A Study of Intelligence and Its Measurement as It Pertains to the Preschool Deaf Child

Patricia H. Slesdet

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A STUDY OF INTELLIGENCE AND ITS MEASUREMENT AS IT PERTAINS TO THE PRESCHOOL DEAF CHILD

by

Patricia H. Slesdet

A Project Report
Submitted to the Faculty of the School of Graduate Studies in partial fulfillment of the Specialist in Education Degree

Western Michigan University
Kalamazoo, Michigan
December 1968
ACKNOWLEDGEMENTS

The author is deeply grateful to all who have made this specialist project possible. I am especially appreciative of the encouragement, advice and constructive criticism of Dr. Morvin A. Wirtz and Dr. Robert Hawkins of the Western Michigan University faculty, and to Dr. Leland Stott, Merrill Palmer Institute, Dr. Marshall Hiskay, University of Nebraska, and Dr. Alathena Smith, John Tracy Clinic, Los Angeles, for their personal interest and encouragement.

Patricia H. Slesdet
MASTER'S THESIS

SLESDET, Patricia Hope
A STUDY OF INTELLIGENCE AND ITS MEASUREMENT AS IT PERTAINS TO THE PRESCHOOL DEAF CHILD.

Western Michigan University, Ed.S., 1968
Education, psychology

University Microfilms, Inc., Ann Arbor, Michigan
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A STUDY OF INTELLIGENCE AND ITS MEASUREMENT
AS IT PERTAINS TO THE PRESCHOOL DEAF CHILD

For the past seventeen years this author has been involved in teaching young nursery and kindergarten deaf children who are from two to six years of age at the Harold Upjohn School, Kalamazoo, Michigan. As a teacher, her prime interest has been in the capabilities or limitations of the children from the standpoint of helping to develop each child's abilities within his capabilities through diagnostic teaching. However, the matter of evaluating capabilities and limitations is not simple. One may use subjective means, which certainly have a place in the total process. Stutsman (21), author of the Merrill-Palmer Scale, so aptly conveyed this point when she expressed the sentiment that the most effective tool the artist has is his hand, but the better able he is to combine skill of hand with the use of delicate tools, the finer and more expressive his art becomes. She continues this analogy by saying that the most effective tool the child psychologist has is his knowledge of children, subjective though it may be; but this knowledge functions much more freely and effectively when it is supplemented by tools that enable the psychologist to determine a child's level of development. This writer would like to echo Stutsman's sentiments from the standpoint of the nursery and kindergarten teacher. Even though one often hears teachers say that they feel they are better able to judge a young child's ability by means
of their subjective observation, as opposed to testing, this author feels strongly that teachers could be helped tremendously if they had some objective tools and techniques to substantiate or refute subjective observations. If, through diagnostic teaching, teachers are to attempt to meet the needs of all of the children in the class, appropriate psychological tests could be of great value to the teacher in educational planning and therapy.

When one begins to consider objective means through psychological testing, however, one finds that both the tools and personnel for such assistance vary a great deal from geographic area to area. In this city, even though it has school diagnosticians, clinics, and university personnel, opportunity for having psychological tests for young deaf children is very limited. A lack of training or experience with children with the specific handicap of deafness, inadequate time to acquire such experience or training, or a lack of time to devote to this special service, are all reasons for this limited assistance. Diagnosticians are frank to admit that the sampling of deaf children with whom they come in contact is much too small upon which to judge validity of their text or testing techniques.

Mobility plays an important role. A diagnostican may be assigned, become interested in testing young deaf children, then moves on, and the process of initiation must begin all over again. However, the teacher remains in the same position as previously, being asked frequently to make evaluations of certain deaf children for diagnostic purposes by physicians, community agencies, case conferences, and school personnel. Thus in this study, the author has attempted to
seek knowledge in this area, at least to the extent of better understanding what is involved in psychological testing of the preschool child, and especially, the preschool deaf child. The material is presented in four stages, one built upon the other, as follows:

(1) reviewing selected research literature in regard to the present concepts pertaining to the intelligence of the preschool child

(2) reviewing the research literature in regard to the measurement of intelligence and tests in use for such measurement with the preschool child

(3) reviewing the research literature in terms of the concepts pertaining to the intelligence of deaf children and its measurement in the preschool deaf child

(4) selecting those tests that may ethically be administered by a teacher who is not a diagnostician or psychologist, choosing those that are appropriate and available, administering these tests, and relating them to diagnostic teaching

At this point, two premises must be presented. They are, (1) what this author means when speaking of the preschool child, and (2) what is meant by selection of tests which may ethically be administered by teachers.

In this study, the preschool child will be considered as the child two through six years of age, as is the usual interpretation in most child development literature. The six year old is included, even though, strictly speaking, the American six year old is a school child, required by law to attend school. The preschool deaf child will also be defined, as is the hearing child, as the two through six year old, despite discrepancies in the use of this term as it applies to various educational programs for the young deaf child. For
example, some programs use the term, preschool, to designate all children below kindergarten placement. Others label all children below first grade or "First Level" as the preschoolers. This terminology could make a difference of from one to three years in the upper age level of the preschool deaf child. Thus, for purposes of this study, the preschool deaf child will be the two through six year old.

Since this author is a teacher of the deaf, interested in the concepts of intelligence of young children, especially deaf children, and ways of measuring such intelligence, the purpose of this paper is to find valid intelligence tests for preschool deaf children which are recommended for use by a teacher, either by author or publisher, or which are permitted for use by a teacher working with a diagnostician or psychologist.

Each of the above categories or stages will be considered in a separate part of this paper, but will be summarized briefly in the general summary.
CHAPTER II

CONCEPTS OF INTELLIGENCE IN THE PRESCHOOL CHILD

What are authorities in the field of child growth and development reporting in regard to current concepts of intelligence and its development in the preschool child two through six years of age? Are the emerging concepts of intelligence cited by the child development specialists the same as, or different from, the bases of the authors of the most frequently used intelligence tests for the preschool child? Let us examine these concepts for purposes of comparison. While reviewing and comparing concepts in intelligence, let us also keep in mind the kind of information that will be of most help to a teacher who is interested in diagnostic teaching. Which aspects of this mental development are measured by intelligence tests? Which aspects should be measured to be most helpful to a teacher? One might keep in mind while reviewing these concepts the possibility of whether or not the traditional preschool measurements will be most helpful, or will some of the newer techniques, such as evaluation scales covering broader areas be more helpful in understanding one's students for educational planning?

A most comprehensive and helpful discussion of intellectual development of the preschool child is contained in a book by Smart and Smart (16). This book is based upon innumerable past and present research studies in regard to children. The authors report that they have used Erikson's broad and deep picture of personality development
and Piaget's illuminating analyses of the growth of the intellect as a focal point for tying together the research studies. The material is presented in greater depth and with more meaningful interpretation than most books on this topic. Therefore, this writer would like to use this work as a basis of discussion of the concept of intelligence and its development, and several subsequent references will be made to this text.

In their book, Smart and Smart think of intellectual development of the preschool child as involving thinking, concept formation, intelligence, language and imagination. They state that thought, language, and imagination interweave and overlap as cognitive growth proceeds. Language provides symbols for thinking, socializes thought through interaction with other people.

In regard to thought processes and conceptual development, the authors report that the intellectual landmark of the end of infancy is the completion of the period of sensorimotor intelligence and at this point, the child has achieved two major feats, the control of his movements in space and the notion of object constancy. The child realizes that an object continues to exist even when he does not perceive it. Sensorimotor intelligence links successive perceptions and movements, with brief anticipations and memories, and it does not take a large sweeping view. They report that Piaget has indicated that sensorimotor intelligence acts like a slow-motion film, in which all pictures are seen in succession but without fusion, and so without continuous vision necessary for understanding the whole.

