cognitive prerequisites to AAC, using Piaget's theory as a guide and in effect replicate Kahn's study with a multi-handicapped population, the strength of recent research has prompted this investigator not only to explore this new school of thought regarding cognitive prerequisites to AAC, but to examine its appropriateness, applicability and effect on school-aged multi-handicapped children. One group of researchers is clearly suggesting cognitive prerequisites are necessary prior to communication intervention and the other is adamantly suggesting they are not.

HYPOTHESES

Based on the literature described, it would seem that there is a need for more empirical research to investigate the propositions regarding Stage VI functioning and AAC use.

The issue is a complex one: Kahn and his group have proposed that Stage VI functioning is indeed necessary for successful expressive language learning to occur; while on the other hand more recent research by Kangas, Lloyd, Reichle, and others have cast doubt on this view by suggesting that language learning can and does take place regardless of the cognitive stage attained.

In light of the research examined here and the powerful arguments put forth by the "why wait" group, it was hypothesized that:

1. *It is not necessary for nonverbal multi-handicapped children to have reached Stage VI functioning for successful AAC language learning to occur.*

If this hypothesis is supported, then the specific training undertaken prior to the implementation of an AAC will need to be examined. If, in fact the child acquires language without satisfying Stage VI and therefore apparently without the "necessary cognitive prerequisites", why would one consider "further cognitive training"as suggested by Kahn? Rather, one would consider more of the same which "readied" him for successful language learning in the first place, i.e., language training. Logically, then, two related hypotheses can be put forward:

2. *multi-handicapped children who have not attained Stage VI functioning would derive greater benefit from language training than object permance cognitive training .*
3. *multi-handicapped children who have not attained stage VI functioning would derive greater benefit from language training than means-end cognitive training .*

METHOD

Subjects:

Three school-aged severely multi-handicapped girls - EB, SA and AE, ranging in age from 12 to 14 years from the Lord Selkirk School Division were selected for this study. They have all qualified for Level III funding under the Manitoba Provincial Special Education Guidelines which provides for students who have very profound multi-handicapping conditions. These guidelines provide the following definition of severely multi-handicapped - "the child who has a combination of two or more severe disabilities which produce severe multiple learning, developmental and/or behavorial problems. The child may have a severe mental disability compounded by a severe physical disability to the extent that he/she cannot respond to the usual instructional techniques as provided in special education programs for the mentally or physically disabled; or, if not mentally disabled, will display two or more severe physical impairments. As a consequence, the child requires intensive assistance and/or supervision on an individual basis". (Manitoba Guidelines for Application for Level III Support for School Divisions, 1992.) These students each qualified for a grant of $18,960.00 in the school year, 1992 - 93.

Although the subjects have varied syndromes, they are all nonverbal, nonambulatory, mentally handicapped and require total assistance for daily functioning in feeding, dressing, transportation, toileting and personal care. All three have fragile health and significant motor impairment which confines them to wheelchairs, hampers voluntary limb movement and requires daily occupational and physical therapy. As well, AE and SA have some degree of visual impairment but none are hearing impaired.

EB and SA receive daily medication for seizure control while AE also takes

daily medication for a variety of other physical and digestive problems. Figure V charts the characteristics and similarities between the subjects.

Characteristics of Subjects	EB	SA	AE
Age	12	13	14
Sex	F	F	F
Height	5'4"	4'9"	4'2"
Weight (lbs.)	110	90	65
Ambulatory	—	—	—
Verbal	—	—	—
Vocal	✔	✔	✔
Cerebral Palsy	✔	—	✔
Rett Syndrome	—	✔	—
Visual Impairment	—	✔	✔
Hearing Impairment	—	—	—
Scoliosis	—	—	✔
Seizure disorder	✔	✔	—
Mental Handicap	✔	✔	✔
Motor Impairment	✔	✔	✔
Digestive problems	✔	—	✔
Voluntary limb movement	—	—	—
Hand sterotypies	—	✔	—
Hand splints	—	✔	—
Teeth grinding	—	✔	—
Daily range of motor exercises	✔	✔	✔
Pummelling required	✔	—	—
Suctioned	✔	—	—

✔ . . . present
— . . . absent

Figure 5. Characteristics of subjects.

Characteristics of Subjects	EB	SA	AE
Tube fed	✔	—	—
Orally fed	—	✔	✔
Laughs	—	✔	✔
Cries	✔	✔	✔
Complains	✔	✔	✔
Toileted	—	—	✔
Diapered	✔	✔	✔
Mobile in walker	—	—	✔
Grasps	—	—	—
Points	—	—	—
In wheelchair	✔	✔	✔
Operates electric wheelchair	—	✔	—
Operates switch	—	✔	✔
IQ	....untestable....		
In integrated classroom	✔	✔	✔
Has siblings	3	1	4
Mother and father in home	✔	✔	✔
Lives at home	✔	✔	✔
Total assistance required	✔	✔	✔
Level III	✔	✔	✔

✔ . . . present
— . . . absent

All three subjects live at home with their families and have done so since birth. They attend school daily and are integrated into grades 5, 6, and 7 respectively in three different schools. They have all attended school since kindergarten and participate daily in programs designed to enhance their quality of life, to promote social interaction and to develop specific skills. The primary goal of their educational program in addition to tending to their immediate physical and medical needs is the establishment of a basic functional communication system.

Prior to the onset of this study, each student was assessed by a variety of measures. The Hawaii Early Learning Profile was administered first during their preschool years and then periodically during the elementary years. This form of evaluation is often used on young children and revealed each girl's ability in the areas of fine and gross motor, cognitive, self help, social and language skills. Other measures included checklists such as the Hanen Early Language Guide, Chapel Hill's Prerequisites to Augmentative Communication as well as a variety of other subjective evaluations which were carried out on a regular basis. Cognitive abilities were not testable using any standard intelligence assessment instruments.

These three subjects were chosen for this study as they are the only nonverbal, motor-impaired, multi-handicapped students in the Lord Selkirk School Division who possess other similarities such as age, education, experiences, one-on-one assistance at school, and supportive parents who are willing to try new and varied approaches to their child's communication and educational programs.

Parental permission for this research was obtained. As well, school division and administrators approval and cooperation was sought.

INSTRUMENT

Uzgiris & Hunt Scale

In this study each subject's cognitive abilities were assessed using the Uzgiris & Hunt Scale (1975).

Piagetian-oriented assessment is based on the concept of mental growth as a series of qualitative changes involving the reorganization and restructuring of concepts (Bybee & Sund, 1982). Piagetian theory predicts that childrens' thinking is qualitatively different at different levels of development and therefore, assessment is best conducted through the use of sequential, ordinal scales (Finch-Williams, 1984). Such scales reflect the fact that acknowledgements at a higher level will intrinsically be derived from preceding levels and encompass those achievements. The child's performance is interpreted in terms of the developmental order of the various stages of cognition developed (Piaget, 1952; 1854; Piaget & Inhelder, 1969). Ordinal scales permit the specification of the child's position on a developmental continuum to derive intervention procedures (Finch-Williams, 1984).

Ina Uzgiris and J. McVicker Hunt have been leaders in the development of Piagetian-based infant assessment scales and have developed such an ordinal scale. Unlike traditional infant tests, which measure global aspects of overall cognitive performance, the U & H scales assess an individual's sensorimotor development in seven structurally related branches:

I visual pursuit to the permance of objects

II means for obtaining desired environmental events

III a the development of vocal imitation

IIII b the development of gestural imitation

IV the development of operational causality

V the construction of object relations in space

VI the development of schemes for relating to objects.

These seven branches parallel the domains of sensorimotor development delineated by Piaget (1936, 1937, 1945). (See Appendix I)

The concept of readiness is the single most important aspect of Piaget's Theory for educators (Kahn, 1979. Piaget (1964, 1970) contends that development must precede learning, therefore the ability to assess which cognitive structures an individual possesses could be very important in determining which skills should be taught to that individual (Kahn, 1979). Since cognitive structures are not readily observable we must infer the existence of these structures from the individuals performance on cognitive tasks such as the Uzgiris & Hunt Scales (1975) (Kahn, 1979). Such scales permit the language interventionist not only to derive an overall index of development (e.g., sensorimotor stage) but also to determine the child's developmental level for specific cognitive contents that have been found to parallel communication development (Finch-Williams, 1984).

Achievements comprising the content of each branch of development are considered to be particular aspects of a more general process involved in the genesis of sensorimotor intelligence. Selected characteristics of the attainments for the separate branch of development at each of the six sequential stages of the sensorimotor period have been described and are included in Table 2, page 12. These descriptions are adapted from Piaget's own accounts of the development of sensorimotor intelligence (Dunst, 1980).

Three types of data are used to determine the qualitative characteristics of a child's patterns of sensorimotor development (Dunst, 1980). First and most important,

the child's development is described in terms of the highest behaviour achieved in each of the seven branches of development. This profiles concrete and specific data concerning the child's level of performance in each of the seven branches of development. That is, knowledge of the highest landmark achieved provides information concerning the particular point along a developmental continuum at which a child is functioning.

Second, the Piagetian stages corresponding to each of the highest critical behaviours achieved is determined. In as much as stages are intended to index the qualitative changes in the genesis of particular concepts of constructions, knowledge of the child's developmental standing according to stage placements provides a measure of the types of cognitive operations that the child is capable of performing. Third, as a measure of the child's variability in performance, a profile of abilities is constructed to graphically portray the child's overall pattern of sensorimotor development. A profile not only depicts the child's major strengths and weaknesses, but it also permits one to pinpoint particular deviations in the development if they are present.

A variety of psychoeducational intervention activities can be developed based on the results of an assessment of a child's sensorimotor capabilities. First, activities can be developed to facilitate cognitive growth in terms of movements from a lower to a higher level of functioning within particular domains. In addition, activities can be developed in which existing sensorimotor abilities are used as a basis for facilitating acquisition of targeted behaviours. Lastly, activities can be developed in which the goal is to integrate and synthesize existing sensorimotor skills to ensure that the infant learns the interrelatedness of functional use of his/her cognitive abilities. All three types of sensorimotor activities are developed within the context of intervention packages (Dunst, 1980).

The use of Piagetian-based infant scales to assess the sensorimotor performance of handicapped children required that these individuals manifest behaviours in the same stage progression as has been found with nonhandicapped infants. A review of the available data by Dunst (1978) revealed that children with diverse handicapping conditions do in fact acquire behaviours in the stage sequence posited by Piaget. The studies reviewed included profoundly and severely retarded persons (Kahn, 1976; Rogers, 1977; Silverstein, Brownlee, Hubbell, and McLean, 1975; Woodward, 1959). Mildly and moderately retarded infants (Spitzer, 1973) cerebral palsied children (Tessier, 1969, 1970) and thalidomide-affected children (Decarie, 1969).

