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AUTHOR Myers, Collin A.; Safford, Philip L.
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ABSTRACT

The descriptive study explored the cognitive and linguistic performances of 63 multiply handicapped preschool children (ages 37 to 71 months). Five measures, such as the Peabody Picture Vocabulary Test, were used to assess the Ss, who were classified in one of three groups (cerebral palsied, other neurologically impaired, nonneurologically impaired). Findings revealed that the three classifications did not differ in performance on any of the measures selected. Among differences between the experimental group and nonhandicapped children were lower performance on the language saturated test of cognitive function and a receptive language measure of noun and action concepts. The Preschool Preposition Test and five tables of research data are appended. (PHR)

COGNITIVE AND LANGUAGE DEVELOPMENT OF PRESCHOOL MULTIPLY HANDICAPPED CHILDREN

Collin A. Myers, M. Ed.
Notre Dame College
Cleveland, Ohio

and

Philip L. Safford, Ph. D.
Kent State University
Kent, Ohio

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Introduction and Background

Disparate in symptom picture and etiology, representing a wide range of behavioral characteristics and apparent capabilities, physically handicapped children would not seem to comprise a "population" for the purposes of psychological research or a "group" for the purposes of educational practice. This very diversity may account in large measure for the relative lack of a research base, concerning learning needs and developmental characteristics, underlying educational approaches and programs for physically handicapped children. This lack of research may well also be due to the small percentage of such children among the general population (Perlstein, 1949; Phelps, 1950; Griffths & Bassett, 1967; Cruickshank, 1976; Best, 1978), the difficulties in accurately diagnosing the children's specific intellectual or educational needs and abilities, and the general exclusion of many of these children from public school programs prior to P.L. 94-142.

Legislative mandate (particularly P.L. 94-142 and Section 504 of the 1973 Rehabilitation Act) would seem to have established unequivocally that the presence of a physical disability does not, in itself, imply the need for special education or placement in a special education setting. It is clear that both access and habilitative services of specialists, such as physical

therapists, must be available within the regular school setting. A child's need for specialized instruction, is indicated by psychological, not physical, considerations--such as special problems in academic skill acquisition, processing of perceptual information, symbolic functioning, and abstract problem solving.

In view of current practice and convention, reinforced by federal requirements to identify the physically disabled as "handicapped" for educational purposes, study of the psychological dimensions of disability would seem imperative. Particularly critical questions are implied by the most fundamental Piagetian tenet: that children's psychological development consists in the successive restructuring of thought which results inevitably from the interactive relationship between the active child and his environment. The sensorimotor roots of reasoning and conceptualization are action schemes, ways of acting upon an evocative environment. However, as Bettye Caldwell has said, "Regardless of the external surroundings, the environment of the young handicapped child is, by definition, depriving" (1973, p. 7). If this is so, crftical questions would be: What impact does restricted or otherwise abnormal motor functioning, or other physical disability, during the early years, have upon children's psychological development? Do different forms of physical disability affect development differently, and are these differences associated with central nervous system involvement? What are the implications for early educational intervention?

Purpose of the Study

The scope of the present study is far too limited to provide answers to these questions. It was our purpose to investigate, in a descriptive and exploratory manner, the performance on selected cognitive and linguistic

measures of a group of physically and multiply handicapped children, ages 3-6, and to discuss implications of findings for approaches in early educational intervention. Specifically, the following research questions were addressed:

1. Are there differences in performance on these measures associated with broad medical diagnostic differentiations (cerebral palsy, other neurologically-related impairment, non-neurologically impaired)?
2. Do physically handicapped children, ages 3-6, perform differently from non-handicapped children on selected measures of cognitive and linguistic functioning?

Traditionally, services for the physically impaired have been associated with a medical model, which focuses upon medical conditions and deviations from the norm, rather than on educational abilities. Such an orientation has often resulted in a focus among educators upon the child's limitations, with a mysterious aura placed about the diagnosis (Best, 1978). Federal law mandates appropriate educational provision for all handicapped children, ages 3-21, including those with physical and multiple impairments. However, given the doubtful educational relevance of sole reliance upon a medical orientation to disability, it is often not clear to what extent a physical impairment may imply specialized instructional needs.

The children in this study, drawn from special education nursery school programs, represent varying degrees and varying forms of physical disability. Piagetian theory suggests the possibility that impaired motor function, to the extent that it interferes with child-environment interaction during the early years, may be associated with cognitive developmental impairment. Moreover, in the case of cerebral palsy or other neurological dysfunction, additional -- or possibly different -- impediments to cognitive development may be reflected.

Their familiarity notwithstanding, certain aspects of Piaget's description of the sensorimotor foundations of thought will be summarized briefly here, since they bear so directly upon the concerns to which the present investigation was addressed.