Smart and Smart indicate that from the end of the sensorimotor
period to about age seven, thinking has certain characteristics
which are more sophisticated than what has gone before but that are
naive in comparison with later thinking. During the preschool years
the child progresses toward more complex thinking.

The following statements are a summary of the characteristics
of preschool thinking as described by Smart and Smart (16, pp. 207-
209):

1. The young child cannot think from any point of view
except his own, and he does not realize that he is
limited in this fashion. His thought is centered
upon one perspective, his own. He can step into the
role of someone else, but when he does it, he loses
himself. He can do through fantasy, in taking the
role of another, what he cannot do through controlled
thought. But neither through fantasy nor controlled
thought can he see both points of view at once and
weigh them. This should be very interesting to
parents and teachers, especially when one stops to
think how many times a young child is asked,"How
would you feel if he took this toy away from you, or
if he hit you?"

2. Perceptions dominate the young child's thinking. He
is greatly influenced by what he sees, hears or other­
wise experiences at a given moment. Literally, seeing
is believing. The static picture is what he believes.
He does not pay attention to transformations or
changes from one state to another. What he perceives
at any one time is, however, only part of what a more
mature person would perceive. However, perception
becomes more flexible or "decentered" with increasing
maturity. As he moves through the preschool years, a
child's thinking becomes increasingly flexible, less
centered and less dominated by perception.

3. Reasoning at this age is from the particular to the
particular rather than from general to particular.

4. Preschool thinking is relatively unsocialized. The
young child feels no need to justify his conclusions,
and if he did, he would not be able to reconstruct his
thought processes so as to show another person how he
arrived at his conclusions. He begins to adjust his
thinking to that of other people only as he becomes
aware of himself as a thinker and as he grows in power to hold in mind several aspects of a situation at a time. Through years of interaction with other people, discussing, disagreeing, coming to agreements, the child gradually adopts the ground rules necessary for logical thinking.

During the preschool period, Smart and Smart indicate that the young child also builds concepts when certain recurring experiences are realized as having similar or identical aspects. Sensory, motor and emotional experiences all enter into the early building of concepts. Young children often group together things they have experienced together, and use one word to mean several of these things experienced together. When the child applies a word to a group of objects or events, he shows that he has a concept of it. He may well have a concept of it before he indicates that he knows a word for it, but at least when he has the word, he has the concept. As a note, when working with the deaf, a child may have a concept for something, but it is difficult to know this because he may not have the verbal symbol to express it. Hence, this inability to verbalize a concept is one important factor in developing an intelligence test for young deaf children, and in addition, is a difficult concept upon which teachers are called to make subjective judgment.

Smart and Smart indicate that the first concepts developed are concrete, tied to definite objects or events. Through repeated experiences, especially those verbalized by other people in certain ways, the child develops abstract concepts. The concepts he builds will always be affected by the people around him, through the give and take of social living. The concept of all is built during pre-
school years. In the early part of this period, the child does not know whether a succession of objects which look alike are one and the same object or a series of objects. Through experience and discussion the child builds concepts of one, some, and all. The concept of all shoes, for example, begins at about age five. Concepts of time are related to bodily activities and related to the environment such as hunger, eating, and sleeping. Other early experiences which form the basis of time perception include dealing with a succession of objects, such as filling a basket with blocks, taking part in an action which continues and then stops, such as pushing or pulling a wheeled toy, hearing sounds of various lengths, perceiving repetitions of stimuli in patterns, such as music or dance, or even rhythms of patting which a parent might do to a child in his arms. In early childhood, time is not "an ever-rolling stream" but simply concrete events, embedded in activity. Time and space are not differentiated from each other, nor are they until beyond childhood. Having no overall, objective structure, time is largely the way that the preschool child feels it or wants it. The young child's concepts of space, like his concepts of time, are derived from bodily experience. He gets sensations from within his body and from interactions with the rest of the world. Concepts become more and more abstract as the child has more experience in grouping objects, dealing with time, space and numbers, experimenting with processes. The process of abstraction is aided by the abstractions offered by language. Thus, because of language deprivation, one can see why the process of abstraction is so much more difficult for the deaf. Both language and concepts are learned
through interactions with people, where the child checks and rechecks his accuracy, eventually achieving socialized thought.

Smart and Smart make these observations in regard to language development. They report that language develops rapidly in the second year of life, speeding up thought and also making it more precise and flexible. The use of verbal symbols makes problem solving much more efficient. Again, one sees why problem solving is a more difficult task for the young deaf child. The authors continue that since the preschool child is centered on his own point of view, his speech reflects this fact. As he gradually increases, through social interaction, his ability to take into account the viewpoints of other people, he continues to talk to himself as an aid to problem solving and planning and directing his activities. Some research has indicated that this very inability to verbalize as a reinforcement factor in problem solving has a definite influence in the intellectual development of the young deaf child. The authors, Smart and Smart, believe that through social interaction, the child comes to possess and use the concepts with which his culture organizes experience. The child also progresses toward the use of adult structure in language, increasing the number of words, refining his use of grammar and speaking in longer, more complex sentences.

Intellectual development receives a big impetus when thinking and speech come together in the discovery that everything has a name. The average timing of the discovery is between 18 months and two years, when the vocabulary increases from around 20 words to almost 300 words, according to Smart and Smart. Over 600 words are added
annually for the next two years, and then the rate of vocabulary increase drops somewhat. The rapid acquisition of language by the preschool child, shown by this increase in vocabulary and development of grammatical structures, is intimately related to the development of autonomy and initiative, to the growth from egocentric thought to objectivity and to social relationships. The authors report it is also closely related to general intelligence, vocabulary being one of the best single measures. Other authors in the field of child psychology and child development, Bernard (2), Dinkmeyer (4), and Thompson (22) express the same belief. In contrast to this developmental sequence in hearing children, let us consider that a young deaf child may be anywhere from two to five years older than a hearing child before he reaches the stage of realizing that everything has a name, and having reached this stage, certainly his acquisition of speech and language is at a much, much slower rate. One wonders what this does to the development of autonomy and initiative in the deaf child, to the growth from egocentric thought to objectivity and to social relationships.

Smart and Smart also feel that imagination plays a very vital role in intellectual development. They feel that imagination plays an important part in the development of controlled thinking. The young child solves through imaginative processes many problems which he cannot handle by controlled thinking. Through mental images, the child represents experiences and objects to himself. He invents symbols to stand for the images and uses those symbols in his thinking. As he acquires language, he is able to think more and more
with the words which his culture gives him as representatives of experiences and objects. In imagination, however, he continues to use some of his own private symbols, and invents more for his own purposes in fantasy, in symbolic thinking and in dreams. Other forms of imaginative expression include dramatic play, in which human relationships and roles are explored; creative language, which produces stories, poems, and humor, reduces anxiety. Young children perform and enjoy in all fields of art, music, dance, printing, and sculpture. Children use all forms of imagination in solving problems and in expressing their thoughts and feelings. With young deaf children this writer has observed that it takes a little longer for them to begin to engage in imaginative and creative play, because their world has been so concrete to them as they have tried to determine what each thing really is, let alone what it could be in imaginative or dramatic play. Too, this writer feels that one has to provide special techniques and opportunities for this development with young deaf children. However, it is extremely important in the development of language and the other aspects of intellectual development, just as with a hearing child.

Thus, Smart and Smart have indicated that thinking, language, and imagination are intimately associated with one another in such a way that each is necessary to mental life. They have pointed out that in all areas of thinking, the preschool child increases in speed and flexibility. Strongly dominated by perception in the early years, he moves toward greater control of his thinking. His earliest concepts of classes, space, numbers, time and causes are rooted in concrete,
personal experience, gradually becoming more objective and abstract as he has more experience, especially in interactions with other people, who check his thoughts and conclusions.