Although the appropriateness of Piagetian - based infant scales has not been specifically examined with sensory-impaired children, the data reviewed by Finch-Williams (1981) indicate that the patterns of sensorimotor development among these individuals are similar to those of nonhandicapped infants. Best and Roberts (1976) found that, except for vocal imitation, deaf children did not differ in their level of sensorimotor development when compared to nonimpaired children. In extensive descriptive studies by Fraiberg (1968, 1975), blind infants manifested sequential patterns of development very similar to those of sighted children in the acquisition of object and person permanence. Most research with the mentally retarded has also concentrated on the sensorimotor stage of development (Inhelder, 1966, 1968; Kahn, 1975, 1976; Rogers, 1975; Woodward, 1959). These studies too, found that the sequence of responses by profoundly and severely mentally retarded children are similar to that found with normal infants (Finch-Williams, 1984). As a whole, the data that are available concerning the sequential patterns of development among handicapped children strongly support the contention that these individuals acquire sensorimotor skills in the same stage level progression as that originally posited by Piaget in 1936,

1937, and 1945 (Dunst, 1980).

In order for Piagetian based scales to be used with handicapped individuals, it must be demonstrated that the use of such scales are reliable. With infants, these scales have generally been shown to have a high interobserver and short-term test-retest reliability and high scalability of items. Reported inter-observer reliability for low functioning retarded individuals has also been high (Kahn, 1976; Robinson, Chatelant, Spritzer, Robertson & Bricker, 1973; Rogers, 1977; Silverstein et al, 1975). The percentage of agreement between independent observers has generally been in the 0.85 to 0.99 range. Both Kahn (1976) and Robinson et al, (1973), have reported high test-retest reliability in the studies of sensorimotor development they conducted. (Kahn (1977) concluded from his studies that the Uzgiris & Hunt Scales can be used both reliably and validly with severely and profoundly handicapped (retarded) children. Finch-Williams (1984) concluded from her review that Piagetian oriented assessment not only have shown that the mentally retarded child develops cognitive skills in a similar sequence to the normal child, that in addition, the Uzgiris & Hunt (1975) Ordinal Scales of Psychological Development appear to be a reliable and valid assessment procedure for the mentally retarded population. The reliability data, in conjunction with the originality data, provide sufficient support to indicate that Piagetian-based infant scales are appropriate for use with handicapped population.

The administration and scoring procedures provided in Dunst's (1980) Clinical Manual for Administration of the Uzgiris and Hunt Scales of Infant Psychological Development was followed.

Augmentative/Alternative Communication Assessment

In addition to a cognitive assessment using the Uzgiris and Hunt Scale, each subject in the present study underwent an assessment of their communicative competence. The Augmentative/Alternative Communication Assessment was administered to established a baseline of each subjects' communication skills. (See Appendix II). The Communication Assessment is made up of 130 items which request information regarding the presence or absence of particular communicative competencies. Examples and explanations are requested for most items. One point is given for each communicative behaviour that is present in each of six specific communication areas:

I Communication: Prelinguistic Skills

a) Goal oriented behaviours: random non-goal directed behaviour; repeats familiar routines in new situations; uses adults to help in getting objects; invents new ways to solve problems.

b) Object understanding: aware of objects not visibly present; aware of location; possession; interest in objects if hidden; not aware object is gone; demonstrates preferences; indicates choices.

c) Play routines: plays with familiar person only; initiates play with person; watches others but does not participate; use objects to pretend; plays with new unfamiliar persons; uses appropriate sequence of routines in play;

d) Early language: imitates motor patterns; responds socially.

II Communication: Cognitive - perceptual functioning

a) Visual skills - i.e., attends to visual stimuli; recognizes people; objects,; pictures; can match and make choices.

b) Auditory skills - attends to auditory stimuli; responds to speech;

responds to simple requests; shows recognition of own name; family members; body parts concepts; action words.

III Communication - Comprehension

a) Demonstrates understanding of story without pictures; with pictures; commands with and without gestures; 10 or more words; own name; a few gestures.

IV Communication: Need

a) Communicates appropriately with adults; peers; strangers; on the phone; initiates interactions; makes needs known; gets someone's attention; use grammatical sentences; combines two or more words; uses single words.

b) Speech production

- respiratory control, laryngeal control, oral structure control
- can suck, chew, swallow, control drooling.

V Communication Methods:

a) Can use speech; vocalizations; crying; signs; gestures; eye pointing; facial expressions; traditional orthography; word/phrase board; alphabet board; symbol board; picture board; technical aids; combined systems.

b) Needs and feelings communicated - food; drink; attention; toileting; discomfort; object; happiness; sadness; anger; humour; love, frustration.

c) Expresses ideas; offers suggestions; asks questions; refers to events.

VI Communication: Style

a) Preferred method of communication - it's availability; used independently; needs assistance.

b) Desirous of technical communication device.

VII Communication: Intervention

a) Speech/communication therapy, service delivery

b) Previous communication assessment.

This assessment resource was developed by senior consultants in the Child Care and Development Branch of Manitoba Education and Training. It is a subjective measurement which is intended to be completed by a speech/language pathologist in consultation with parents and school personnel. The Communication Assessment is only part of a multifaceted approach to multi-handicapped children's total programming, which includes assessment information in the following areas as well: social/emotional development, academic/cognitive skill development, physical/occupational therapy and functional status. A count was obtained of all communicative competencies observed and graphed for pre and post treatment comparison.

PROCEDURE

At the outset of the study, a Piagetian-oriented approach to cognitive assessment was employed. Each girl was assessed individually using Assessment in Infancy (Uzgiris & Hunt, 1975). Their sensorimotor level of functioning for task performance according to this scale was determined and a baseline was established. Each subject also underwent an assessment of their communicative status using the Augmentative/Alternative Communication Assessment. Having ascertained their functional level of communicative competence, a second baseline was established for each subject. Each subject was then assigned a treatment method.

One subject received AAC language training only, one received cognitive training (visual pursuit and permanence of objects, and operation causality), in conjunction with language training, and the third received cognitive training in means

for obtaining desired environmental events (means-end) and spatial relationship, followed by language training. These three treatments are discussed in detail in the next section under Treatment. The exact training procedures are outlined in the appendix (III, IV, V).

Although it was originally intended to randomly select a treatment condition for each subject, it was decided that not only would it be in the subjects best interest if the conditions were matched to their apparent strengths; that by doing so, growth could be accelerated. Subject AE had requested many months before and finally was granted the opportunity to try the "Real Voice" augmentative communication device for 8 months by the Association for Community Living Open Access. This is a lending library of sorts which permits clients to try ACS devices before purchasing. It seemed appropriate then for this subject to be given Treatment 1 (ACS language training only).

Subject SA fit well into Treatment Condition 2 as the Causality training portions (specifically environmental control) were issues raised by her caregivers as relevant and appropriate skills to focus on for specific skill training.

The treatment in Condition 3 was also the most conducive to the subject EB's strengths. Her eye gaze and awareness of space appeared to be her strongest skills.

Kahn in his (1984) study chose means-end, object permanence, and causality as the cognitive skills to be developed, and found that whether with or without language training, the subjects who were given cognitive training in each of these areas increased their cognitive levels and learned language more successfully. These same cognitive skills were chosen and applied to the multi-handicapped children in this study. Spatial relationship training was added to even them up, so that each subject receiving cognitive training would receive two types each. These four areas represent the four highest levels of attainment on each subjects profile which increased hope

that they could be further developed.

The treatments took place each morning between 9:15 and 11:15 in the subjects' special needs classrooms. These rooms afford a relatively controlled atmosphere free from noise and distractions. Each of the training programs were conducted on a 1-1 basis and consisted of a concentrated, highly directed effort to have the child improve her performance in the area being trained. Training sessions were "ideally" 30 minutes each school day for 2 years. Although it was desirable to have the training carried out regularly each day with no exceptions, the reality of missed days due to sickness, inservice days, medical appointments, field trips, etc., needed to be realized. In addition, September is considered a settling in month with adjustments to new peers, teachers, classroom and so on. Similarly, June is a winding down month with a multiplicity of irregular days. The training sessions then in reality were approximately 8 months long with a 4 month hiatus in between.

The treatments were carried out by trained Speech/Language Teacher Assistants. All the trainers were white females, of similar age and education. They have had experience working with multi-handicapped children and have received intensive training in both the language and cognitive procedures to be followed. Prior to the implementation of this study, they demonstrated a thorough working knowledge of the concepts and steps involved. Two raters evaluated their knowledge and practical application of the treatment and agreed that they were ready and able to participate in this study. The trainers were monitored on a regular basis to ensure consistency in performance and reinforcement.

These raters were two female speech/language pathologists who have completed 50 hours of training for observation and assessment of alternative and augmentative communication skills. They are Caucasian, middle class educators of

similar age, education and ideology, each with approximately 15 years of verbal and nonverbal communication experience in both regular and special education. They rated the subjects pretreatment communicative status as well as their level of functioning, according to the Uzgiris and Hunt Scales. Through practice in settings similar to the treatment situations, they have reached an inter-ratio reliability of approximately 90%. The raters closely supervised the trainer's daily program and were responsible for collecting and collating the data. They arranged to have training sessions videotaped to ensure that 1) all procedures were carried out appropriately and 2) feedback was provided.

Since the raters were present during training on a regular basis but were not as familiar to the subjects as the trainers, habituation to the observers was established by inclusion of the rater in the therapy room for 1/2 hour periods several days a week for 1 month prior to the actual training.

At the end of the training period, all the subjects were again assessed using the Uzgiris and Hunt Ordinal Scales (1975). Growth within the sensorimotor area was expected. As well, the Augmentative/Alternative Communication Questionnaire Assessment Resource was readministered. The data was collected and the results compared to the initial assessment. The outcome of these measurements was the difference or the effect which occurred as a result of the treatment and was measured as the difference between the baseline and the post treatment results.

Treatment:

Condition 1: ACS Language Training Only

Kahn, in his language only training condition, adapted Bricker, Dennison & Bricker's (1976) language training program. He pointed at an object and asked the subject "What is this?" They then progressed through various "linguistic phases".

In this ACS language training only treatment, a variety of language training options were presented.

Initially, The Chapel Hill Prerequisites to Augmentative and Alternative Communication Training program was implemented. This checklist is provided below.