Theoretical Development: Action, Perceptual Organization and Thought

The relationship of object and subject in the development of knowledge is of crucial importance in this discussion. The acquisition of knowledge involves more than simply recording events or object properties as figuarative copies of reality or systematically filing or correcting information. A wholly empiricist approach, where knowledge exists externally with the event/object itself excludes the action of the individual. According to Piaget, to "know" an object, a person must act upon it - manipulate it with his hands at first and later with his mind.

In infancy these interactions are so meshed with the motoric actions of the child that there is no distinction between object and self; rather the infant sees the world as an extension of himself. The construction of objective knowledge occurs through two types of interdependent activity:

1. coordination of the actions themselves
2. introduction of interrelations between objects (Piaget, 1970, p. 704)

Approximately 9-12 months, a baby discovers object permanence, which Elkind (1970) describes as the foundation for concepts "about" objects and their attributes. At first this concept is dependent upon the position of the object in the infant's perceptual field, while later it becomes independent when the object exists though not in view. The concept begins

to emerge when the baby looks for a missing object at the point at which it disappears. The scheme of object permanence requires a new mental structure to accommodate this new perspective independent of the child's actions. Once object permanence is established, the baby can move around and see the object from another perspective, realizing that it is still the same object. His point of view changes; the world begins to exist as separate from himself, rather than an extension of himself. For the object to stay the same even when he moves, the child must coordinate his actions (movement of his body and the object). Thus, structures are imposed upon external reality through coordination of action schemes.

In later stages these primitive actions are reflected in operations which are interiorized actions.

A major development during the preoperational period involves the acquisition of concepts. As Flavell (1970) pointed out, concepts carve the world into functional units for dealing with the world. Concepts are expressions of a rule (Sigel, 1975) which reduce complex masses of stimuli to manageable amounts (Flavell, 1970, citing Bruner, Goodnow, and Austin, 1956). Concepts develop in a sequential manner and become more complex with increased age (Inhelder & Piaget, 1964).

Concept attainment commences in the sensorimotor period when the child assimilates information into action schemes and subsequently accommodates the structures. The child must be able to discriminate one object from another, master the permanence of object concept, and achieve a degree of decentration. Interiorized actions form a beginning understanding of the meaning of an object which the child learns to make use of. For example, the child soon learns that by sucking the nipple, versus the skin in general, he will get milk.

Relational concepts, like other forms of conceptualization, similarly have their origins in the action schemes of the sensorimotor period. (Inhelder & Piaget, 1964; Flavell, 1970). Specifically, they originate in action schemes relating to objects in space. Also needed for the maturing of relational concepts is the beginning of decentration, starting with the me/world dichotomy and the subsequent Copernican revolution in the 12-18 month period.

The ability to discriminate two or more objects, to see them as separate from oneself, and to locate and relate them in terms of space, are the necessary precursors to the development of relational concepts. Such relational concepts, expressed as prepositional relations, form the basis for the Preschool Proposition Test (Aaronson & Schaefer, 1968) used in the present study. As Chomsky (1957) suggested that in language, there must be competence prior to performance, it would seem logical to assume that there must be relational ("prepositional") competence in the form of interiorized action schemes, prior use of relational concepts. For example Furth's work with the deaf (1964, 1966) suggested that certain concepts were present before a linguistic system developed.

Bearing closely upon this line of thinking is the work of H. Clark, specifically his discussion of perceptual and linguistic space. Clark (1973) contended that man has a perceptual apparatus which is peculiar to him alone (i.e., two ears, two eyes, bipedal) and that this apparatus is functional, usually from birth. Note that this is similar to Piaget's concept of structure. Piaget suggested that one element of structure is the biological hereditary transmission of physical structures (i.e., the eye, ear, the ability to manipulate objects with thumb and finger coposition, all of which give parameters to the types of intellectual

achievement possible and not possible in man). A child learns to use English terms for space and time correctly by applying these terms to the a priori knowledge which he has about space and time as developed from his perceptual apparatus. The child has, then, a perceptual space (P-space) due to existing on this planet. The P-space must exist prior to any correct language application of any particular term. Any term expressed in Language (L-space) should correspond with that term as it was pre-developed in P-space. Similarly, Piaget would hold that interiorized action schemes begin the structuring of one's world before understanding and subsequent language expression can occur.