It is at this point that one can realize the very important role that good nursery schools can play in facilitating intellectual development during these preschool years. Smart and Smart feel that the tremendously rich environment of the good nursery school offers never-ending opportunities for building mental structures. The child constantly perceives, integrates his perceptions and integrates sensory experience with verbal expression. The authors cite the research of Jenson (9), which indicates that nursery schools stimulate mental growth in a variety of ways including opportunity for problem solving within their ability, language development, and concepts of time. A recent review of research on teaching in the nursery school by Sears (15) cited by Smart and Smart yields considerable evidence that nursery school attendance promotes social, language, and intellectual growth. The quality of the nursery school seems to make a difference in whether such growth can be demonstrated. Gains are greatest, according to the author, in the children who start with the greatest room for improvement. Those from homes providing meager stimulation are likely to make the greatest intellectual gains.

The tremendous growth potential of young children demands a rich and varied environment in order for a child to realize this growth potential. Supplements to the home in the form of nursery schools, kindergartens, play groups, and so on, provide places and opportunities where children can reach out to interact with their nurturing
world, according to the authors.

Examination has been made of the viewpoint of two child development specialists who have based their opinions of intellectual development during the preschool years upon the views of the noted psychologist, Jean Piaget, and the psychoanalyst, Eric Erikson, and upon information gained from hundreds of various research studies which they have cited.

How does the concept of intelligence presented by Smart and Smart compare to that of the authors of intelligence tests, and hence, the aspects of intelligence that will be measured in these tests? In the consideration of these concepts, one will attempt to keep in mind which aspects of mental development are being measured by the traditional preschool tests, and whether or not the traditional preschool intelligence tests will be most helpful to the teacher, or whether some of the newer, broader techniques in evaluation scales now being published may be more appropriate to a teacher's specific needs in learning about her students and their particular needs.
CHAPTER III

INTELLIGENCE TESTS FOR PRESCHOOL CHILDREN

The second phase of this study will involve the nature of the measurement of intelligence in the preschool child and tests in use for such measurement of intelligence. It will attempt to answer one's question in regard to the comparison of the concept of intelligence by specialists in the field of child development and that of the authors of intelligence tests for preschool children. It will also attempt to answer one's question in regard to which aspects of mental development are being measured by traditional preschool tests, and how these compare to current concepts of intellectual growth. It will also attempt to present other pertinent information which this writer feels is important for teachers to understand about the measurement of intelligence.

An exhaustive three year study of the problem of measuring preschool intelligence has recently been undertaken by Dr. Leland H. Stott, of the Merrill-Palmer Institute, and Dr. Rachel S. Ball, author of the Merrill-Palmer Scale and now of Arizona State University, under the auspices of the U.S. Department of Health, Education and Welfare, Project No. 1166 (20).

Stott and Ball's study has three main approaches. First, the technical and professional literature covering the concept of intelligence and its measurement, particularly of the infant and early childhood levels, was reviewed, organized, and summarized. This first
part deals briefly with some of the trends of thinking on the nature of intelligence that have predominated in the past and with those that are now current. Special attention is given to the problem of the developmental change in mentality during infancy and childhood. It also deals with the development of tests and scales for the measurement of mental ability, during these early stages, and with the various uses that have been made of these testing devices.

The second approach in the study was a questionnaire survey made of the current practices in testing the intelligence of infants and preschool-age children. This questionnaire was designed to provide an estimate of the relative frequencies with which the various tests are presently being used, and for what specific purposes.

The third approach was to analyze statistically the actual content of five of the most widely used infant and preschool scales in terms of children's actual performances on each specific test item. The purpose was to determine (1) to what extent these test scales are similar in item-meaning content, that is, whether they involve the same or different ability factors, and (2) to determine the consistency or lack of consistency, with which each scale maintains the same meaning content at its various age levels. This most valuable piece of research, based upon 221 reference sources has provided a great deal of pertinent information for this writer's study, and has provided answers to many questions. Hence, many references will be made to this report. It would appear that many of those working with and interested in the preschool child have been wondering about some of the same problems. Stott and Ball have provided some
pertinent information in the following data which they have presented in their study.

In recent years, they report, developmental psychologists have been showing an increased interest in the earliest phases of human development. The period of infancy has always been an area of interest and concern, but, in the early days of study of child development, the main focus was on the baby's physical well being, that is, his care, nutrition, rhythms of sleep and wakefulness, and patterns of feeding and elimination. Pediatricians and child-care specialists twenty-five years ago were vitally concerned with such issues as breast versus bottle feeding, self-regulation versus clock scheduling of the infant's feeding periods and the problems of toilet training. The authors believe that today the focus of interest seems to have shifted in the direction of what the baby is like psychologically at birth, that is, his tempermental nature, his 'intellective' functions and when they appear, and the extremely rapid changes that take place in these psychological aspects during the early weeks and months of infancy. They feel that there is a lively and growing interest in cognitive development, and in the possibilities of facilitating optimal development without pressure but through an awareness of certain "critical periods" of development by providing appropriate conditions of stimulation.

Stott and Ball feel that conceptions of the nature of mentality and the processes of intellectual development are undergoing modification in terms of these newer interests. They indicate that whereas, formerly, intelligence was widely conceived of as a general,
initary, pervasive quality that quantitatively characterized the individual throughout life, it is now more frequently conceived of as an interrelation of abilities or functions that are central to one's coming to know and to cope with his environment. The idea that intelligence is "fixed" by heredity, not only in terms of the amount the individual possesses but also in rate and pattern of development, is generally being replaced by the view that environment is also an important determinant in interaction with the organism. They imply also that in these newer viewpoints is the idea that developmental changes in mentality are qualitative, as well as, quantitative, in nature.

The authors state that another conceptual change concerning the nature of intelligence, which they also feel is long overdue, is related to the dichotomy of "motor" behavior versus mental or central processes. They substantiate their belief in this manner. The infant begins to know and cope with his environment through his motor responses to stimulation. His eyes follow a patch of color. He responds to the sound of a person's approaching steps. He kicks and thrashes about with his arms in a random, disorganized manner, bringing his hands in contact with objects within his reach. He grasps, mouths, shakes, and bangs them, and thus "experiences" them with his various senses. They indicate quite clearly, however, that in the beginning these simple, sensorimotor experiences do not involve the awareness of the objects from which the stimulation comes. Thus, they state that there could be no central representation of them, as such, at first. However, developmental change is
rapidly taking place, and soon, with further maturation and experience, the child learns to differentiate objects, and to respond to them as objects as he sees, grasps, and tastes them, and hears them fall to the floor. His motor behavior now involves the cognitive awareness of things and persons. His functioning, with respect to them, has become meaningful. The authors believe that all his motor manipulations, eye-hand, fine motor, and gross motor coordinations, appear now to be centrally mediated and directed toward some kind of adjustment to, or coping with the environment. Therefore, they state that sensorimotor experiences are "intellectual" in nature. Hence, Stott and Ball express their belief that motor behavior of the young child is mental behavior. In this simple sensorimotor activity mental processes are also involved. The child, presumably, has simple cognitive awareness of the situation. Some memory traces from past experience must also play a role in determining his behavior. They state, at this early age, a number of specific abilities, not just general ability, constitute the structure of mentality. Based upon their research, Stott and Ball have stated their position in regard to the long-standing difference of opinion that has existed among some psychologists in regard to the nature of intelligence in the very young child.

The authors feel strongly that the quality of one's functioning at any age or stage of development obviously depends upon such specific mental ability factors. One functions effectively in terms of the realities of a situation only to the extent to which his cognitive abilities make him aware of its various aspects and its
complexities, and to the extent that his memory abilities permit him to profit from past experiences, and also, to the extent that his abilities to "think", to try out implicitly alternative modes of functioning, facilitate a wise choice of a course of action. The authors believe that in the intelligence-test situation, the child is judged as bright, average or retarded, with an assigned mental age or IQ, in terms of the adequacy with which he performs the tasks and solves the problems presented to him.