_____ 1. Activities or events are followed by indications of pleasure and/or attention on the part of the child. (Step 1)

_____ 2. Activities or events are followed by indications of displeasure or withdrawal on the part of the child. (Step 1)

_____ 3. The child changes his/her behaviour if the behaviour results in some consistent change in the environment. (Step 2)

_____ 4. There are objects/events known to be reinforcing to the child. (Step 2)

_____ 5. These objects or events can be represented by objects and/or pictures. (Step 2)

_____ 6. The child has a consistent, efficient, readable, voluntary movement (signal). (Step 3)

_____ 7. The physical range of the child's signal is known. (Step 3)

_____ 8. The child uses the signal to communicate a desire for a reinforcing object or event. (Step 4)

_____ 9. The child can and does scan (using vision, touch, hearing, two objects. (Step 5)

_____ 10. The child uses the signal to indicate preference or choice within a reasonable period of time. (Step 5)

_____ 11. The child uses the signal to indicate preference or choice within a reasonable period of time. (Step 5)

_____ 12. The child uses the signal to indicate a choice between two pictures objects/events. (Step 7)

_____ 13. The child is reinforced when the selected item is received. (Step 7)

_____ 14. The child scans pictures when 3 or more are present. (Step 8)

_____ 15. The best placement of pictures to ensure a reliable response from the child is known. (Step 8)

_____ 16. The maximum number of pictures that this child can use reliably is known. (Step 8)

Figure VI. University of Chapel Hill, North Carolina's PREREQUISITES AUGMENTATIVECOMMUNICATION ASSESSMENT CHECKLIST (√ = yes)

As it's name implies, it is a program developed to ensure that the prerequisite skills are in place and provides the guidelines and directions to do so. The steps of this training program are sequentially arranged in graduated difficulty and each has a pretest, a training procedure and post test criteria to be passed before moving on to the next step. While this specific ACS training was underway, additional sources of language training were also introduced. The shaping of yes and no responses was undertaken. A red circle with the word NO and a green circle with YES were mounted on the subjects tray. As questions regarding familiar people and objects were asked, e.g., "Is this Mom ", "is this apple", the correct responses were modelled (verbally) and paired with the appropriate gesture. Smiling, eye blinks and nodding were used for yes and quieting and shaking head were used for no. For each response, the stimuli (words, object, or picture) and method used was recorded. A tally of responses was kept with 7 out of 10 needed for mastery.

Vocabulary and concept development was introduced concretely, at first and later with pictures and graphics via an Apple 11GS Computer . It is well accepted that children initially learn best through concrete experiences with their environment. Seeing and manipulating an object and hearing the name for it (labelling) helps children become familiar with the objects in their world. Only after they have come to understand what the actual object is will they then realize that miniatures, photographs, pictures and drawings of that object are related to it. Because we were unsure just at what level of this hierarchy the subject was functioning, it was necessary to expose her to all levels for this aspect of language training.

Initially, she was asked to make choices between the objects on her wheelchair tray, e.g., "Show me ball", "Cookie", etc. Then pictures were introduced using the same request and gradually adding a third choice. Eventually computer programs with basic

vocabulary were tackled. Responses were tallied and again 7 out of 10 was considered mastery.

A variety of simple electronic devices, such as a dial scanner, light scanner and communication board were selected and used for trial periods to reinforce language learning and to establish the power of communication. Additionally, training took place with a variety of switches and access sites to encourage the best possible response. Vocabulary that was familiar to the subject was selected for use with these new devices as they were introduced. Each piece of equipment was demonstrated and used for a minimum of 6 weeks. Responses were tallied to determine the success rate of each. Finally, sophisticated electronic communication devices with verbal output and scanning access were introduced and trained. The Real Voice Communication Output Device and Dynavox were programmed with appropriate vocabulary and trained daily for approximately 8 months. The subject had to scan the 8 pictures, choose one and through switch access advise the trainers of her choice of activity or food. All training sessions were be carried out within the daily language training times (30 minutes), and data was collected.

Condition 2: Cognitive Training and Language Training

The subject in this treatment received daily training in visual pursuit and the permanence of objects and causality based on Kahn's (1984) training program (see Appendix III) and causality. Certain modifications needed to be made due to the subject's motoric involvement and inability to reach for the hidden object. Instead, questions were asked which encouraged the subject to indicate her response. Eye gaze or any other idosyncratic gesture or movement was encouraged and accepted if both trainers agreed that the response was a purposeful signal.

Causality was trained following Dunst's (1980) training procedure (see

Appendix IV). Again, modifications were necessary because the subject did not have voluntary limb movement. Instead of hand manipulation she used a chin switch to activate various toys and objects. A computer with cause and effect training activities was employed as well as devices for environmental control such as a tape recorder, popcorn popper, fan, radio, blender, hair blower, and electric wheelchair to teach the concepts of causality. The subject learned that each time she activated her chin switch by dropping her head down and hitting it with her chin, that she was causing an action to occur either on the computer or in her environment. Responses were tallied out of 10 attempts.

The concurrent language training encouraged eye pointing and light pointing skills (light attached to headband which shines light on choice), in addition to choice making opportunities (between food and activities), vocabulary, language and concept development (concretely, pictorially, and graphically on the computer) and yes/no response shaping as described in treatment one. Unlike Kahn, however the subject did not have to reach the highest level in object permanence and causality before language training commenced. Data was collected from all tasks.

Condition 3: Cognitive Training

The subject undergoing this treatment procedure received means-end and spatial relationships training. The Means-End program adapted by Kahn (1984) was used (see Appendix VI), although again, further modification was necessary since all of Kahn's subjects were able to voluntarily move at least one arm and this subject could not. Dunst's training program for spatial relationships was followed since vision did not appear to be impaired and ability to track and scan was evident. Once again, however, the substeps beyond scale step 7 required action on the subjects part, so modifications were necessary to ensure that the subject could observe the stimuli and then respond to

indicate her choice. This cognitive training continued for the duration and was to be followed by language training when mastery was reached. This training is outlined below.

CONSTRUCTION OF OBJECTS IN SPACE

1. Searches for sound with eyes.
2. Alternates glance slowly between two visually presented objects.
3. Alternates glance rapidly between two visually presented objects.
4. Localizes the source of sound.
5. Secures visually presented objects
6. Follows trajectory of objects falling within view.
7. Follows trajectory of objects falling out of view.
8. Turns mirror over to view functional side.
9. Turns photograph or other picture around to view functional side.
10. Rotates three-dimensional objects to view functional side.
11. Places (drops) objects into a container.
12. Stirs with a spoon in a cup.
13. Uses hammer-stick to play xylophone
14. Bangs spoon on inverted cup.
15. Dumps contents out of a narrow-necked container.
16. Places objects into a cup-dumps out contents.
17. Builds tower of two cubes.
18. Places rings on a stacking stick.
19. Allows an object to move down an incline.
20. Makes simple detour to obtain a desired object.
21. Makes complex detour from cul-de-sac to obtain a desired object.

22. Indicates the absence of familiar persons.

DESIGN AND DATA ANALYSIS

The research method used in this study is that of a descriptive case study approach. Descriptive research involves collecting data in order to test hypotheses and answer questions concerning the current status of the subject in the study. This study used observation and interviews as the means of collecting data.

Case studies were undertaken where subjects were assigned to the treatment condition in the experiment and given only one of the treatments. There was an equal number of subjects and treatment conditions and the subjects were matched closely on the relevant characteristics of age, gender, physical disability and communicative and cognitive level.

A count of frequency of the observed communicative behaviours from baseline to post treatment was taken for each subject. These data were compared to see if there was an increase in communicative development and cognitive functioning after the treatments. The data for each condition were also compared to establish if one of the conditions was more effective in affecting change and promoting growth in expressive language via augmentative and alternative communication systems. The data analysis in this study is presented through visual inspection and analysis of graphic presentation of results.

Although this study originally set out to replicate Kahn's (1984) study, it became unrealistic to compare it statistically because of the difference in number of subjects which has also resulted in an alternative design. While Kahn had three groups of eight subjects each, his findings indicated that the group receiving cognitive training showed increased ability to acquire expressive language, and the group

receiving language training only progressed the least. The present study, although using a case study approach has also demonstrated the effects that the various treatments have on cognitive and language development, thereby providing a means of comparison between Kahn's study and the present results.

The format was appropriate in this case due to the small numbers involved and because it afforded the opportunity to realize the effectiveness of treatments for each participant. The overriding objective was the identification of intervention strategies which would change the behaviour of the subject involved, that in this case was effectively developing communication behaviour.

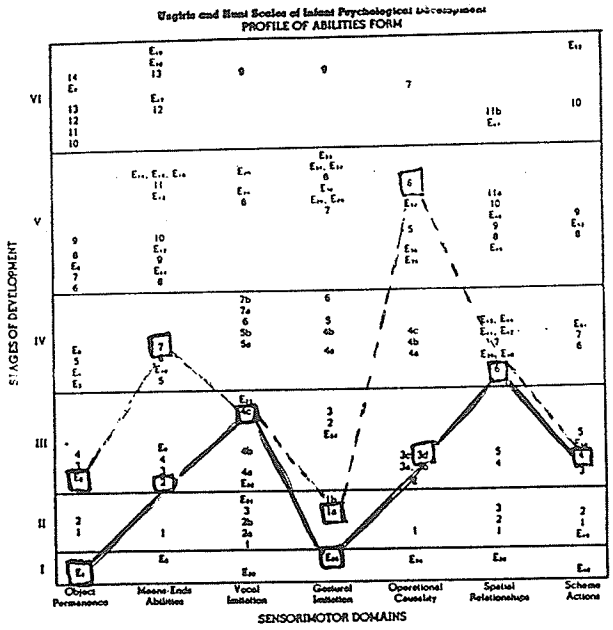
RESULTS

After the treatment conditions were completed, post test data was obtained for both cognitive functioning and communication competence and compared to the baselines. The subjects in all treatment conditions showed an increase in both their cognitive functioning as measured on the Uzgiris and Hunt Scales (1980) and in their communicative status.

Figure VII shows the profiles of the pre and post test scores for each subject obtained on the Uzgiris and Hunt Scales (1980). Although none of the subjects attained overall Stage VI functioning or even demonstrated Stage VI functioning in any individual sensorimotor domain, increases in each subjects level of cognitive functioning were noted across most domains. Although it is difficult to judge what improvement might have been considered "significant", it was anticipated that growth to the sixth stage of attainment might have been realized, as in Kahn's study. This was not the case.

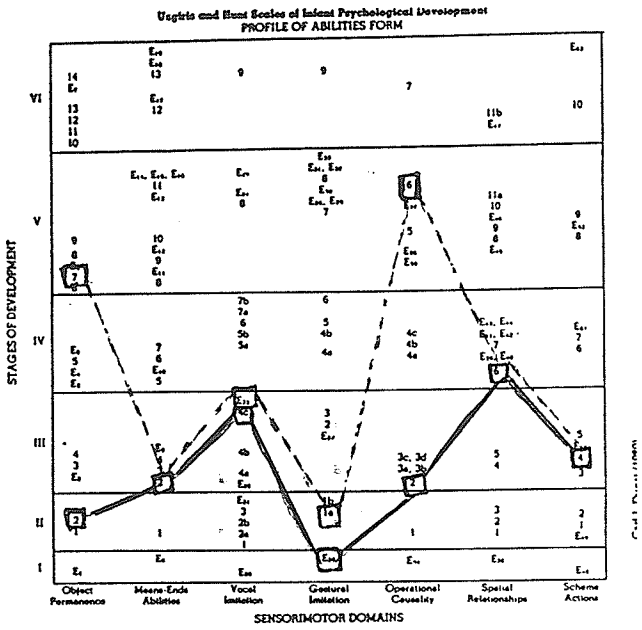
As is evident on the following profiles, most of each subjects cognitive functioning fell below Stage IV prior to the treatments. After the interventions, increased functioning was noted in all areas except for gestural imitation and schemes for relating to objects. The greatest increases were noted in object permanence, means-end, and operational causality, all areas for which specific skill training was received.