In his canonical (bipedal, upright, forward-facing) position, man moves through his environment with himself as the point of reference for relating the world, all objects, in space. It is this position which Clark suggested is of critical importance in language for expressing relationships. Gravity pulls in a downward direction resulting in a natural vertical relationship. With his bilateral symmetry, man has a natural left/right dichotomy. Further, man's perceptual organs are faced forward from the body, resulting in a natural front/back relationship. With self as reference point, a child developing through the sensorimotor period can interiorize the relationships required in the understanding of prepositions (as used in the Preschool Preposition Test, Aaronson & Schaefer, 1968). As these interiorized spatial relationships of objects are developed, the child is developing what Clark (1973) referred to as P-space, which is the necessary prerequisite to its expression in Language (L-space). Clark dealt considerably with spatial words. For example, he pointed out that such words as "above" and "below" reflect a position of one person to another person or object. Self, again,

is the reference point in relating these positions. Note here that the child with impaired mobility may well have his reference points located differently. He may be prone, thus the spatial relationships in this case would be different (i.e,, up is no longer above the head, but straight out from the chest). Thus the P-space would have a different concept of various terms resulting in altered meaning in the L-space expression.

English spatial terms, therefore, reveal that L-space has properties that are identical with those of P-space. First, L-space shows the universal use of points, lines, and planes of reference, both in prepositions, where there is one or two, and in adjectives, where there are two. Second, there are three specific primary planes of reference: (1) ground level, with upward positive and downward negative; (2) the vertical left-right plane through the body, with forward positive and backward negative; and (3) the vertical front-back plane of symmetry through the body, with right and left both equally positive. Third, L-space requires the use of canonical position to define uses of vertical expressions for dimensions that do not coincide with gravitational vertical. And fourt, L-space requires the notion of canonical encounter to account for the egocentric uses of terms like "front" and "back." The coincidence of these properties with those of P-space is obvious (H. Clark, 1973, p. 48).

As a companion, complementary hypothesis to the discussion by H. Clark, E. Clark present the Semantic Feature Hypothesis (SFH) to account for the application words to perceptual and cognitive events (P-space to L-space).

Citing the thinking of Slobin (1973), Clark (1974, p. 106) suggests that a "child will first learn those aspects of language that are within the scope of his current cognitive development, so that as the child developes cognitively, he will gradually learn to use more complex linguistic formulations." The order of development of these more complex linguistic formulations is based on their cognitive complexity. The meaning of a particular word for the child does not necessarily match that of the adult. At first learning a word, a child will select one or two features of the word and gradually add semantic features until the meaning matches that of the adult (Clark, 1973; Clark, 1974; Bierwisch, 1967, 1970 as cited by Clark, 1974, p. 108). Two types of words are dealt with by Clark:

1. nonrelational words - those with tangible referents and
2. relational words (pertinent to this present study - those with no tangible referents.

H. Clark (197) and E. Clark (1973) would both contend that the language usage of these relational terms would be mapped from language space (L-space) onto already operative, corresponsing P-space. In other words, as Schlesinger (1971) and Bloom (1975) would suggest, language is mapped onto already existing thought.

It is during the pre-operational stage of development that the semiotic function of language develops. Piaget (1970) purports that language usage is dependent on sensorimotor action schemes developed in the sensorimotor period. The acquisition of lanaguage is basically dependent upon two pre-conditions: 1. the general backdrop of imitation which allows for interpersonal exchange and 2. the varied structural characters making up the basic unit of Chomsky's transformational grammar

(Piaget, 1970). To meet the condition of imitation, not only must the motor techniques of imitation be present, but "the object, spatiotemporal, and causal decentrations of the second sensorimotor subperiod must have been mastered must have been mastered." (Piaget, 1970, p. 711). This would also point out the sequential nature of the stages. Piaget continues that to meet the structural characteristics of transformation grammar, the previous operation of sensorimotor schemes must exist in that they aid Chomsky's transformational structures to operate. He cites Sinclair's then unpublished work (p. 711) that the structure's "origin is fn neither an innate neurophysiological program (as Chomsky would have it) nor in an operant...process (as Chomsky (1959) has shown conclusively)."

Research related to P-Space

Space prevents discussion of the literature to any great extent. Therefore, supportive and non-supportive research will only briefly be touched upon. As noted above, E. Clark's semantic feature hypothesis was supported by various research presented by E. Clark (E. Clark, 1972; E. Clark, 1973; 1974; H. Clark, 1973; Bierwisch, 1967, 1970, as cited by E. Clark, 1974; and Postal, 1966, cited by E. Clark). One of the earliest to set the direction of this research is Donaldson & Balfour (1968, cited by E. Clark). Later, Donaldson & Wales (1972) presented more research supporting E. Clark. Also reporting related positive findings are Klatsky, Clark, and Maken (1973).

Furth's research (1966) is also reflective of this notion that a non-linguistic conceptual base is existant prior to a linguistic expression. He found that the deaf have certain concepts (conservation of weight) prior to a developed linguistic system.