Stott and Ball prefer, therefore, to apply the term "intelligence", not to innate mental developmental potential, not to the growing capacity to acquire new and more effective modes of behavior within the limits of that potential, not to one's abilities to perform, but, rather, to the observed, measured, or evaluated quality of appropriateness, adequacy, and effectiveness of performance. They feel that this quality is, and must always be judged or assessed in terms of what the subject does or can do.

The authors feel that in devising performance items and constructing scales for appraising this attribute of children's functioning, however, care should be taken, insofar as possible, to include items that will require the child's exercise of all the various abilities that modern research has been able to identify as constituting the complex structure of intellect in children. They believe that tests and scales that have been constructed on the theory of a single, general mental ability may fall far short of the mark.

Stott and Ball found that the presently available and widely
used tests and scales for measuring mentality at the infant and preschool levels, with few exceptions, were devised and standardized in terms of the older conceptions of the nature and development of intelligence. They state that tests were generally standardized at these early age levels upon few, and, in many instances, poorly selected cases. Nevertheless, they report that when used with discretion the tests have proved to be very useful instruments. In general, they state that although the present-day users of the scales find them indispensable, they are well aware of their defects and inadequacies. They would like to have the scales amplified, modernized, and restandardized.

The authors point out a lack of correlation and a difficulty in explaining this lack of correlation between infant and preschool test scores, and scores obtained during later childhood, in terms of the concept of quantitative change. The authors explain that the question of qualitative versus quantitative change in mental development involves the problem of the nature or structure of intelligence. They point out that on the theory of a single general-ability factor, development would simply be an increase in amount. A child's intelligence would grow by simple accretion. All his new acquisitions, such as his increasing ability to solve problems, perform more difficult, abstract, and complex tasks, would be based upon, and come about by virtue of this growing, general-intelligence factor. On the other hand, they point out, with the assumption of qualitative change, a feasible explanation is that mentality of different levels of development is different in its constituent
qualities, as well as amount. Therefore, since the tests were designed on the theory of a constant general-intelligence factor rather than a developmental sequence of qualitatively different levels of functioning, they fail to register adequately the developmental change taking place. The authors feel that as a result it would seem that a promising approach to the construction of mental tests for early childhood might be along the lines established by Piaget in 1952 and with reference to the findings on structure of mentality as it changes with age as set forth by Fulford in 1959. It will be recalled, here, that Chapter II of this paper, pertaining to concepts of intelligence in the preschool child, is based upon these principles and findings of Piaget. The authors of this research project state that it seems clear that qualitatively different levels of mental functioning occur in the course of development and each level, or stage, although it emerges from and is continuous with the preceding one, has its own unique and characteristic structural features. A true developmental sequence of levels of mental functioning, based upon these unique and characteristic features, is needed as a basis for the construction of better infant and preschool-age mental-test scales. Stott and Ball believe that the final summation of the mental test, would from this point of view, express the levels of mental functioning for a broad band of abilities, each of which is possibly developing at a different rate depending upon each level's genetic potentiality and environmental stimulation. Thus, the authors believe, as a diagnostic tool such a summation would be available for a differential
analysis of the various aspects of the child's mental life.

Stott and Ball point out some interesting problems of test construction with young preschool children. The adequate accumulation and selection of appropriate test items and their accurate scaling depend directly upon the size and representativeness of the same group of children studied at various ages and levels of development. No problem is presented with school age children since compulsory school attendance brings together into groups the total population of these children. Thus, groups can easily be selected to sample adequately the various segments of the population. The situation is quite different with children under school age. The problem here is largely one of finding the children individually and getting the parents sufficiently interested to allow the children to be tested. Thus to make up adequate and representative samples at the various age levels under school age, a great deal of time-consuming searching activity is necessary.

They point out another source of grave difficulty in the assessment of mental status in very young children is the extremely limited repertory of behavior of which children are capable. Since intelligence must always be measured in terms of level and quality of performance, the younger the children to be appraised the more limited the performance possibilities that can be used as indicators of mental status. Stott and Ball point out furthermore, that although there are wide individual differences in inherent potenti-
the child grows older. This fact creates the problem of finding and
devising a sufficient number of test items for test-scale construc-
tion and has been a difficult one from the beginning.

The authors point out that for the above reasons, there has
been, until relatively recently, a marked neglect of the child below
school age in the mental-testing movement. The few early efforts to
construct tests particularly at the infant level did not prove to be
successful.

A brief history of mental tests for preschool children presented
by Stott and Ball in their research indicates that Binet was the
earliest investigator to attempt to test children below school age
and to establish definite measurement standards. In his first crude
scale, published in 1905, he included several tests for children
under age three. However, little use seems to have been made of
these tests by Binet. In his 1908 revision, he included items only
for children three years of age and older. There have been a number
of early American revisions and modifications of Binet's scale. In
1913 Terman made a revision, scaled down to the three-year level,
but in its standardization, only ten children aged three and fifty-
one aged four, were tested, and as a result this revision also had
very limited value as a preschool scale. During the early 1920's a
variety of tests and scales designed for use with infants and young
children appeared, and most were revisions or modifications of
Binet's original scale. It was also during the early 1920's that
the more successful and more adequately standardized infant and pre-
school tests, which appeared later, were in the early stages of
development. A few tests not related to the Binet items also appeared during this period but none was adequately standardized for children younger than five years. Among these were Koh's Block Design Tests, the Detroit Kindergarten Test, the Rhode Island Intelligence Test, the Pitner-Cunningham Primary Mental Test and the Cole-Vincent-Vincent Test.

Stott and Ball report that little real effort was concentrated on the problem of assessing mental status in infancy until Gesell began his normative studies in 1919. He and his co-workers began to study systematically the ordinary and normal developmental behavior of infancy and early childhood. The plan was to observe and record infant behavior as accurately as possible for successive age levels during infancy and early childhood, and hence to establish norms for each level. The concept of "developmental age" was applied to these normative levels and from this material the Gesell Developmental Schedules were prepared. The schedules were simply categories of items arbitrarily arranged to allow a rough appraisal of the child's level of development in each of four major areas: motor behavior, adaptive behavior, language behavior, and personal-social behavior. The procedure in the use of these schedules was purely observational. In general, they constituted a standardized procedure for observing behavior and evaluating the course of behavioral development. The Gesell Schedules have been one of the main sources of material in the construction of subsequent tests for young children. Stott and Ball point out that, as was true with other tests of infant ability, evaluative studies of Gesell's schedules generally have demonstrated
practically no correlation with later tested intelligence. However, the authors cite research by Knobloch and Pasamanick (11) in 1960 reporting consistency and predictive value of the 40-week Gesell Developmental Schedule. As a result of their experience with the schedule, Knobloch and Pasamanick reportedly regarded it as a neurologic examination stemming from what they considered to be an integral interrelationship between neurologic integrity and maturational development. The study cited by Stott and Ball was based on the evaluation of 500 premature infants and 492 full-term controls. The general conclusion reached by Knobloch and Pasamanick was that the Gesell developmental examination was a reliable and valid tool for identifying infants with deviations in neurologic or intellectual development.

Stott and Ball indicate that during this period of the 1920's, much attention was given to the later preschool years. Dr. Stutzman Ball published what became the Merrill-Palmer Scale of Mental Tests for Preschool Children in 1931, and she had been at work on it since 1922. Through the years it reportedly has been one of the most widely used preschool scales. Most of the evaluation studies of infant and preschool tests made during the 1930's and 1940's were concerned with the question of predictive validity. The most frequent criterion used was later Stanford-Binet IQ.