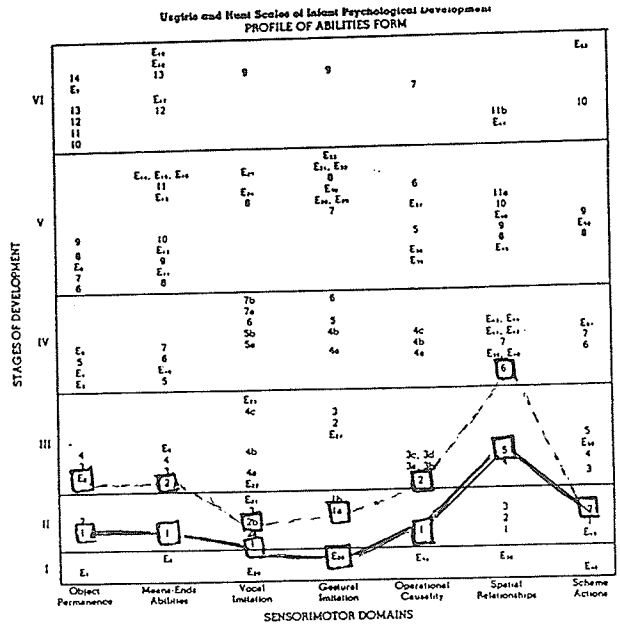
Improvement was also noted in some domains for which no specific training was received. This generalization was similarly reported by Kahn (1978) and Henry (1977) in their studies on accelerating cognitive development.



Subject AE

Subject SA





Subject EB

Pretest
Post test

Figure 7. Subjects' pre and post profiles on Piaget's Sensorimotor Domains

It had been anticipated that even though the subjects had motoric difficulties which interfered with critical behaviours necessary for object permanence and means-end tasks, that during the training period the trainers might be able to get the children to indicate through some other means (e.g., eye gaze) the "correct" response which might have permitted attainment of Level VI. Such was not the case except in causality (Level VI almost reached) where liberal interpretation of Dunst's program was taken and utilized functional everyday items (e.g., popcorn popper, blender, tape recorder, fan, hair blower) instead of toys.

The amount of and appropriateness of interpretation in this whole study was very difficult to ascertain. If no extrapolation or modifications were made, the scale would have little relevance or usefulness to the severely and multi-handicapped population at all, as most higher level tasks would be impossiblities in all domains. However, finding that comfort zone where extrapolation of the task to what "seemed" a justifiable modification and yet remaining objective about the very nature of the task was a major concern. For example, in the Development of Schemes for Relating to Objects, most critical behaviours required action (or manipulation as in most of the domains). While the subjects could not "rotate", "examine", "drop", "throw", "hug", or even "give", they could "show objects to others" if their environment was accordingly engineered. If objects were displayed on their wheelchair tray or on a computer screen, and they were asked to "point to the cookie" would they not be "showing the object?" Liberal interpretation was sometimes necessary but it was also important to adhere as closely as possible to the critical behaviours as outlined.

Just as cognitive functioning increased across all treatment conditions, so did communicative competence. The following figure shows these increases for each subject.

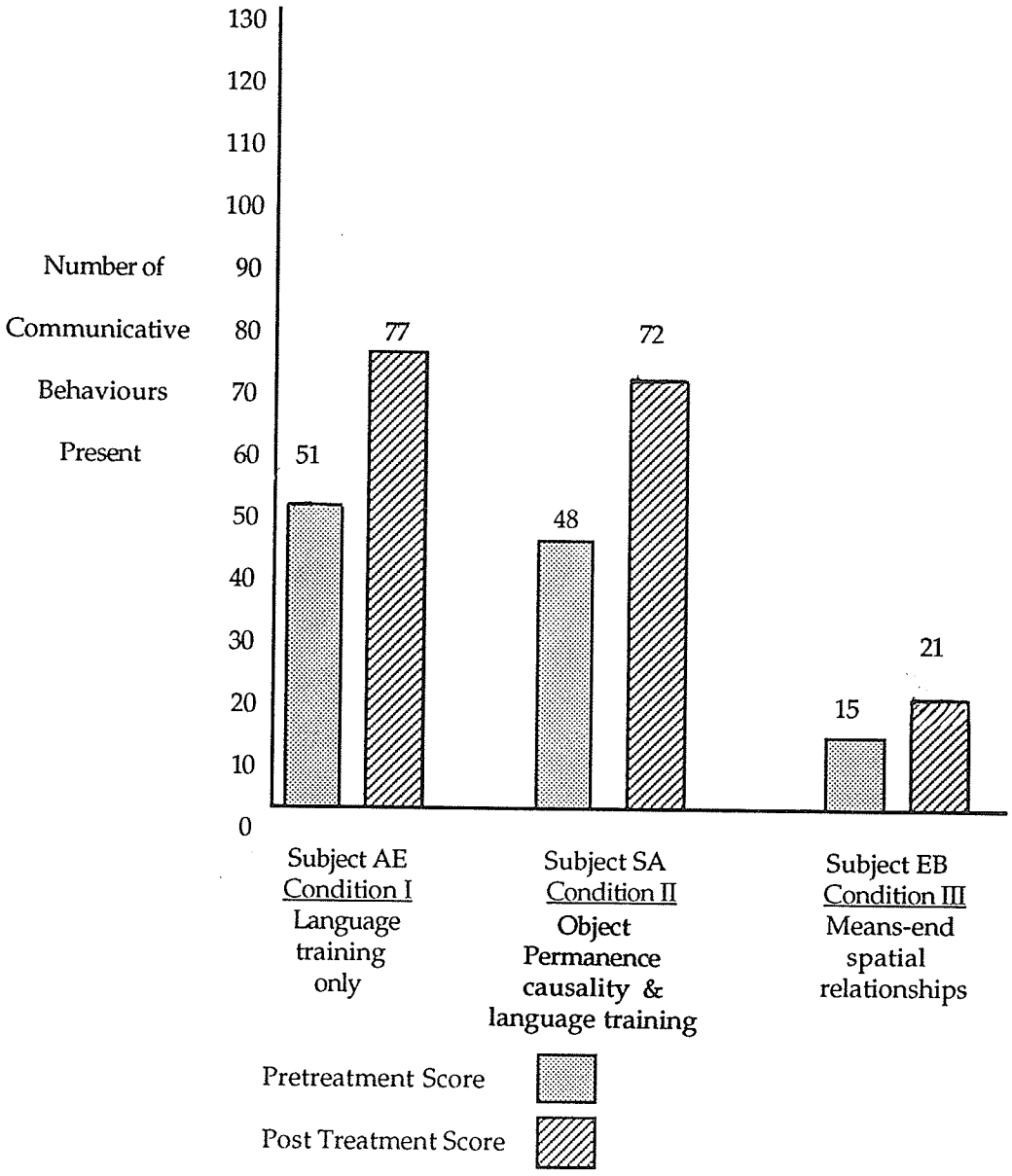


Figure 8. Improvement in communication functioning for each subject in each treatment condition.

It is noted that the largest language increase occurred in Condition I with language training only, followed by Condition II which included both cognitive and language training. Condition III, which had only minimal language training because it concentrated on first establishing cognitive abilities, showed the least growth in language development. Unlike Kahn who found that both conditions receiving cognitive training improved, while his language training only group did not, this study found that all conditions afforded some increase in communicative ability. The two conditions providing cognitive training however, showed less growth than did the language training only group. Condition III with the greatest amount of cognitive training improved the least. These results are in direct opposition to what Kahn reported.

For the sake of argument, if the subjects in Condition I and II had been in Kahn's study they would have had little opportunity to improve their language skills because they had not yet demonstrated Stage VI functioning. Instead they would have been subjected to the same cognitive training situation each day for two years unless they mastered the skill and progressed to the next level. In this study, however, their language skills improved, a) because of the language training in general, b) because of the variety in language training, or c) because of the combination of both cognitive and language training.

According to Kahn (1980) and Bates et al. (1975) means-end cognitive training is the best indicator of and the most important for initial use of referential speech. In their studies it did appear to improve language development, however in this study means-end training did not significantly improve the subjects ability to learn language. It, in fact, resulted in the least improvement.

In addition to the hard data, substantial anecdotal information was obtained

about each subject and her treatment condition. Experiences, observations, and comments from the trainers, parents, peers, and raters provided valuable results and were collected during the various interventions. The trainers' observations were especially useful because they worked so closely with the children each day and had the opportunity to observe and compare their own experiences with the subjects to those with others. They noted details such as whether or not generalization of skills were occurring to specific situations; what particular stimuli sparked interest, excitement, and interactions; what frustrations or barriers were encountered; what kind of motivation or encouragement worked best; and very significantly, the impact on each subject of their fragile and varying health conditions.

Each trainer kept an extensive log of the child's daily activities. In it they recorded the results of each skill training activity, physio and occupational therapy, field trips, amount of food consumed, toileting patterns, problems encountered, medical concerns (e.g., seizures, fever, stomach upsets, etc.) and any other remarkable event. This log went home daily for parents to read and was returned the next day with comments and new information if necessary. Using this as a vehicle of communication between home and school, the school was kept updated on the children's physical conditions as well as events in their personal lives which might be appropriate topics of conversation during the school day. The trainers felt this exchange of information was critical to the experimental process because the parents often reported that the students were not feeling well or were highly medicated which of course affected the daily program and the outcome of training sessions, if undertaken.

The fragile health of the subjects was constantly an issue to be reckoned with during this study. There were some periods of time where they endured illness or physical problems causing obvious discomfort and pain. During these times the

children could not focus on any task either at all or for more than a few minutes at a time. Sometimes they were so heavily sedated that they exhibited side effects and slept much of the day.

Subject EB who had a diagnosis of cerebral palsy and seizure disorder was affected to the greatest extent by poor health. Ongoing seizure activity seemed to greatly reduce her capabilities and she was frequently heavily medicated and sleepy. Although her cognitive training program was attempted regularly, it was not always possible, placing her at a much higher risk level for receiving little or no stimulation. Efforts were therefore made to bombard her with tactile, auditory and visual stimulation to compensate for the lack of regular stimulation.

Until the age of 9 EB was fed orally however, when she began to choke and gag to such an extent that it became dangerous, a tube was inserted directly into her stomach for feeding. This procedure caused a natural lack of oral stimulation which was compensated for by gently vibrating her mouth, lips, cheeks, and throat. This stimulation however, appeared to be very distressing to her and ended after a few months. Her ability to vocalize and smile also disappeared with the oral stimulation.