Wertheimer (1961) found that a newborn infant could coordinate auditory space and visual space (i.e., a baby has moved eyes toward a clicking sound). This suggested an operative early perceptual space. Similar findings are reported by Papousek (1967) and White (1971).

Kagan's (1972) research on infant's response to moderately discrepant stimuli also support the early perceptual activity prior to language. Similarly, Bruner's discovery of neonates' ability to control light patterns and focusing of pictures lends support to this thinking (Pines, 1970).

Kuczaj and Maratsos (1975) and Friedman & Seely (1976) found contrasting results not supportive of the Clarks' research.

Research related to the PPT

Aarsonson et. al. (1978) reported many of their studies which found moderate, significant correlations of the PPT to the Binet and the PPVT.

Similarily, McCall, Erchorn, & Hogarty (1977) reported moderate, significant correlation of I.Q. scores and knowledge of prepositions. Aaronson & Phillips (1977) found moderate, significant correlations of the PPT with the PPVT.

Research related to the Physically Handicapped and Performance on the I.Q. Measures, the PPVT, and Expressive Language Measures

Most of the following research is limited to studies dealing with the cerebral palsied. One main reason for this is that the C.P. make up the largest portion of the multiply handicapped population. Best (1978, pp. 12-13) reported on a 1965 California survey which showed that 58% of the physically handicapped population was identified as C.P. The remaining 42% consisted of all other neurological and non-neurological, but crippling impairments.

Many researchers have found that about 50% of the cerebral palsied perform more poorly than non-impaired children on standard I.Q. measures (Phelps, 1946; New Jersey Study, 1951 and Dundsdon, 1952, cited by Cruickshank, Hallahan & Bice 1976, Miller & Rosenfeld, 1952, Cardwell, 1956, Mastulkova, 1973 as cited by Holowinsky, 1979; Cruickshank, et. al., 1976)

Further [illegible] Schalling (1968, as cited by Cruickshank et al [illegible] have [illegible] the cerebral palsied individual to be deficient in abstraction ability. However, one should not overlook the wide range of abilities within this population (Phelps, 1946; Evans 1950 as cited by Crickmay, 1966, and Safford & Arbitman, 1975).

Further, Dunn (1973) concluded that this group does have problems in conceptualization. Moreover Birch and Berthner (1967, p. 402) mention several studies Cotton, 1941; Strauss and Werner, 1941, 1943; Werner and Strauss, 1944; Dolphin and Cruickshank, 1951; Jordan, 1956; and

Birch, 1964) which point out that "Brain injured children perform particularly poorly on a variety of tasks to test conceptual ability." (p. 402) These authors then proceed to analyze the "Stimulus Competition and Concept Utilization in Brain Damaged Children."

Results showed that C.P. children performed more poorly under the condition of increased stimulus distractors. When MA was controlled, C.P. children did better under condition reduced stimulus distraction, except for only the highest MA levels. This suggests that the C.P. are more stimulus bound than normal children.

Referring to this same study, Cruickshank et al. (1976, p. 174) commented that the results "suggest that perhaps the cerebral palsied child's distractibility to irrelevant stimulus details may inhibit his conceptual processing." Melcher & Peck (1967) found that the cerebral palsied identified fewer action concepts as compared to object concepts as measured by the PPVT. Further, the cerebral palsied tended to use non motoric response modes.

Many authors (Cruickshank, 1976, Lencione, 1976, Dunsdon 1952, as cited by Lencione, 1976) have reported that the cerebral palsied often have difficulties in language development. Hood & Perlstein (1956), Denhoff & Holden (1951), and Dunn (1973) are but a few others reporting similar findings.

One must not overlook, however, contrasting [illegible] finds no language difference between the cerebral palsied and normal children (Love, 1964). Indeed, Lencione (1976) suggested that the reported language delays may be an artifact of inadequate tests.

Finally, Irwin (1966) found that the language of understanding of the cerebral palsied (as measured by the PPVT) to be lower than their language of use (measured by modifying the PPVT).

Method

Subjects

Sixty-three children aged 37 to 71 months were selected from one of two agencies serving preschool multiply handicapped children. 12 were located in an agency in Omaha, Nebraska, while 51 were in a similar agency in Cleveland, Ohio. To be served at either agency, a child must have been medically diagnosed as having some crippling condition or other health impairment. All children who were enrolled and available at either agency at the commencement of the study were included.

Discriminate function analysis did not discriminate between the two groups on any of the variables or measures in question. Therefore, the 2 groups were combined to form one sample of sixty-three subjects. Three divisions were made among the subjects:

1) the cerebral palsied (N=31)

2) those with other neurological impairments (N=12)

3) those with other crippling, but non-neurological impairments (N=20).