In the late 1930's, the Minnesota Preschool Scale was developed by Florence Goodenough and her co-workers. The scale is available in two equivalent forms, each consisting of 26 items. Many of its test items were adopted from the Kuhlmann-Binet Scale, some from
other available scales, and still others were new and original. It was standardized on 900 carefully selected children. Stott and Ball indicate that, in general, the strong points of the Minnesota Scale were its careful standardization, two parallel forms, and high interform reliability. On the negative side, the tests were not particularly appealing, especially to children under three years of age.

Stott and Ball report that a number of performance and non-language tests have been devised of which some extend well into the preschool age range. They indicate that perhaps the best known of these is the Goodenough Draw-a-man Test, published by Goodenough in 1926. The child is simply instructed to make a picture of a man and to make the very best picture that he can. Emphasis is placed upon accuracy of observation and the development of conceptual thinking rather than upon artistic skill. The test is scored in terms of such items as the parts of the body included, clothing details, and perspective. In 1961, a revision and extension of the test was published by Harris. In this revised form, the child is asked also to draw a picture of a woman and himself. The Self Scale was included more as a projective test of personality. The scales project downward to age five. It is indicated that there may be two main sources of unreliability of the Goodenough Drawing Test. One is the change that frequently takes place in the quality of the child's drawing as measured by the scale on two different occasions. The other is a result of the subjective judgment of the scorer of the test.
By 1933, Stott and Ball report, Bayley had accumulated a considerable number of test items from various sources, particularly from Gesell, Stutzman, and Goodenough. With many of her own items added, and by adopting many of those available for lower age levels, the California First-Year Mental Scale was published in 1933, and contained 115 test items covering a mental-age range from birth to 18 months. Effort was also made to provide continuity of content by using appropriate tests of the same functions at successive age levels, a condition reported by Stott and Ball to be lacking in most intelligence scales. A feature of this work, rarely found in standardization procedures, according to Stott and Ball, was the longitudinal nature of the data. The same infants, who numbered between 52 and 61, were tested monthly, yielding some 870 separate test scores for scaling procedures. This early scale was quite widely used, but, along with other infant scales, again according to Stott and Ball, became generally discredited because of its failure to predict later Stanford-Binet IQ. A new revision of the California First-Year Scale known as "An Infant Scale of Mental Development" was published by Bayley and her co-workers in 1958. The new series of tests used the original California norms as a frame of reference but also included alterations, deletions, and additions. New items were "borrowed" or adopted mainly from the scales of Griffiths and Cattell. Stott and Ball also state that this new set of scales, and the assessment procedure associated with it, undoubtably constitutes the most adequate mental-testing program at the infant level yet to appear. As of 1965, it had not
yet been made available for general use.

The Cattell Infant Intelligence Scale was regarded by many psychologists as the most satisfactory device for testing very young children, according to Stott and Ball. The children were tested on a longitudinal basis at 3, 6, 9, 12, 18, 24, and 30 months for standardizing purposes. The items for the final scale were selected on the basis of several criteria. Among them were, ease of administration and scoring, objectivity, lack of cumbersome equipment for administration, attention-getting and holding value, and increase in the percentage of passing from age level to age level. Since tests requiring a time limit were considered undesirable for use with very young children, no time-limit tests were included in the Cattell Scale. The test materials are very similar to those used in the Gesell Developmental Schedules and the lower levels of the Binet Scale. Stott and Ball indicated from research findings that intelligence scores of children under two years of age, as measured by this scale, are of little value in predicting subsequent IQ scores. They did find, however, that the scale discriminated significantly between premature, mature, and postmature infants at ages 6, 12, 18, and 36 months.

Stott and Ball also present a brief resume of the following performance scales. They indicate that the idea of measuring mentality through motor performance goes back to the early days of the testing movement. They believe that in a sense, every "mental" test is a "performance" test since there is no way of appraising mental ability except in terms of what the subject can do. In the
"performance test" however, they indicate the effort is made to eliminate, insofar as possible, the use of language by either the examiner or the subject.

The authors indicate that the first major attempt to standardize a series of such tests in the form of a scale was the Pintner-Paterson Performance Scale of 1917. All the tests in the scale were presented without language, and no language was required in the responses. The scale consisted of fifteen tests, many of which have been included in more recently standardized scales. The reliability of the Pintner-Paterson Scale proved to be considerably lower than that of most verbal scales, according to Stott and Ball.

In 1930 Arthur released the Arthur Performance Scale. It contained eight of the Pintner-Paterson Tests together with Porteus Mazes of 1924, and Kohs Block Design Test of 1923. All of the new tests were restandardized on a new sample of eleven hundred children, aged 5 to 15 years. A "Revised Form II" of the Arthur was published in 1947. Because of its limited use at the preschool levels, Stott and Ball feel that the Arthur Scale has only historical significance for the present topic. Stott and Ball indicate that in recent years a number of attempts have been made to devise non-language mental tests of such a nature that the responses to them could not be influenced by experience or learning peculiar to any culture. Certain of these so-called culture-free tests have been standardized for children as young as two years. The Leiter International Performance Scale is pointed out as an outstanding example of this type of instrument. It consists of a series of tests developed over a period
of years of use with different ethnic groups in Hawaii and Africa. A revision of the scale was issued in 1948, largely based on the testing of American children. Stott and Ball indicate a distinctive feature of the scale is the elimination of instructions in pantomime as well as speech. The child's comprehension of the task to be performed is treated as part of the test.

It is indicated that the Leiter Scale was designed to cover many of the same functions as those tested by the usual verbal scale. Among the tasks set for the child are the various matching tasks—such as colors, forms, pictures, picture completion, the copying of designs, analogies, series completion, the recognition of similarities and footprints, immediate memory, and classification of animals. The 1948 revision extends down to age two years. The scale is administered individually without time limits. It provides both mental age and IQ scores.

In 1952, the authors report that Arthur published an "adaptation" of the Leiter Scale. This revision was standardized as a point scale and is suitable for use with older preschool children.

Stott and Ball report that in all mental tests for young children, with the exception of the non-language tests, vocabulary items have been found to be valid indicators of mental-development level. A scale, published in 1948 by Ammons and Ammons, is unusual in that it is a vocabulary test that is essentially non-verbal, that is, the testee need not say a word. He is asked to point to one of four pictures on a card that best illustrated the meaning of a given word spoken by the examiner. The scale consists of sixteen cards,
each with a list of words graded in difficulty. It requires only fifteen minutes to administer. The standardization of the scale as a preschool instrument was based on a representative preschool-age population which consisted of a sample of 120 American-born white children ranging in age between two and five years. The sample included the same proportions of the various occupational groups as was found generally in fathers of preschool children of the United States in the 1940 census.

Stott and Ball indicate that in 1954, Griffiths reported a new scale designed to measure infant mentality. The total scale consisted of five subscales that presented a "balance" of five different areas of behavioral development: locomotor, personal-social, hearing and speech, hand and eye development, and performance. Each subscale contained what the authors describe as 52 finely graded items arranged in order of difficulty, making a total of 260 items in the whole scale. It was designed to test children during the first two years by presenting three items for each week of life for the first year and two items for each week of the second year. Stott and Ball indicate that Griffiths conceived of intelligence as general ability, and she set out to measure as many as possible of its various manifestations. She borrowed many items from other scales, especially the Gesell Schedules, but devised many more of her own. No claims were made for the predictive validity of the scale.

Stott and Ball report that Brenner recently devised a simple and easily administered test for appraising children's "readiness" for entrance into the first grade. The test consists of five tasks,
whose basic patterns are built on the principle of Gestalt. The tasks are: (1) copying ten dots of equal size arranged in a specific order, (2) copying the sentence, "Fred is here," the instructions varying with the age of the children, (3) drawing a man, (4) number-producing activity, using one-centimeter cubes, and (5) number-recognition activity. The major premise is that perceptual-conceptual development is a main agent in personality development, learning and readiness for school. Stott and Ball state that the total score on the Brenner Gestalt Test was found to correlate .81 with the teachers' rantings on the children's levels of functioning.