After several months of tube feeding, some of EB's weight and strength returned. Her seizure activity lessened due to new medication, and she appeared much more alert and comfortable. Cognitive training continued but it was observed that because of her fragile health, fewer expectations were made of her and little improvement was noted. Because she was a good size for her age, moving and positioning her was back stressing, resulting in the training of three teacher assistants over the two year period. Becoming comfortable with the subject and continuing to stimulate and interact with her with no reciprocation was an ongoing concern and in reality probably contributed in part to the minimal growth in both cognitive skill and

communication. The raters and trainers along with her family, realized the importance of continuing all interventions, especially as her peers and other adults gradually began to withdraw. Her fragility and lack of response frightened some. Her peer group waned. One trainer remarked "It's sometimes as though they don't see her as a person. They don't acknowledge her presence."

Subject SA, who had Rett Syndrome including the affiliated hand sterotypies, received both cognitive and communication training. In order to indicate her choices to remove screens in the object permanence training, it was necessary to train language as well. Her trainers indicated that it was very difficult to acertain through her ususal channels of eye gaze, head pointing, and switch response if she was comprehending the cognitive tasks within the object permanence training program. They also questioned the possibility of learned helplessness. Perhaps this subject did not indicate to remove the screens because she has never had the opportunity to experience the process and learn from it. Perhaps she had never needed to. It was observed that her lunch was always removed from the bag and unwrapped for her and her juice or milk always appeared before her ready for drinking without any indication on her part or request from her trainer. Her gifts were always opened for her and her lunch kit was always emptied. Perhaps these were perfect opportunities lost over the years to teach functional object permanence. When discussed with her trainer as purposeful and possibly helpful actions, it was discarded quickly as "mean" and possibly "teasing".

Because SA seizured occasionally upon becoming very excited, the enthusiasm and intensity of her interventions were affected. Her trainers seemed reluctant to really challenge her and were hesitant about adopting either a playful or firm voice. With the increase in calm came a decrease in affect and eventually in expectation. The raters noted this phenomena, which, like subject EB, resulted in less interaction from

adults. Peers, however, continued to interact. They didn't worry about overstimulation. Her smiles and occasional laughter seem to provide a reciprocal link to her peers. They often "hung out" with her at noon, pushed her around the halls in her wheelchair, or "assisted" her in a classroom project. The trainers saw these peer interactions as the critical elements in her program. They felt that the cognitive and language training in general expanded the communicative base from which she could operate. Her positive reaction to most people strengthened both the intensity and the power of the interaction and increased the liklihood that it would be repeated on the next opportunity.

Subject AE is diagnosed with spastic cerebral palsy and severe scoliosis, visual impairment and is medically fragile. She has learned to operate a knee switch with a fair degree of accuracy. Her trainers reported that although the data showed a successful response rate of approximately 50 - 60%, it was their feeling that the low rate was due to a body which wouldn't co-operate with the mind. If a timed response was required (such as on a computer or dial scan) she had great difficulty co-ordinating her efforts for a successful response. The trainers commented that it was important therefore to reword the request and ask it from a different angle and response format to determine if she really knew the answer. Their feeling was that she understood both the question and the answer but simply could not physically come up with the correct response. In reality, however, they couldn't really explain the low scores. They had the feeling she knew more but couldn't obtain the hard data to prove it.

A variety of strategies to get to the same response were built into her language program to avoid boredom and increase the chance of success. The trainers suggested that this apporach was fun and stimulating for the subject and themselves and felt they demonstrated an increased enthusiasm while engaging in the language training.

They also reported a much higher degree of responsiveness than either of the cognitive training programs. It was observed that the language training promoted interaction which could be easily generalized to other situations and people. This in turn resulted in increased reactions to and attempts at further interactions. AE developed the greatest affect of all the subjects and automatically offers a smile and positive body language if a friendly greeting or remark is exchanged. Her trainers reported that they feel adults and peers alike are more likely to approach children who offer a positive response to the initial interaction and worked hard to establish that message. Therefore, both the subject and the trainers were rewarded by every successful interaction.

The power of the language training was much more evident in the anecdotal results than in the hard data. In all three cases it was apparent that the subjects responded to a much greater degree when relating to people than they did when relating to an object. A major conclusion reported by the trainers in this study was that the subjects who were given language training developed a much greater affect than they previously exhibited. Their body language including vocal attempts, imitative behavior attempts, smiling, eye contact, and other awareness behaviors, however manifested, prompted others to initiate interactions with them, thus reinforcing the power of communication attempts. The trainers felt that these interactions, in turn, increased language attempts and further development. The subjects receiving cognitive training did not get the extra advantage of these powerful communication interactions and the trainers were concerned that by the very nature of the cognitive task that we were setting the children up for failure. Not only did they feel, in these cases, that we weren't promoting language development, they felt that we were reducing the chance of them taking a risk the next time. Gradually, they noted a disinterest and a marked

decrease in attempts, both in the task being trained and in communication in general. With reduced reaction on the subjects part, a marked decrease was also noted in the interactive attempts by adults in the child's environment. It is possible and likely that after repeated attempts at an interaction with no response elicited on the child's part, that others in the environment, including adults and peers will eventually stop initiating interactions upon receiving no reward for their attempts. The trainers were worried that a general reduction of any sort in terms of personal interaction with these children was very concerning especially given the already limited amounts of stimulation they receive from their world. The trainers therefore sometimes wondered aloud at the rationale of training cognitive tasks. Perhaps, in this day of social integration and functional special education, it is a valid question to ask.

Piaget posited in his theory, that the training of cognitive structures, while possible, was not advisable because of potential complications. He believed that a child who is pushed to develop cognitive structures will not learn them as well as children who are allowed to develop them in a more "natural" manner and that the incomplete nature of this learning could have implications for later learning. Kahn (1984) suggested that if Piaget was correct about the effects of training cognitive structures, then his subjects who received cognitive training should have shown little or no benefits from such training. That was not the case in his studies. This study however supports Piaget's theory; that accelerating cognitive training does not promote language learning and that language training itself is the best approach to effective communication development for severely multi-handicapped school aged children.

DISCUSSION

It would appear from the results of this study that Kahn's findings have not been supported. Cognitive training was not the major factor in improving language learning. Thus, Kahn's conclusion "that it seems obvious that children below the beginning of Stage VI on both object permanence and means-end should receive cognitive training before speech training" and that "this study is especially obvious and important to those responsible for the development of speech and language with severely and profoundly retarded clients" are also not supported. These conclusions would delay the implementation of a speech language program, or, as in this study, an augmentative and alternative communication program. We have seen that it is in fact the language training itself that is responsible for the development of communicative skills.

Similarly, it was noted that Stage VI functioning is not necessary for the implementation of an augmentative and alternative communication system.

Taking the results of this study into account as well as the anecdotal information and observations that were accumulated during the process, Hypothesis #1 "It is not necessary for nonverbal multi-handicapped children to have reached Stage VI functioning for successful AAC language learning to occur" is supported.

This study validates the "why wait" group of researchers in their position that it is not necessary to delay the introduction of an ACS until Stage VI is achieved and in fact, is in the child's best interest to do so.

Hypothesis #2 that "multi-handicapped children who have not attained Stage VI functioning would derive greater benefit from language training than cognitive

training (object permanence)" is also supported. Although some improvement was noted in the object permanence condition, it was impossible to separate it from language. Hence the cause of the improvement noted is unclear. Perhaps it was the object permanence training but because the language training condition only showed such improvement, it is likely that the added language component had a major impact on the result. This data in addition to the arguments developed by the anecdotal information leads to the fairly strong conclusion that language did indeed play a major role on the results of Condition 1.

Hypothesis #3 that "multi-handicapped children who have not attained Stage VI functioning would derive greater benefit from language training than cognitive training (means-end)" is also clearly supported. In this condition, less language was required and the outcome is clearer. Means-end training only slightly increased communication functioning and had minimal effect on the overall cognitive performance.

While the strength of argument appears to favour the results as described and noted on the previous graphs, we must be careful to interpret with caution because it has been noted that there are alternative perspectives to the interpretation. If, for example, one were to consider percentage increase in each of the conditions instead of numerical increases, the results would be less conclusive. Condition I with language training would only produce a 66.2% increase while Condition II with object permanence and language training would get 66.6%. Using the same formula, Condition III would afford a 71% increase indicating that the pretreatment score of 15 is 71% of the post treatment score.

Similarly, if one were to calculate the increase in the percentage between the pretreatment scores and the post treatment scores, the results would be 33.8%, 33.4%,

and 29% respectively.

As with most research, the results of this study must be considered with caution. Given the possibility of various interpretations of the same data, one might safely conclude that while the results are suggestive, further research is needed before conclusive formuations are to be made.

Although group designs are often the preferred method of experimental research because the results can be generalized to the population of interest, they may not accurately reflect the performance of any individual within the group. Because subjects in the field of special education challenge researchers with such diverse needs and abilities it is even more valid to look at individual rather than group data. For this very reason, the uniqueness of each child, control groups, pairing, matching, and replication are not always possible.

Therefore, although this study began with the idea of replicating Kahn's study to see if his results could be generalized to the severely multi-handicapped population, it became quickly apparent that major dilemmas and obstacles were to be encountered. However, the investigation into this relatively untravelled territory and the insights it provided regarding basic assumptions made of this population and the resulting educational programs and directives were invaluable. Because of the small number of subjects and impossibility of finding matched subjects it was necessary to gather descriptive data using a case study approach. Numerous questions and issues arose as did points for discussion and clarification and confounding variables were experienced. They all deserve explanation.

The major confounding variable that was encountered in this study was the overlap that occurred in both the cognitive and language training. In training the cognitive abilities of object permanence, means end, causality and spatial

relationships, it was necessary not only to use language to explain the tasks and how the child was to respond, but also to rely on indications of response that had to be trained (using language) as well. Unlike Kahn who had a straight forward approach to his cognitive training activities (no words) and his language training ("What is this"), modifications and liberal interpretation were necessary to allow the multi-handicapped children to participate and the study to proceed. It was necessary to establish a consistent method of response to see if the subjects understood such actions and concepts as removing screens, hidden objects, securing items and causality in the various training program. Thus, the sensorimotor task performance and language ability was confounded on these items. Snyder, McLean, McLean & Etter (1988) suggest that in situations such as this where the two are confounded that it becomes meaningless to talk about the relationship between language and sensorimotor status for the affected scales and stages.

While Kahn referred to the "language training" portions of his studies as speech training, linguistic training, and oral language training, (often using them interchangeably) it was felt that he himself often confounded the language task. While on one hand during his language training activites he requested his subjects to label objects (using both speech and language) he concluded that none of the subjects in the language training only treatment reached a "linguistic or speech" phase of training. In fact, they were doing just that. Using speech to label is a language function. In this present study it was found necessary to refer to a broader sense of language development than Kahn did. Communication development and competence encompassed vocalizations, smiles, facial expression, eye movement, and body language in general, in addition to the regular features associated with speech and language. Because some of the subjects interact regularly with their world at these prelinguistic levels, it was

necessary to look at these critical behaviours. Similarly, parallels really couldn't be made between the single word labelling response that was required in Kahn's "language training" and the complex eye gazing, light pointing or dial scan responses that were requested from the nonverbal children.