The pooled sample comprised 29 Black and 34 White children with 21 girls and 42 boys.

Instruments

Following is a list of the measures used in the study:

1. Stanford-Binet Scales of Intelligence, L-M (Terman & Merrill, 1960)
2. Peabody-Picture Vocabulary Test (Dunn, 1965)
3. Preschool Preposition Test (Aaronson & Schaefer, 1968)
4. Developmental Sentence Scoring (DSS, Lee, 1974)
5. DSS subscales: Indefinite Pronouns, Personal Pronouns, Main Verbs, Secondary Verbs, Negatives, Conjunctions, Interrogative Reversals, Wh-Questions, and Sentence Point.

6. Syntax Age

7. Mean Length of Utterance (MLU)

8. Motor Age

The Preschool Preposition Test (PPT) (Aaronson & Schaefer, 1968) is a test of development in which a child must understand and use various prepositional relationships (i.e., "on top of", "in front of", "under", "above", etc.; for a full list of the prepositions used, see Appendix A). A metal board with raised metal figures of a boy and a car is placed before the child. He is given a rubber ball cut in half with a magnet attached to its back. The child is then requested to place the ball "Anywhere on the car," for example. Before testing the prepositions, the child is taught the necessary non-prepositional elements not already known (i.e., "boy", "car", "board"). (For whole test form, see Appendix A.) A child with even limited hand use can place the ball on the board. No verbal response is required. The child's response is marked on a record form which graphically reproduces the metal board in order to facilitate subsequent scoring. The authors suggest that the test be used for screening Head Start children in order to find those who have special needs so that early intervention to meet these needs can be planned (Aaronson, Phillips, Bertolucci, and Aaronson, 1978).

Developmental Sentence Scoring (DSS) (Laura L. Lee, 1974) is a ". . .method for making a detailed, readily quantified and scored evaluation of a child's use of standard English grammatical rules. . ." (Lee, 1974, p. xix).

Besides an overall Developmental Sentence Score (DSS), the procedure also gives specific quantification of syntactic growth through its nine subscale scores: Indefinite Pronouns (Ind. Pro.), Personal Pronouns (Per. Pro.), Main Verbs, Secondary (Sec.), Verbs, Negations (Neg.), Conjunctions (Conj.), Interrogative Reversals (Int. Rev.), Wh-Questions (Wh-Q), and Sentence Point (Sen. Pt.). Normative data are reported for children one and one half to eight

years of age for this "measure of a child's spontaneous use of grammatical rules at a particular time in a particular setting . . . " (Lee, 1974, p. 168). A spontaneous language sample of 50 full sentences was recorded in a free-play situation with the clinician interacting with the child. The recording then was transcribed and scored.

A developmental Syntax Age can be derived from the DSS. Reported in months, it estimates the child's expressive syntactical age.

For Mean Length of Utterance (MLU), each morpheme in a language sample is counted and the total amount divided by the number of utterances contained in the sample as outlined by Roger Brown (1971). Koeningsknecht (1974) reports this as being highly correlated with the DSS procedure of Lee. This technique is an indicator of syntactic development (Dale, 1976).

For Motor Age, a child's level of physical or motoric development is measured by a rating scale routinely used at one of the agencies. Each child's overall functional age in months at the time of testing, with prosthetics used, was obtained from the chief physical therapist. All children in this study had fair to good use of their upper extremities.

Four demographic variables were considered: ADC Status, Sex, Race and Home Environment Rating. To provide a measure of parental nurturance and language stimulation in the home, agency social workers rated home environments employing a 3-point scale developed by the first mothers. Home environments were rated as low (1), average (2) or high (3) with reference to (a) quality of verbal/non-verbal interactions of parents, child, and siblings; (b) interest of parent in carrying through on therapies prescribed; (c) type and consistency of discipline in terms of whether it was enhancing or inhibiting to the child's development; (d) quality of child-rearing practices and nurturance; and (e) availability and use of learning materials within the home. Using the children's records, two other raters achieved interrater reliability of 94% and 100% agreement, respectively.

Results and Discussion

Tables 1 and 2 present descriptive statistics on all measures across medical diagnosis (cerebral palsy, other neurological impairments, and non-neurological impairments) as well as for the entire sample pooled. The three groups were pooled because, as noted later, no significant differences in performance were found among the groups on any of the measures.