Thus the authors conclude their description of infant and preschool mental tests available in 1965.

The second aspect of this study was to determine by questionnaire the relative frequency with which each of the various infant and preschool mental tests was used and for what specific purposes. The questionnaire was sent to a total of 750 treatment agencies, research centers, and individual clinicians and researchers. Of the 330 returns, 113 indicated that children under six were not included in their clientele. The results, consequently, are based upon 217 completed returns. Nearly 60 per cent of the respondents represented educational institutions, nursery schools, kindergartens, day care centers, and like service centers. Fifty-one different tests and scales were checked or mentioned as being used with children under six years of age. The Stanford-Binet was by far the most frequently used, that is about 90 per cent of the time. The authors report the six most used tests next in order were, in order of frequency,
Goodenough's Draw-a-man, the WISC, the Gesell Schedules, the Cattell Infant Scale, Ammons Picture-Vocabulary, and the Merrill-Palmer Scale.

The appraisal of mental capacity by the respondents was made for a variety of reasons, according to the authors. The most frequent reason, given by eight per cent of those replying, was for diagnosis of such conditions as mental retardation, speech or hearing defects, organic brain damage, or other disabilities.

Testing was also done in connection with treatment procedures. The types of treatment reported were psychotherapy, fifty-two per cent; parent counseling, nine per cent; physical and occupational therapy, five per cent; and developmental guidance, three per cent.

The authors report that special values, as well as inadequacies, were reported by the respondents for each of the widely used tests. The most frequently mentioned limitations were poor validity, manuals inadequate or difficult to use, limited norms, poor predictability, insufficient diagnostic precision, culturally outdated, too subjective, or lacking in theoretical rationale for the dimensions measured. The authors report that many suggestions were made for the improvement of the available tests by the persons using them.

In discussing the use of tests in the study of infantile mental ability, the authors discuss the relation between early and later test scores. Attention was given to their general finding that infant-test results have no practical value in predicting later levels of mental functioning, as measured by tests of intelligence. Reference was made to the many studies in which the lack of
predictive validity was demonstrated. During more recent years, they report, a few studies of a more analytical nature have appeared in which attention has been directed toward the identification of the factors responsible for these findings. After citing some of these research reports, the authors report that assuming that all the tests in such studies were really measuring "intelligence", the conclusion follows that intelligence in early infancy is not of the same quality as intelligence at school age and later.

In discussing the factors affecting early IQ's and their stability or change in IQ ratings and in reviewing the few research studies, Stott and Ball believe that the evidence demonstrates the differentiating roles of the various aspects of the social environment in the development of mentality. It also lends support to the view that verbal and nonverbal intelligence are factors that do indeed vary somewhat independently of each other at the preschool level.

Stott and Ball point out the use of early childhood tests to aid in the perennial problem which besets school administrators in initiating and properly orienting the great numbers of five and six-year-olds who present themselves each year for entrance into the regular elementary schools. They indicate that one obvious need is some sort of foreknowledge of each child's degree of readiness for the public school experience. They add that there are, of course, a number of reading-readiness tests in wide use, but relatively little is being done in the way of a comprehensive assessment of total readiness for school experience, and that any program designed
to make such an assessment would involve the use of some form of preschool mental testing. It will be well to keep this statement in mind, as some of the tests chosen for administration in Chapter IV of this paper are basic to this statement.

Stott and Ball point out that relatively few published reports of this type of use of tests are to be found in the literature. However, one such research study investigating readiness for school and the criteria for such readiness was done by Brenner and Morse (3) and cited by Stott and Ball. The correlations between scores obtained on tests used to measure readiness for school, namely, Goodenough Draw-a-man, Sangren Information Test for Young Children, and Pitner-Cunningham Primary Mental Ability Test, were high enough to indicate that, as has long been assumed, mental ability as measured by mental tests is perhaps, in general, the most basic single factor in children's readiness for school.

The authors believe that because of the natural uninhibited responses of the young child, mental-test results, which pool all of the varied responses into one unitary score, such as an IQ, give an inadequate picture of the child's performance. They indicate a profile of ability based upon the factor significance of the items is readily obtained and offers far more meaning for the mental-test evaluation. The authors of this factor analysis study state that the long felt need for clinical testing tools, giving part-score meaning, has produced devices for part scores that are based upon "theoretical" concepts such as performance ability versus verbal ability. They point out that verbal tests may involve the same processes as the so-
called motor tests. Tests requiring responses of words may really emphasize memory or evaluative abilities that cannot be classified as semantic. Tests dealing with verbal content that have no objective test materials or verbal tests involving manipulation of blocks or form-fitting situations, may both call for the same kind of cognitive response. Hence, one cannot, by inspection or observation alone, discover the meaning of items, as their true meaning is indicated only by factor analysis according to Stott and Ball.

Stott and Ball believe that the standardized test situation, however, can afford a quick and adequate means for the evaluation of the child. The contribution to the understanding of a child by an experienced and insightful examiner observing his various responses in a controlled environment, cannot be denied; however, without a standardized test which utilizes all the possible potential assistance for making the evaluation, the results are largely opinion and subjective judgment. The authors believe that such findings are of value only insofar as the examiner is capable of using observational cues, and they have little to commend them in terms of objectivity. The results may be meaningful and valuable to an experienced clinician, but without standardization there is failure in communication with others who need to apply the test findings. However, they believe that this kind of evaluation is to be preferred to that of the examiner who simply follows the rules laid down by the test directions, comes out with a generalized score, and is serenely sure that the measure is an objective one.

This writer feels very strongly that Stott and Ball's above
statements are as appropriate to teachers as clinicians. As was mentioned earlier in the purpose of this paper, it is the writers belief that teachers of the very young should be equipped with objective techniques in addition to subjective judgment, and it is the combination of both that will benefit most in diagnostic teaching and hopefully, in preventing learning disabilities. Stott and Ball believe that if it is possible to devise mental tests that utilize the presently available knowledge of test development, such as, item selection, factorial validities, statistically sound modern scoring devices, and up-to-date standardization procedures, psychologists shall have moved a step forward in providing more truly objective and trustworthy tools for such use.

By factor finding or analysis, Stott and Ball found some pertinent information about the many infant and preschool mental tests being used, and particularly about "psychomotor" performance. In the evaluation of the operations elicited by the test items in their study, they discovered cognition, memory, evaluation, and both divergent and convergent production, in addition to the hand dexterity and other psychomotor skills for which they found no ready intellectual process name. They state that the naming of test performance as "psychomotor" is an acknowledgement of failure to analyze the behavior adequately and, thus, emphasizes the motor, rather than the psychological implication of the task. They indicate that most of the child's motor reactions require that intellectual processes accompany the movements involved in the testing situation. They are goal directed and examiner directed, and they involve discrimination,
selection, and control of the neuromuscular responses to be used. These motor responses are more appropriately chosen actions for the infant and preschool age level studied, than they would be for older ages, when the behaviors have become more habitually performed. Hence, they report, these tests, involving what seem like simple motor responses at these young ages, are actually much more complicated and need more selective judgment and control than we realize. This is the reason they are indicators of intellectual ability. The habitual responses of children at more mature levels have not been developed at these younger ages. Thus, the authors of this study report that superficial judgment about these responses, lumping them into a category called "psychomotor" or "performance", constitute a very inadequate analysis of the behavior involved. As a teacher of young children, and especially as this writer observes them in physical development or manipulative activities, she certainly concurs with the authors in regard to the amount of intellectual involvement which goes into the problem solving aspect necessary to accomplish many of these tasks. For example, one two-year-old could not stand on one foot in physical development as some of the three and four-year-olds could, and so after a few days of "thinking the problem through", he finally thought of reaching down and lifting the foot with both hands. When this didn't work, he put his two hands and one foot on the floor and lifted the other foot. To his satisfaction, he was able to stand on one foot, even if in a tripod position.