Kahn's language training program did not vary in its approach. If an object was presented and the child did not give the correct response the same procedure was undertaken again and again. Therefore if repeated efforts to train a subject in a given step were unsuccessful, overlearning of the preceding steps was implemented. The language training in this study used various training tasks to try and capitalize on both learning styles and strengths.

It was noted that the object permanence training proceeded with little difficulty while eye gaze responses were required but when the correct response required that the subject pull off the cover, problems arose. Because the subject could not physically remove the cover she had to be given the opportunity to choose the appropriate response (via eye gaze). This means of discovery did not provide the same reinforcement or have the same effect as that observed in natural "self discovery." Multi-handicapped children do not have this physical experience to draw on. Object permanence is highly experiential and includes holding, grabbing, and securing objects. Their physical impairment interferes with their ability to "make something happen" by exploration or manipulation of toys and objects. As a result these children have little opportunity to gain experience through interaction with objects or others and in fact cannot participate in this highly experimental physical discovery period. It certainly gives rise to the following question. If environment is an important determinant in Piaget's Theory, and the multi-handicapped have such little opportunity to explore it, to manipulate objects in it and to interact with people within

it, then is this theory based on normal childhood development the correct framework to be working from when we are considering language assessment, training and programming for this population? Additionally, should it be shaping major educational decisions, or further still, should it be considered at all in the lives of severely multi-handicapped children?

Kahn reports that his findings are in part supportive of Piaget's Theory and in part in conflict with it. Piaget is opposed to the training of his theoretical concepts. He believes that the stage related concepts, which are the basis for his theory, can not be taught. Rather, they must be acquired through the developmental process (Piaget, 1970). Yet, Kahn and his colleagues have not only taught children sensorimotor concepts through direct intervention, but delay language training until this is achieved. Still, Kahn says that overall, his findings are supportive of the Piagetian proposition that the learning of particular skills is dependent upon the prior acquisition of a particular level of cognitive functioning. Again a question is raised. Is this theory appropriate to the application of the multi-handicapped population when they can demonstrate language learning without stage VI functioning in any domain?

Kahn's conclusion that cognitive training was the key factor in language development was not supported by this study. Instead, it revealed that language training itself was more important in the development of language. Upon reflecting on the discrepency between these two studies, several questions spring to mind ... How did Kahn know that it was the cognitive training that accounted for the language growth? The cognitive training was only for 20 minutes each day. Why couldn't the factor responsible arise from another situation entirely, such as a language experience like bath time, meal time, a walk outside, or a group activity? Perhaps other one-on-one or group interactions that occurred with his subjects throughout their day provided

language rich experiences, stimulation or positive feedback that could have accounted for the increase in language development. This study certainly found greater reasoning in the notion that positive language interactions would give rise to repeated language opportunities and therefore growth.

Because the Uzgiris and Hunt Scales (1975) were developed for and validated with the population of normally developing infants, it is difficult to interpret the performance of older severely handicapped individuals on many items. The physical size and experiential history of these children change the nature of items so they do not represent the type of problem solving that they do for a very young child (Snyder, McLean et al, 1988). As well, many nonverbal multi-handicapped children are unable to provide the variety of motor responses and language skills requested on the Uzgiris and Hunt Scale. When this situation arises, does it then reflect a cognitive sensorimotor deficit or a highly specific neuromotor disability?

Similarly, can the severely handicapped child who can not speak and therefore is unable to name the items on Step 10 (Stage VI) of the Schemes for Relating to Objects subscale, ever achieve Stage VI on this scale? Also, to achieve Stage VI on the Object Relations in Space Scale, they must indicate the absence of a familiar person, in response to "where is _____?" If they can't indicate, they can't achieve Stage VI on this sub scale either. A myriad of similar problems was evident throughout the scale.

Therefore, in order to use these scales to assess the subjects in this study, some interpretations and adaptations were made. Functional age appropriate items were used instead of toys. Pictures of possible responses were given as choices. Directions were repeated and reworded and responses were modelled and reinforced. Consistent responses were trained in a variety of forms. Although levels of attainment were

eventually assigned, several concerns arose in the process. The main problem was that language and cognition were again confounded. Were the subjects therefore receiving a fair and accurate measure of their abilities and conversely, were we measuring what we thought we were measuring? Did the liberal interpretation or modifications interfere with the very nature of this task? It is a futile argument because while the answer might be yes, the modifications were necessary to explore the issue at all.

The most critical problem Snyder, McLean et al (1988) have identified in using the Uzgiris and Hunt (1975) Scale is the small number of items or "critical actions" that are used to make judgements about a clients stage status on each of the subscales. They have summarized the number of critical actions associated with each stage in each scale based on Dunst's (1980) analysis. They found that of the 35 stage VI scale cells, there are 12 cases in which only 2 critical actions are used to assign a stage, and 9 cases where it is based on only 1 critical action response. They suggest that this is not an appropriate means of assigning stages for a severely handicapped child due to their typical inconsistent responses on test tasks attributable to inattention, lack of motivation, and highly specific skills deficits. They also state that similar reliability and validity must be demonstrated if infant measures of sensorimotor skills are to be used with severely handicapped clients.

The issue is complex. While it is agreed that assessment in general is necessary and that cognitive abilities must be reflected in the overall evaluation, indicating that an individual is functioning at sensorimotor III or IV or VI has little meaning unless the specific measures, procedures and nature of the materials used to determine the stage are also reported. Also, the efficacy of applying norms derived from child development with this population is questioned. We must be cautious about extending assumptions from normally developing children with normal experiences to learners

with multi-handicapping conditions who have had very different experiential opportunities.

It has been discovered that numerous theories and opinions stress the dependence of language development on prior cognitive and perceptual growth. However, empirical support for these positions is often absent and the theories themselves are difficult to translate into intervention strategies for teaching language. A further difficulty is that much of the supporting information that is available comes from literature on normal infant and child development.

Language intervention programs often fail with severely and profoundly retarded persons because most attempts to teach low level individuals have been based on programs or training procedures developed primarily for higher functioning children (Guess, Wilcox and Brown, 1988). Perhaps similarly, we are attempting to use programs that have been established for severely and profoundly retarded individuals for use with the multi-handicapped population. Kangas and Lloyd (1988) suggest we are and that we need to be cautious about such assumptions. Furthermore, we are basing these actions on a theory of normal childhood development. Guess, Sailor, Keough and Baer (1976) suggest that while there is certainly the temptation to use the structure of normally developing language as the base for teaching nonspeech modes, there are indications that severely handicapped, language delayed children do not follow the same sequence of language development observed in nonhandicapped children (Guess, Wilcox, Brown, 1988). If so, this would eliminate the reason for looking at the parallel in the first place. These kinds of doubts in addition to those raised within the present study seem to lead us to the reasonable conclusion that Piagetian Theory may not be the appropriate framework on which to base interventions for multi-handicapped children. Piaget's Theory itself, the Uzgiris and Hunt Scales which are based upon it,

and the many studies which validate it's usefulness with other populations are all to be approached with caution when discussing the applicability of Piagetian Theory, study and training programs to nonverbal severely multi-handicapped children.

As educators we are aware that ineffective and inefficient communication profoundly limits social, educational and ultimately vocational opportunities. We are also aware through the use of augmentative and alternative communication systems, that more children are able to participate to a greater extent in all aspects of daily living. Augmentative and alternative communication is an area of clinical practise that is here to stay; not just in clinics but in classrooms as well.

We must realize that we are continuing to operate educationally with many assumptions and procedures that do not have the support of quantitative or qualitative data. Such assumptions have impacted on treatment programs for multi-handicapped children in that they have led to delaying or denying the provision of augmentative or alternative communication systems. As with most educational programming dilemmas, the most effective treatment intervention will eventually be developed by selecting and adapting several program suggestions. So it is with AAC. We need to consider all possible and meaningful avenues and do what we feel is the best practise for each child. It may be that the appropriate selection and teaching of AAC approaches will facilitate the goals of functional communication for some individuals without necessarily advancing the developmental level of either the cognitive or language abilities (Kangas and Lloyd, 1988). While language itself is age old, we are in just the infancy of a rapidly changing technological explosion, which will continue to raise new questions for our school-aged children with severe multi-handicaps. One can only speculate on the many additional ways that technological advances will continue to improve both the communication system components and the skill development

programs for individuals using special augmentative communication techniques. It should be remembered, however, that some of the most powerful and effective advances have been and continue to be in such "nontechnical" areas as assessment techniques, training approaches and materials, and the development and documentation of better interaction strategies. It is essential that we explore each area to facilitate the development of communication skills. While various approaches continue to evolve and researchers continue to study and argue the cognitive prerequisite theory, especially as it pertains to severely multi-handicapped children, little empirical evidence in the field exists. We must strive to strengthen our research base if we expect to provide efficient and effective communication programs in educational settings. In the meantime, we must not allow decisions based on other populations to interfere with these children's right to communicate.