Insert Tables 1 and 2

Question I

Analysis of covariance was performed to determine whether differences existed between cerebral palsied, other neurologically impaired, and non-neurologically impaired children in performance on measures of cognitive and linguistic functioning (Revised Stanford-Binet Intelligence Scale, Peabody Picture Vocabulary Test, Preschool Preposition Test, and Developmental Sentence Scoring). An attempt was made to administer all measures to each child proximate in time. However, this was not always possible. Therefore CA was entered as a covariate to control for this variation. Differences in measured intelligence might also affect scores on the various tests. One would not know if group differences, as defined by medical diagnosis were due to medical diagnosis or to intellectual differences. Therefore MA on the Binet was entered as a covariate. As Table 3 shows, analysis of covariance revealed that the cerebral palsied, other neurologically impaired, and non-neurologically impaired did not differ in performance on any of the measures selected. Separate analyses of variance on the Binet MA and IQ

also revealed that these three groups did not differ on either of these two scores.

Question I.I

Since no significant differences in performance were found among the various medical diagnoses on any of the selected measures, the three groups were combined to form a pooled sample of 63 children. Table 2 summarizes total sample characteristics, including performance on the dependent measures.

Measures chosen for this question were those for which norm comparisons could be made:

1. Binet MA and IQ scores
2. PPVT MA and IQ scores
3. Total DSS score
4. Scores on the subscales of the DSS
   a. Indefinite Pronouns
   b. Personal Pronouns
   c. Main Verbs
   d. Secondary Verbs
   e. Negatives
   f. Conjunctions
   g. Interrogative Reversals
   h. Wh-Questions
   i. Sentence Point

t-tests against the hypothesized value of their own mean CA versus their actual mean MA score on the Binet and PPVT resulted in significant t values in both cases. The handicapped children in this sample attained significantly lower scores on each measure. Similarly, t-tests against the hypothesized population value of 100 for the IQ score on the Stanford-

Binet and the PPVT also revealed that these children earned significantly lower scores. Table 3 summarizes these results.

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Insert Table 3

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In view of the lower performance on a language-saturated test of cognitive function (the Stanford-Binet) and a receptive language measure of noun and action concepts (the PPVT), similarly lower performance on the DSS measure of language functions would seem likely. However, for purposes of educational programming such differences, should they exist, must be specifically identified. Therefore, t-test comparisons were made at the three age levels given by Lee (1974) in the normative data for the DSS.

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Insert Tables 4, 5, 6

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At 36-47 months, the physically impaired children in this sample scored significantly lower on the following measures: DSS Score, Indefinite Pronouns, Personal Pronouns, Main Verbs, Interrogative Reversals, and Sentence Point. Statistical significance was not found between the physically impaired and the normative group on Secondary Verbs, Negatives, Conjunctions, or Wh - Questions. At 48-59 months, significantly lower scores were found on the following measures: DSS Score, Indefinite Pronouns, Personal Pronouns, Main Verbs, Secondary Verbs, Negatives, Conjunctions, Interrogative Reversals, and Sentence Point. No significant difference was found on Wh - Questions. At 60-71 months, significantly lower scores were found on: DSS Score, Indefinite

Pronouns, Personal Pronouns, Main Verbs, Secondary Verbs, Conjunctions, and Sentence Point. The physically impaired scored significantly higher than the normative group on Wh-Questions. No statistical significance was found between the physically impaired sample and the normative groups on Negatives and Interrogative Reversals. These results are summarized in Tables 4, 5, and 6.

The measure of particular interest, the Preschool Preposition Test, did not lend itself to norm comparison. The data supplied by the authors were not totally representative of the preschool population, since their intent was to deal mainly with Headstart children. However, visual inspection of the data suggests that, after controlling for MA/IQ, the present sample would not differ from similar groups of children represented in the data reported by Aaronson and Schaefer (1968).

Questions arise as to whether the distribution of sex, race, SES, and home environmental factors could confound results. However, chi-square analyses revealed that distributions based on these variables were equivalent across medical diagnosis.

The literature has suggested that economic factors (Satz, 1977) in the home and/or verbal and nurturance behavior of the parents (Aaronson, Philips, Bertolucci, and Aaronson, 1978; Steele & Wagner, 1977) may exert powerful influences on children's development. Therefore, ADC status, as the most readily available measure of economic status of the family, was considered. Similarly, the children were rated by agency social worker, as being from a low, average, or highly nurturing and language-stimulating environment.

Sex and race differences were also considered. Analysis of covariance with CA and MA (Binet) as covariates, revealed the following findings:

1. There were no differences in performance between boys and girls on any of the measures in question, except for the PPVT, in which

boys scored significantly higher.

2. There were no differences in performance between Black and white children on any of the measures, except for Motor Age. Here the Black children in this sample consistently scored significantly higher.