This writer believes Stott and Ball's explanation of the indicators of intellectual ability as evidenced in motor performance to
be very helpful in understanding what is intended to be measured in many items of preschool tests, and its relation to later learning abilities.

In their factor analyses of infant and preschool mental-test content, Stott and Ball included test protocols of 1,926 infants and young children. These were studied by factor analysis to determine the meaning content of the tests used. Item intercorrelations were obtained for two levels each of the Cattell Infant Scale, the California First-Year Scale, and the Gesell Developmental Schedules, for five levels of the Merrill-Palmer Scale, and for three levels of the Stanford-Binet, Form L. The general findings of this factor-analyses as reported by Stott and Ball were:

(1) Whether or not the suggested names for the factors represent their true meaning, it is evident that children, with wide individual variation, and even as young as three months of age, are capable of "thinking" processes.

(2) The factor content of tests of different age levels for the same scale vary. Hence, one of the reasons for longitudinal changes in mental-test scores is that the child is being tested for different abilities at the two age levels.

(3) The content of the various scales also varies greatly. One scale will emphasize cognition and memory, with no items related to evaluation and production, while another scale emphasizes these abilities and neglects other processes. For the infant scales, only the California and Gesell 12-months schedules include a memory factor. The Merrill-Palmer Scale has little memory content and the Stanford-Binet has two memory factors for each age level.

(4) Of the test scales analyzed in this study, only those of the infant level contained items which were interpreted as involving "divergent production". This factor is the one most closely associated with creativity according to the authors. In view of
these results, one would not expect the scales at the preschool and perhaps older levels to "select" creative children, since they do not contain items testing creativity.

(5) Some intelligence tests have items that are highly correlated, yielding some large, rather general factors. These general factors do not necessarily test "g", or general intelligence content, but, rather are merely so narrow in their coverage of abilities, that there is little variation in their meaning.

(6) The meaning of the test item is not necessarily related to the format and type of material used. Items containing blocks for manipulation may be just as effective an indication of cognition as are tests using words. This writer feels that this is an extremely important factor to remember as it pertains to tests for young deaf children, which will be discussed in the next chapter of this paper.

(7) There is no evidence from this study that the results of the infant tests show less valid discrimination of ability than do the tests for older age levels. Some tests have a much wider range of test-item meaning than others, but this is not necessarily a matter of age; it may be rather, a result of the kind of items selected for the test scale.

(8) Observational guessing about related item meaning is shown to have little validity in grouping together items in terms of the fundamental item relations, as shown by the factor analyses. For example, the Gesell items are quite differently classified by factor selectivity than they are by the levels in the Developmental Schedules.

Hence, this study by Stott and Ball has presented in depth the theoretical thinking that underlies the efforts of the makers of tests and of the persons who were otherwise interested in the nature of intelligence and how it develops in children, the relative frequency with which each of the various tests is used and for what specific purposes, and the determination of the meaning content of
of tests used by means of factor analysis.

The general conclusions reached by the authors after this extensive research project are interesting and pertinent. The authors feel that their research has demonstrated that there is a real need for more adequate means of appraising the mentality of young children. They feel that recent research has provided a better understanding of the nature of intelligence, its determinants, and the nature of its developmental change, thus furnishing a sounder basis for new scale construction.

Another general conclusion reached by the authors is that the users of presently available tests generally feel the need for improved testing devices and techniques. Their analyses of scale content have demonstrated a great lack of consistency among and within the scales now in wide use, in regard to factor content and meaning, thus pointing up the need for more consistent and adequate test scales.

The authors state that any attempt to develop a new intelligence scale, if it is to be an improvement over what is now available, must first and foremost be guided by, and be consistent with, the best conceived and most solidly based theory of the nature of mentality. Research has made it quite clear that the human being, even at very early ages, possesses not just one single general ability factor, but a number of abilities. They continue, however, that it should not be assumed without proof, that the same repertory of mental abilities will be found at all levels of development. They, Stott and Ball, indicate that Guilford's theory of structure of intellect

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is presumed to be the structure to be found in young adults, the completed structure. They point out that the structure of the infantile intellect is in its early stages of development and, therefore, is presumably relatively simple, although its constituent abilities are indeed "intellectual" in nature. Since the young child's intellect is developing, it is changing constantly by the emergence of new abilities. However, the authors point out, as the repertory of abilities common to children at these different early age levels is determined through continued research, test items for their evaluation can be devised and appropriate scales constructed.

The above conclusions, and in particular the opinion regarding the guidelines for any new test, presented by the authors as a result of their extensive research project, would seem to clearly answer the question which was raised in Chapter II of this paper. The question was whether or not currently used mental-tests measure intelligence as it is currently conceived by child development and child psychology specialists. Stott and Ball found, as cited earlier in this chapter, that the presently available and widely used tests and scales for measuring mentality at the infant and preschool levels, with few exceptions, were devised and standardized in terms of the older conceptions of the nature and development of intelligence. Since the tests were designed on the theory of a constant general-intelligence factor rather than a developmental sequence of qualitatively different levels of functioning, they fail to register adequately the developmental change taking place, according to Stott and Ball.
The authors also point out in their general conclusions that it must be realized that it is always the child's level of "acquired" abilities that is available for testing, not the child's capacity or his mental potentiality. They point out that one can only observe or test what the child can do, what he has "learned" to do. Children, through use of their present abilities, acquire new abilities that are within the level of their developed capacity. A child who has been deprived of an environment that would stimulate and allow the exercise of his cognitive and perceptual abilities may perform at a relatively low level on a test, not because he has a low capacity, but simply because he has not learned to do the things required in the test performance although they may be well within his capacity to acquire. The authors conclude that perhaps one of the reasons for the lack of "predictive validity" of infant tests is that babies, as a result of wide variations in environmental stimulation, acquire varying degrees of ability within the limits of their developed capacity; tests measure the acquisition of the abilities rather than the capacity.

Thus, in this exhaustive study of infant and preschool mental tests, many of the initial questions regarding the nature of the measurement of intelligence in the preschool child and the nature of tests in use for such measurement of intelligence have been clearly answered. The issue of whether or not the current concepts of intelligence, as set forth by psychologists such as Piaget, are measured in traditional preschool intelligence tests has also been clearly answered. This research has provided an excellent background
of information and understanding of factors involved in testing young children. This writer feels that it is very important for teachers to understand these factors.

There are some other pertinent factors which this writer believes all teachers should understand in regard to intelligence tests and scores. These factors, as presented by Smart and Smart (16) and Bernard (2) are:

(1) Mental age or MA, found by comparing a child's test performance with the average performance of a large number of children to see if he has done as the average, or less than the average.

(2) IQ, a ratio of CA to MA, and found by dividing MA by CA and multiplying by 100, is a measure of rate of growth in mental age.

(3) Standard error in measurement, which really has reference to a built-in margin of error specific to each test, must be considered when comparing test scores of two children and when comparing two tests on one child. The standard error will differ between tests, between IQ levels of the same test, and between ages with the same test.

(4) The value of test information to teachers, parents, and others who deal with children, in giving them a workable approximation of the child's present level of intellectual functioning, which in turn will help them know what should be reasonably expected of the child. However, this should not be based upon a single test score.

(5) Mental tests are samples of behavior giving highly valuable indications, not measures, of the present rate and status of mental development. Innate intelligence is revealed only through manifestations of developed intelligence.

(6) The results of tests, especially for infants, are approximate.

(7) One must be aware of the many unsolved problems of intelligence testing.
One must be aware of the validity and reliability of a test.

Tests may be of great value in the diagnosis and correction of deficiencies in the growth patterns of children.

Mental tests are highly valuable in developing an understanding of children generally.