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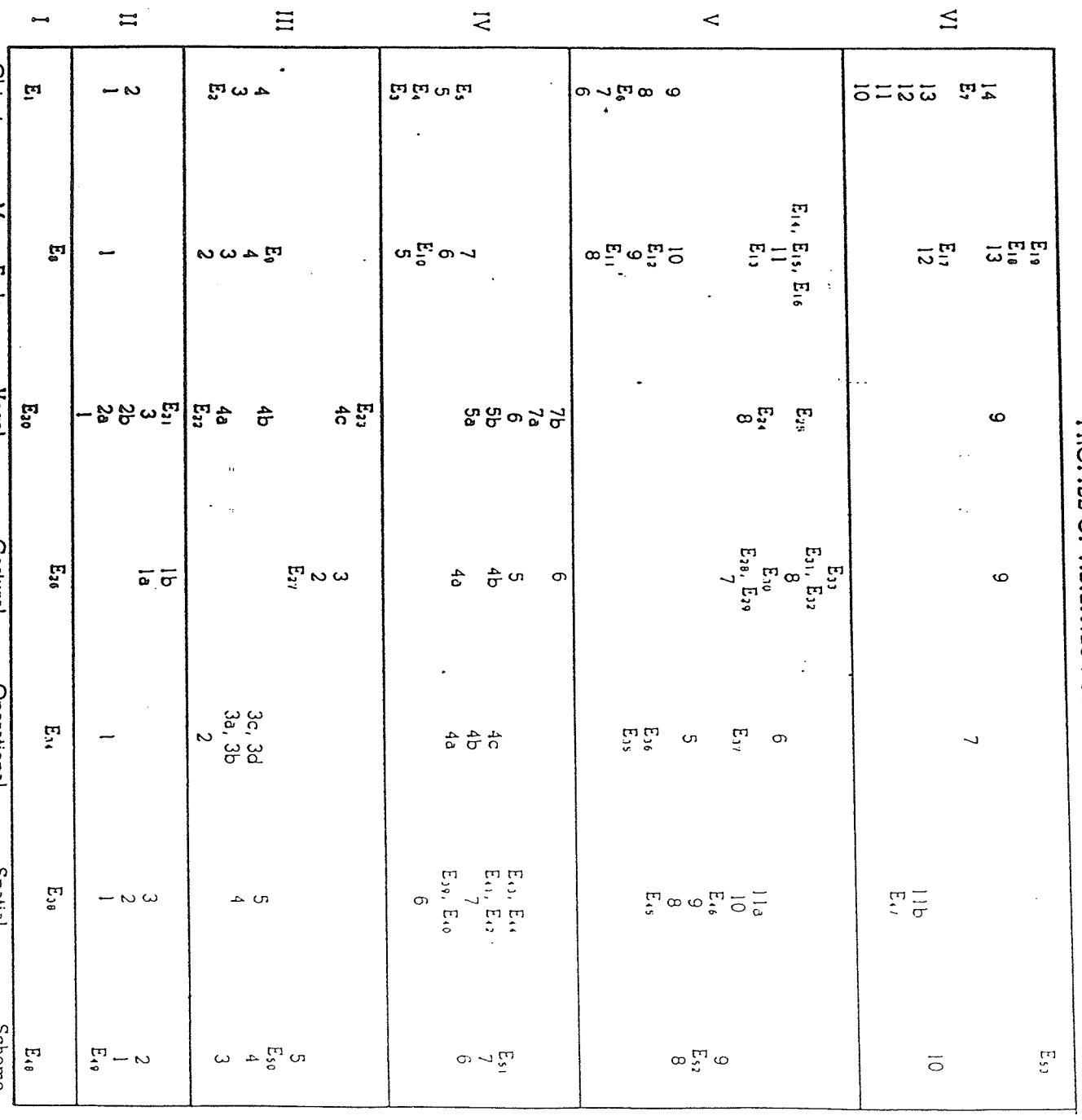
APPENDIX I

Appendix I

Child's Name _____ Sex____
Date of Birth_____ Date of Test_____ Age____
Examiner _____
Comments:



Carl J. Dunst (1980)

APPENDIX II

Appendix II

ASSESSMENT INFORMATION
COMMUNICATION

Student: _____ Date _____

Person completing form: _____

Title: _____

This form is to be completed by the speech language pathologist. We encourage you to consult with those involved in the student's care to establish an accurate record of the student's needs. (e.g. parent, teacher).

Please omit any question which are not appropriate to the student's current age or abilities.

I. COMMUNICATION: PRELINGUISTIC SKILLS

Please check and comment on applicable areas.

1. Goal oriented behaviours

☐ random, non-goal-directed behaviours

e.g. _____

_____

☐ repeats familiar routines in new situations

e.g. _____

_____

☐ uses adults to help in getting objects

e.g. _____

_____

☐ invents new ways to solve problems

e.g. _____

_____

2. Object understanding

☐ aware of objects not visibly present

e.g. _____

_____

☐ aware of location (e.g. food in refrigerator)

e.g. _____

_____

☐ aware of possession (own or family member)

e.g. _____

_____

☐ functional object use

e.g. _____

_____

☐ loses interest in objects if hidden

e.g. _____

_____

☐ not aware object is gone

e.g. _____

_____

☐ demonstrates preferences

e.g. _____

_____

☐ indicates choices (describe how)

e.g. _____

_____

3. Play routines

☐ plays with familiar person only

e.g. _____

_____

☐ initiates play with another person

e.g. _____

☐ watches others, but does not participate

e.g. _____

_____

☐ uses objects to pretend

e.g. _____

_____

☐ plays with new, unfamiliar persons

e.g. _____

_____

☐ uses appropriate sequence of routines in play

e.g. _____

_____

4. **Early language**

☐ **imitates motor patterns**

e.g. _____

_____

☐ **respond socially (e.g. eye contact, smiles, greets)**

Cognitive-perceptual functioning

A. Visual Skills

1. Attends to visual stimuli
   What kind? _____
   How long: _____

2. Recognizes some people
   Who? _____
   _____

   How indicated: _____
   _____
   _____

3. Recognizes common objects

   Examples _____

   How indicated? _____
   _____

4. Recognizes small replicas of common objects
   Examples _____
   How indicated? _____

5. Recognizes pictures
   _____ family _____ animals
   _____ self _____ objects

6. Can match

   _____ object to object (give examples) _____
   _____
   _____

   _____ object to picture (give examples) _____
   _____
   _____

   _____ picture to picture (give examples) _____
   _____
   _____

   _____ abstract forms

   _____ circle to circle _____ triangle to triangle
   _____ square to square _____ diamond to diamond

   Other _____

7. Can make choices

   _____ scan between 2 objects (give examples) _____
   _____

   _____ Indicate choice, how? (give examples) _____
   _____

   _____ scan between 2 real pictures (photographs) _____
   _____

   _____ indicate choice (give examples) _____
   _____

   _____ scan between 2 line drawings - Indicate choice (give examples) _____
   _____

B. Auditory

1. Attends to auditory stimuli
   What kind? _____
   How long? _____

2. Responds to speech
   _____ smiles when talked to
   _____ recognizes significant people's voices (ie. mother, father).
   _____ responds differently to pleasant and angry talking (give examples) _____
   _____
   _____

3. Responds to simple requests or instructions, e.g., "Look at (or point to)" or "where is?"

People
____ Parents _____ Teacher _____ Friend

Other (list) _____
_____

Real objects (list) _____
_____

Pictures (list) _____
_____

4. Shows recognition of the following when the words are spoken

____ own name

____ names of family members (list) _____
_____
_____

____ body parts (list) _____
_____
_____

____ concepts
____ more ____ in ____ up ____ little
____ big ____ out ____ down ____ one

Action words (list) _____
_____
_____

5. **Representational level**

Recognizes/understands

☐ Text

☐ written word

☐ symbols (specify) _____

☐ line drawings (specify) _____

☐ photos

☐ objects

II. COMMUNICATION: COMPREHENSION

1. Does the student demonstrate an understanding of:

☐ one page story without pictures

☐ one page story with pictures

☐ commands of two or more steps without gestures

- ☐ commands of two of more steps with gestures
- ☐ commands of one step without gesture
- ☐ commands of one step with gesture
- ☐ ten or more single words
- ☐ own name
- ☐ a few gestures

III. COMMUNICATION: NEED

Using speech or other methods of communication, rate the student's need to:

Level of Need

Currently Met	Mandatory	Desired	Not Needed	Communication Need
☐	☐	☐	☐	communication appropriate with adults
☐	☐	☐	☐	communication appropriate with peers
☐	☐	☐	☐	communication approp. with strangers
☐	☐	☐	☐	communication over the phone

Currently Met	Mandatory	Desired	Not Needed	Communication Need
☐	☐	☐	☐	initiates interactions
☐	☐	☐	☐	make needs known
☐	☐	☐	☐	get someone's attention
☐	☐	☐	☐	uses grammatical sentences
☐	☐	☐	☐	combines two or more words
☐	☐	☐	☐	uses single words

Speech Production (O.T. and SLP evaluation)

1. Respiratory Control
   ____ has developed ability to control exhalation for speech production
   ____ has inadequate speech breathing pattern

2. Laryngeal control
   ____ has difficulty coordinating exhalation and production of laryngeal tone
   ____ has marked tension associated with phonation

3. Control of oral structures
   Note any persistent infantile oral reflexes (suckle, mouth, opening, biting)

   _____

   _____

   _____

Check appropriate level of functioning

	Adequate	Poor	Very Poor
lips	____	____	____
mandible	____	____	____
tongue	____	____	____
palate	____	____	____

Is able to:

Suck _____

Chew _____

Swallow _____

Control drooling _____

4. What is the prognosis for development of intelligible speech?

_____

_____

Reasons for this prognosis _____

* It may be necessary to complete a prespeech or eating and feeding assessment for further information or clarification.

IV. COMMUNICATION: METHODS

1. Is the student's speech clear enough for strangers to understand?

☐ yes ☐ no ☐ sometimes

If yes, go to section V. If no, please continue.

Check any means of communication currently used:

☐ speech, but needs to repeat
☐ vocalizations/crying
☐ signing
☐ gestures
☐ eye pointing
☐ facial expressions
☐ traditional orthography
☐ word/phrase board
☐ alphabet board
☐ symbol board
☐ picture board
☐ objects
☐ combined systems (specify) _____
☐ technical aid (specify) _____
☐

2. What kind of things are communicated?

____	desire for food	____	happiness
____	desire for drink	____	sadness
____	wants attention	____	anger
____	need for toileting	____	humor
____	discomfort	____	love
____	desire for object	____	frustration

Other _____

_____

____ express idea (give examples) _____

_____

____ offers suggestions (give examples) _____

_____

____ asks questions (give examples) _____

_____

____ refers to events which occured in the past (examples) _____

_____

_____

____ comments on or asks questions about future events (examples)

_____

_____

V. COMMUNICATION: STYLE

1. **Please describe the student's preferred method of communication.**

_____

_____

_____

2. **Please describe any communication systems which have been tried and discontinued. Explain why they were discontinued.**

_____

_____

_____

3. **Please check one. In general, is the student's communication system:**

☐ always available and used independently

☐ always available and needs assistance

☐ only available in a few situations

☐ seldom or never available

4. Do you see a major discrepancy between what the student understands and what he is able to express to others? Please describe.

a) With family _____

_____

_____

b) With peers _____

_____

_____

5. What do you expect a technical communication device to enable the student to do that he cannot do with his current method of communication?

_____

_____

_____

6. Please state your major concerns about the "communication".

_____

_____

7. Any other comments or concerns?

_____

_____

_____

VI. COMMUNICATION: SPEECH/LANGUAGE INTERVENTION

1. Does the student presently receive speech therapy? ☐ yes ☐ no

_____

2. Service delivery (e.g., direct, consultation).

_____

3. How long has the student received speech therapy? Check one.

☐ 0-6 months ☐ 3-5 years
☐ 6-12 months ☐ over 5 years
☐ 1-3 years

4. Dates of previous communication assessments

Dates	Locations	Speech Language Pathologists
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

PLEASE ENCLOSE MOST RECENT REPORTS AND THERAPY SUMMARIES.

APPENDIX III

Appendix III

GENERAL TRAINING PROCEDURES FOR OBJECT PERMANENCE

The procedures were designed to be used with children who have the use of their vision and who have no physical disability that would prevent them from reaching and grasping with at least one hand. Adaptations are necessary if these conditions are not met. There are 15 steps in the object permanence training program and 12 steps in the means-end training program. Each child should enter the program at his or her own level, which can be assessed by using the appropriate Uzgiris and Hunt (1975) scales. The child should then be trained on each successive step in the order in which they are presented here.