3. There were no significant differences in performance on any of the measures related to ADC status of family.

4. There were no differences related to level of Home Environment Rating on any of the measures in question.

Implications for Special Education

Contrary to expectations, no differences were found in performance of the cerebral palsied, the other neurologically impaired, or the non-neurologically impaired on selected measures of cognition, receptive vocabulary, prepositional knowledge, or expressive language. This suggests that these groups were more similar than disparate in performance on typical educational measures. Any differences existing prior to analysis of covariance, with CA and MA as covariates, could be accounted for by chronological or mental age, rather than medical diagnosis.

Further, when groups were pooled there were no differences in performances by virtue of being physically impaired which again could not be accounted for by chronological or mental age. This present sample scored significantly lower on measures of cognition (Binet) and receptive noun and action concepts (PPVT). Differences were expected on the expressive language measures (DSS and its subscales) due to differences in developmental level, and these are summarized in Tables 4, 5, and 6. Specification of type of linguistic deficit is critical for the planning of appropriate remedial intervention.

It is also important to note that there were no differences on any measures of cognition, receptive vocabulary, or expressive language between groups defined by sex, race, ADC status, or Home Environment rating which could not be accounted for on the basis of chronological or mental age. These children, though of different demographic make up, were more similar than dissimilar in performance. Consequently, some justification could be found for grouping them together for educational programming.

Additionally, however, the absence of differences from normal children related to medical diagnosis or physical impairment, not attributable to chronological and/or mental age, calls into question practices of segregated educational placement in agencies or schools. These children can and should be served within the public school sector with appropriate ancillary services provided as necessary (i.e., physical, occupational, or speech/language therapy). This is consonant with federal interpretation of law, as recent decisions in California exemplify.

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Appendix A

PRESCHOOL PREPOSITION TEST*

Description

The Preschool Preposition Test (PPT) is designed to test the young child's knowledge of prepositions. Preliminary evidence indicates that knowledge of prepositions correlates with verbal comprehension in the early years. The test lends itself for use with children three and four years old (five in disadvantaged populations). It takes the form of a ball game which young children find appealing.

The test can be administered by nonprofessionals with minimal training. Persons who have the ability to work with young children can easily establish rapport and present the test items. Scoring the test, which requires a different type of skill, can be completed separately from the testing and if necessary by different personnel. The test should be used in its entirety as the items are not ordered for difficulty.

The equipment consists of a yellow metallized board, bearing the slightly raised figures of a green automobile and a red boy, and magnetized red rubber balls. Children who have had little experience with viewing flat pictures are more comfortable with the raised figures. The features and color of the boy are designed to reduce clues for identification of race. The test items direct the child to place one of the balls on the board in relation to the figures, the key word(s) in each command being either a preposition or a prepositional phrase.

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*This is taken from the PPT's manual of Instruction (Aaronson & Schaefer, 1968).

PRESCHOOL PREPOSITIONAL TEST

List of Prepositions as Presented

in the Test

1. .....into
2. .....up/high
3. .....under
4. .....inside
5. .....down/low
6. .....in back of
7. .....underneath
8. .....on the top of
9. .....in front of
10. .....between
11. .....in backof
12. .....on
13. .....between
14. .....below
15. .....against
16. .....beneath
17. .....behind
18. .....above
19. .....near
20. .....next to
21. .....at the top of
22. .....on
23. .....in

Table 1

Descriptive Statistics on All Measures
Across Medical Diagnosis

Variable	C.P. N=31		Other N.I. N=12		Non-N.I. N=20	
	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
C.A.	56.81	9.36	54.58	7.20	51.80	8.99
Stanford-Binet						
MA	45.45	14.14	47.17	11.61	47.25	10.56
IQ	82.03	19.05	85.05	19.00	92.75	17.96
PPVT						
Raw	37.10	15.66	41.67	9.39	34.65	14.51
MA	48.52	18.74	50.75	13.91	44.80	15.71
IQ	81.71	24.56	89.41	17.81	81.35	22.30
PPT						
Raw	14.77	5.77	14.75	5.63	14.80	4.76
DSS						
Raw DSS	4.28	2.72	5.05	1.15	4.34	1.88
Syntax Age	30.71	18.44	35.50	4.44	30.45	11.52
MLU	3.98	2.33	4.81	1.26	4.36	1.83
Indef. Pron.	19.06	17.40	20.50	9.10	18.40	11.41
Pers. Pron.	38.52	32.62	40.83	18.67	31.60	17.74
Main Verbs	42.65	33.15	48.25	16.28	37.55	18.91
Secondary Verbs	14.26	15.21	20.83	10.61	11.50	10.71
Negatives	9.64	10.68	14.42	7.66	8.95	8.06
Conjunctions	11.19	13.50	13.83	14.86	11.05	11.34
Inter. Revers.	4.58	6.27	2.83	3.56	2.10	3.74
Wh- Questions	7.35	10.35	10.25	8.80	6.15	9.28
Sentence Pt.	22.48	16.70	26.67	12.94	23.20	11.26