The child may be placed on the floor or seated at a table, which ever seems most comfortable for the child. The criterion for achieving a step is successful performance of the task during two successive training sessions. Each session should be about 20 minutes.

OBJECT PERMANENCE PROCEDURES

1. *The child cannot follow an object smoothly through a 180 degree arc.* Use objects that have a sound (e.g., a music box). Let the child hold the object as it is moved. Help the child turn his or her head smoothly. These suggestions may be used singly or in combination.

2. *The child loses interest in an object when it disappears.* Move the object to the place from which it will disappear from view but leave it in full view of the child. On successive trials gradually leave less of the object in view of the child. At each step, the child's eyes should linger at the point where the object partially disappears. Finally, through successive approximation, the entire object should disappear and the child's eyes should linger at the point where it disappears. If at any time during this process the child's eyes do not linger at the point of partial or total disappearance, go back to the previous step.

3. *The child does not obtain a partially hidden object.* The same procedure should be followed as in Step 2 except that the child should obtain the object on each trial and the procedure should continue only until the object is half hidden. In addition, the object used should be made as large and bulky as possible. If at any given time in this process the child does not obtain the object, he or she should be prompted and helped to find the object.

4. *The child's glance does not go to the point of reappearance after several trials (three or four) during which an object disappears from view and then reappears at another place.* Try using an object that has sound associated with it (e.g., a music box or a bell) and make noise with the object as it reappears. Repeat this several times (three or four). Gradually fade out the amount of sound being produced. In some cases, it might be necessary when beginning this procedure to prompt the child's head and help him or her move it into the correct direction.

5. *The child does not obtain a completely hidden object.* Begin with the object half covered and slowly, step by step, cover more of the object, having the child find it at each successive step. When the object is finally completely hidden from view, it should be placed under the cover so as to present a large lump. This lump should also gradually be diminished. When necessary, the child should be prompted and helped to find the object. Initially, the use of an object that produces a sound (e.g., a music box) can also be helpful.

6. *The child does not always search under the correct cover when an object is alternatively hidden under each of two covers.* The same procedure can be followed here as in Step 5. However, if the child searches under the incorrect cover only, he or she should be allowed to practice this task separately for a considerable period of time (four or five sessions). This will allow the child's cognitive structures to accommodate and incorporate the new information. If this fails, go back to the procedure in Step 5.

7. *The child does not always search under the correct cover when an object is randomly hidden under each of three covers.* The same procedure should be followed here with three covers as was used in Step 6 with two covers.

8. *The child does not find an object when it is hidden under three screens that are arranged so that they have to be removed one at a time.* An object should be used that has a sound associated with it (e.g., a music box). The sound should be faded out gradually on successive trials. It might also be necessary to prompt and help the child remove the second and/or third cover.

9. *The child does not find the object when it is placed in a box that is them emptied under the cover (invisible displacement).* The box should be left under the cover with the object in it for the child to find. Then the child should be permitted to watch the box being emptied with the object then remaining under the cover while the box is removed. This is done by keeping the cover raised on the child's side. Then lower the cover and have the child find the object. This procedure should be repeated four or five times. Then the task should be attempted with no prompts. If the child still cannot find the object, repeat the procedure.

10. *The child does not always search under the correct cover when an object is hidden, through invisible displacement, under a second cover.* This follows the preceding step in which only one cover was present. The same procedure should be followed here as in Step 9. However, if the child searches under the second cover when wrong at first, he or she should be allowed to practice this separately for four or five sessions. This will allow the child's cognitive structures to accommodate and incorporate the new information. If this does not work, go back to the procedure in Step 9.

11. *The child does not always search under the correct cover when an object is alternately hidden, through invisible displacement, under each of two covers.* The same procedure should be followed here as in Step 10.

12. *The child does not always search under the correct cover when an object is alternately hidden, through invisible displacement, under each of three covers.* The same procedure should be followed here as in Step 10.

13. *The child does not always search under the correct cover in the same order that the examiner's hand followed when the object is hidden in the examiner's hand, then moved beneath each of three covers, leaving it finally under the third cover.* The object should be left under the first cover and the trainer should go no further. Then the object should be moved under the first cover and left under the second cover with the trainer going no further. The child should be prompted and aided in this search. Then the object should be moved under the first and second cover and left under the third cover. Again, the child should be prompted and aided in this search. This procedure should be followed in both directions (i.e., left to right and right to left).

14. *The child does not search directly under the last screen after finding the object there on several (four or five) previous trials using the preceding task.* The child should be allowed to practice for a considerable period of time (four or five sessions). If this effort is not successful, the same procedure should be followed here as in Step 5.

15. *The child does not follow the reverse order (last cover, middle cover, first cover) of the examiner's hand movements when the object is hidden under the first cover and the examiner's hand continues under the middle and last covers.* This can occur after the child successfully goes directly to the last cover on at least three previous trials. If the child is still unsuccessful after four or five trials, the same procedure should be followed here as in Step 5.

APPENDIX IV

Appendix IV

OPERATION CAUSALITY

E34: Vocalizes and/or smiles in response to adult talking.

Location: Same as in E1, or any position comfortable to the child.

Object: None.

Directions: While the child is quiet and alert, lean over him/her, and attract his/her attention. Talk to the child in a soft, pleasant voice. Repeat several times if necessary.

Response: Child vocalizes, laughs, and/or smiles in response to the adult talking to him/her.

E35: Pushes or pulls an adult's hand as a causal action to have a behavior instigated or repeated.

Location: Any situation during the assessment period.

Object: None.

Directions: Generally, this behavior occurs spontaneously during the assessment period, and is not elicited as part of the test situation. Often, the child will take the parent's hand and pull or push it toward something the child desires or to have a behavior performed. In some instances, the child attempts to direct the parent's hand and arm toward the location where the child desires to go, or toward an object the child wants.

Response: Child attempts to engage the adult into a goal-directed sequence by talking his/her hand and directing it toward the desired goal.

E36: Child repeats behavior (shows off) to maintain an adults attention.

Location: Any situation during the assessment period.

Object: None.

Directions: Generally, this behaviour occurs spontaneously during the assessment period, and is usually elicited in response to the examiner's and/or parent's social responses (smiling, laughing, talking) to something the child says of does. If the behavior does not occur spontaneously, the examiner can often elicit the response by making a "big deal" of something the child does or says (e.g., playing pat-a-cake).

Response: Child repeats behavior that the examiner and/or parent has reinforced to maintain the adult's attention.

F37: **Uses gesture *plus* visual/vocal behaviors to have an adult instigate a desired action, get something the child desires, or otherwise attempt to communication to an adult.**

Location: Any situation during the assessment period.

Object: None.

Directions: Generally, this behavior occurs spontaneously during the assessment period. The child may use pointing, a "come here" gesture, or any other communicative gesture to gain the examiner's and/or parent's attention. However, the gesture must be accompanied by *both* visual looking at the person the child is attempting to communicate to with a concomitant vocal utterance as part of the communicative act.

Response: Child uses a gestural plus visual/vocal behaviors as a communicative act. The child either looks at the person he/she is attempting to communicate to or looks back and forth between the person and the object or event to which the child is attempting to call the person's attention. The vocalization used does not have to be a socially recognized word, but can be any vocal pattern that apparently is used as part of the communicative act.

APPENDIX V

Appendix V

MEANS-END PROCEDURES

1. *The child does not systematically keep a noise-producing toy (e.g., a rattle) active.* Help the child hold and move the object so that it produces its sound. Reinforce the child for producing this sound. Gradually, through the use of time delay, the amount of assistance is reduced so the child is grasping and moving the object independently.

2. *The child does not grasp an object when both the object and hand are in view simultaneously.* Prompt the child verbally or, if necessary, physically to grasp the object. Gradually, fade out the prompt.

3. *The child does not reach for and grasp an object that is held about 12 inches in front of his or her face.* Move the object toward the child's hand so that the object and hand are simultaneously in view. If this is not sufficient, go back to the previous step.

4. *The child with objects in both hands does not drop one in order to reach for a third more attractive object that is offered.* Remove the object from the child's preferred hand and place the new object in the hand. Follow this first procedure by using time delay to gradually reduce the prompts until none are needed.

5. *The child does not use an object (e.g., a pillow) within reach to obtain a desired object on it that is out of reach.* Demonstrate that the support object can be moved so as to bring the desired object within reach. If this demonstration is not sufficient, prompt the child to grasp and pull the support and gradually fade out the prompt.

6. *When the child is engaged in play and the most necessary object for the activity is removed, the child does not try to regain the object and resume play.* If the child continues play without the object, this activity should be stopped. The object should be removed, at first, only a few inches so that the child can easily reach it. Verbal and, when necessary, physical prompts should be used to help the child regain the object. Gradually, the object should be removed further away from the child until he or she must move to regain the object.

7. *The child pulls on an object (e.g., a pillow) when a desired object is held about 4 inches above it (i.e., the child pulls a "support" object when the desired object is not on it).* Hold the desired object 12 inches above the "support" and gradually reduce this distance to the 4 inches in the original task. If the child persists in pulling the "support," permit this activity for at least four or five sessions to allow the child's cognitive structures to accommodate and incorporate the new information (that the object is only retrievable when it rests on the support). If this approach fails, hold the object higher in alternation with placing the object on the support.

8. *The child does not use a string attached to an out-of-reach object in from of him or her to obtain the object.* First, demonstrate that upping the string will result in the object being obtainable. If this demonstration is not sufficient, prompt the child to grasp the string and pull it. Gradually, fade out the prompts. It may be helpful to begin this second phase by tying the string loosely around the child's wrist and making sure the string is taut. This will cause the object to move whenever the child moves his or her arm.

9. *The child, when sitting in a chair, does not use a string attached to an object on the floor to obtain the object.* The same procedure as used in Step 8 should be followed.

10. *The child does not use a stick to obtain an out-of-reach object.* The same procedure as used in Step 8 should be followed.

11. *The child cannot place a long necklace in a tall, narrow container because of the length of the necklace and unsteadiness of the container.* Demonstrate the preferred method; that is, rolling up the necklace and holding the container while putting the necklace into it. If this demonstration is not sufficient, begin with a very short necklace (just a few beads on a string) and gradually increase its length upon successive successful attempts by the child. Use prompts and physical assistance as needed.

12. *The child stacks a few rings and attempts to stack a solid (no hole) ring.* Allow the child to perform this action for quite a while to see if he or she eventually realizes that the ring is solid and cannot go on the peg. If this experience is not sufficient, begin by using a solid ring with several redundant cues (e.g., all the stackable rings can be of one color while the unstackable ring is of a different colour; all the stackable rings can be quite large while the unstackable ring is relatively small; or the outer edge of the stackable rings can be round while the unstackable ring is square). Gradually until the hole or no-hole dimension is all that remains.

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