Table 2

Descriptive Statistics on all Measures
For Entire Sample
N=63

Variable	$\bar{X}$	S.D.	Range	
C.A.	54.74	9.01	37 - 71	mos.
M.A. - Binet	46.35	12.48	13 - 79	mos.
I.Q. - Binet	86.02	19.00	47 - 121	
RAW - PPVT	37.19	14.31	9 - 63	
M.A. - PPVT	47.76	16.88	24 - 90	mos.
I.Q. - PPVT	83.06	22.59	16 - 123	
RAW - PPT	14.78	5.35	2 - 22	
Motor Age	33.84	15.35	3 - 60	mos.
RAW - DSS	4.44	2.23	0 - 9.4	mos.
Syntax Age	31.54	14.57	0 - 67	mos.
MLU	4.28	2.01	0 - 7.5	
Indefinite Pronouns	19.13	14.20	0 - 65	
Personal Pronouns	36.76	26.41	0 - 114	
Main Verbs	42.10	26.51	0 - 110	
Secondary Verbs	14.63	13.33	0 - 58	
Negatives	10.33	9.46	0 - 48	
Conjunctions	11.65	12.95	0 - 41	
Inter. Reversals	3.46	5.18	0 - 22	
Wh - Questions	7.52	9.70	0 - 40	
Sentence Point	23.51	14.35	0 - 50	

Table 3
Results of
One Sample t-tests
On I.Q. Measures

Measure	Mean	S.D.	Hypothesized Value	t	N=63	df=62
Stanford-Binet						
M.A.	46.35	12.48	59.74	8.56***		
I.Q.	86.03	19.00	100.00	5.84***		
PPVT						
M.A.	47.76	16.88	56.33	4.02***		
I.Q.	83.06	22.59	100.00	5.96***		

*** $p < .0001$

Table 4
Results of
One Sample t-tests
On DSS and Subscales

Age Level Months	Measure	Mean	S.D.	Normative Standard	t	N=13	df=12
36 - 47							
	D S S Score	4.54	2.33	6.64	3.23**		
	Indefinite Pronouns	25.85	21.46	49.50	3.98**		
	Personal Pronouns	36.77	29.78	94.25	5.91***		
	Main Verbs	46.08	35.12	94.08	4.93***		
	Secondary Verbs	15.85	16.34	16.22	0.11		
	Negatives	11.00	12.57	16.00	1.44		
	Conjunctions	13.15	14.26	20.60	1.89		
	Interrogative Reversals	2.46	5.32	7.63	3.51**		
	Wh - Questions	5.69	8.94	4.80	-0.36		
	Sentence Point	21.92	14.45	35.28	3.34**		

* P < .05
** P < .01
*** P < .0001

Table 5
Results of
One Sample t-tests
On DSS and Subscales

Age Level Months	Measure	Mean	S.D.	Normative Standard	t	N=29	df=28
48 - 59							
	D S S Score	4.80	1.98	8.04	8.74***		
	Indefinite Pronouns	19.48	10.74	56.80	18.56***		
	Personal Pronouns	38.31	21.91	105.53	16.39***		
	Main Verbs	44.28	21.37	108.90	16.15***		
	Secondary Verbs	15.86	12.70	25.08	3.88***		
	Negatives	10.31	8.65	17.40	4.38***		
	Conjunctions	12.17	13.29	36.25	9.68***		
	Interrogative Reversals	4.17	5.85	7.32	2.88**		
	Wh - Questions	8.90	9.21	6.40	-1.45		
	Sentence Point	25.62	13.76	37.15	4.47***		

* P $<$ .05
** P $<$ .01
*** P $<$ .0001

Table 6
Results of
One Sample t-tests
On DSS and Subscales

Age Level Months	Measure	Mean	S.D.	Normative Standard	t N=19 df=18
60 - 71	D S S Score	4.10	2.44	9.19	9.10***
	Indefinite Pronouns	14.05	10.48	68.35	22.59***
	Personal Pronouns	35.58	31.20	108.42	10.18***
	Main Verbs	37.11	26.78	139.20	16.62***
	Secondary Verbs	11.68	11.74	21.72	3.73**
	Negatives	9.95	8.67	13.75	1.91
	Conjunctions	9.79	12.07	61.32	18.61***
	Interrogative Reversals	3.42	4.18	2.00	-1.48
	Wh - Questions	7.21	11.39	4.82	-9.15***
	Sentence Point	21.85	14.88	39.10	5.05***

* $P < .05$
** $P < .01$
*** $P < .0001$