This discussion of intelligence tests, limitations of mental testing in childhood, and the value of tests concurs with this writer's premise in the introductory portion of this paper, which expressed a personal opinion that some kind of objective evaluation and opinion by the teacher would certainly be in the best interests of the child, especially if the examiner, teacher, and others involved are wise enough to use the information as it is intended for use.

In summary, this portion of this paper has reviewed research information regarding preschool tests, their development, their content and their current use, together with other information about mental tests which should be pertinent to any teacher. Thus, it has been possible to answer initial questions presented as to the concept of intelligence, and how this concept as presented by current child psychologists and child development authorities compares to that of the authors of intelligence tests most frequently used with preschool children.

This comparative information has been very helpful in understanding the basis of traditional preschool tests and the newer, broader techniques of evaluative scales such as the Valett Developmental Survey of Basic Learning Abilities, the Early Detection
Inventory by McGahan, and the Evanston Early Identification Scale, all of which have been published as special assessment tests since 1966. The writer's opinion is that each of these tests seems to incorporate many of the recommendations of Stott and Ball for the improvement of preschool tests, and each is especially helpful to the teacher in meeting the specific learning needs of her pupils and in diagnostic teaching.

In addition, each of these evaluative scales, according to its test manual (23, 13, 12) is designed to be administered ethically by a classroom teacher or trained clinician, who in turn would request further diagnostic testing by qualified psychologists if the need were indicated in the evaluative scale.

It appears that this kind of test provides both an objective and an ethical tool for the use of a teacher interested in diagnostic teaching, as well as pertinent information about the child based upon current concepts of development. In that the initial premise expressed the need for this kind of tool, some of these tests will be described in detail in Chapter V. These tests were chosen for administration to preschool deaf children at specific age levels because they met the criteria of objectivity and ethics.
CHAPTER IV

INTELLIGENCE OF THE DEAF AND ITS MEASUREMENT

Current concepts of intellectual development and the development and use of preschool tests currently in use to measure this development have been reviewed in Chapter III. This information has been based upon findings with hearing children. It has been presented to establish a basis for understanding the intelligence of the deaf child and the use of psychological tests in the measurement of this intelligence.

What has been the history of psychological testing with the deaf? What is the relationship between intelligence and deafness? What are some of the psychological factors and problems involved in testing the deaf? What are the tests being used to measure the intelligence of the preschool deaf child? What are the criteria for the selection of the most valid tests available designed to test the intelligence of the preschool deaf child?

Dr. C. P. Goetzinger, an audiologist at the University of Kansas Medical School, has done research in regard to the history of psychological testing of the deaf. This history is contained in a paper he has prepared entitled, "Psychological Assessment" (6).

In this paper, Goetzinger indicates that prior to the development of standardized psychological tests at the turn of the present century, a Mr. Greenberger, then a Superintendent of a State School for the Deaf, sought a few game-like tests whereby he could screen
applicants to one of his schools. He proposed the use of picture books and a number test which could be effectively employed for this purpose. In addition, he recommended that block building and tasks involving perception of form and color could be used to advantage in attempting to get an index of a child's ability. Greenberger believed that building with blocks, arranging sticks so as to make certain forms, or any childish game could be made the means of finding out whether an applicant was capable of fixing his attention upon a subject, and whether he had any reasoning faculties. Goetzinger indicates that it is obvious from Greenberger's beliefs that he had some insight as to the value of non-language performance tasks in assessing the intellectual potential of language deprived individuals.

Goetzinger reports that preceding the advent of the Goddard revision of the Binet Scale in this country, there were a few published reports of studies which attempted to compare the mental abilities of deaf and hearing children. After the Goddard revision of the Binet, Goetzinger indicates that it remained for Pintner and Paterson to explore the usefulness of the Binet with the deaf. As a result of their experiment they concluded that the test as it stood was not suitable for use with the deaf. This finding triggered a series of investigations in schools for the deaf during the period from 1914 to 1918.

In addition, Pintner developed his non-language mental test, the Pintner Educational Achievement Test and a Performance Scale of Intelligence. The conclusions of Pintner and Paterson's research
based upon their tests as indicated by Goetzinger were:

1. that the Binet Scale, unmodified, was not suitable for use with the deaf
2. that on mental tests which did not depend on hearing, the average deaf child was retarded from two to three years as compared to the hearing
3. that on the average orally taught pupils were superior to those taught manually because the bright students were chosen for oral instruction
4. that the deaf did not manifest a sex difference in test results
5. there did not appear to be a difference between the congenital and adventitious deaf, however, on tests which were dependent on audition, those children who suffered hearing loss after four or five years of age seemed to benefit because of having once heard
6. that on tests which involve hearing, as memory span for digits and the language scales, the deaf child on the average, regardless of age, was only equal to the hearing child of seven, eight, or nine years

These results have produced continued studies in the field during the years that have followed.

Goetzinger indicates that in the ensuing years an impressive amount of evidence has accumulated which indicates that the deaf are either normal or within normal limits when individual performance tests are employed to assess intelligence. He states, however, that there are, even yet, conflicting findings when the group type non-language mental tests are used.

Goetzinger continues that as might be inferred from the above review, what might be termed the "Pintner Era" in this country extended until approximately the mid-forties. He indicated it was chiefly characterized by the development of tests in order to
psychologically assess the hearing impaired, and also the comparisons between the hearing and hypacusis on general indices of function. During the Pintner era the principal tests for the measurement of intelligence were the Pintner Non-Language Test, the Pintner-Paterson Form Board Scale, the Grace Arthur Performance Test (Form I) and the Chicago Non-Verbal Examination which made its debut in the early thirties. Another test used somewhat in this era was the Ontario School Ability Examination.

Something new and exciting happened in this field in the mid-forties. Goetzinger reports that following World War II, experts in the medical communication fields returned to civilian life with a fresh fund of knowledge made possible by virtue of the unlimited resources which has been at their disposal during the crisis. Also, the interaction between various disciplines which had developed during the war was carried over into the recovery period. He believed that in so far as the field of deafness is concerned it could be said that the science of audiology was conceived during the war years. Included in the term as used by Goetzinger here is implied medical, rehabilitative, and communicative aspects of hearing and speech.

Of importance with reference to the psychological assessment of the auditorily impaired, according to Goetzinger, was the development of additional mental scales such as those by Wechsler, Hiskey, Leiter and others. Tests to probe for organic brain damage and aphasia by Halstead, Wepman and others were also developed. In addition, he reports, interest in projective techniques and in electro-physiological measurements has influenced psychological assessment. In short, he
feels, differential diagnosis became a by-word.

In conjunction with the interest in the more minute features of mental functioning, there was a host of studies dealing with visual perception of the deaf as compared to the hearing. More recently, he reports the interest has swung to the study of concept formation and linguistics, in an effort to unravel the perplexing problems which are engendered by deafness, and to provide a firmer basis for diagnosis. The incredible advances in electronics with the various types of computers has made possible the simultaneous recording of much physiological data during behavioral tests. Spurred on by the experimental work of Skinner, Goetzinger believes those interested in the deaf seemingly are verging on methodological breakthrough in the education of the deaf through programmed learning.

Irrespective of the advances which have been made, there are many problems associated with the psychological assessment of the deaf according to Goetzinger. One of fundamental importance he indicates to be the prediction of educational achievement in deaf children from psychological tests. However, this appears from various studies to be a difficult task even with hearing children, and even more so with deaf. He reports that all too frequently in schools for the deaf, there are children who do not measure up to expectations, even when such variables as age at school entrance, years spent in school, degree of deafness, and age of onset were taken into consideration. For several years now, there has been much interest clinically in attempting to define patterns which will provide clues for the poor progress of these students, and he indicates that in some instances
there are rather close cut indications of specific defects such as aphasia or other learning disabilities. He points out that Myklebust of Northwestern University has been particularly active in attempting to pinpoint specific disabilities which have been superimposed on deafness.

As a teacher of the deaf, this writer has had these pupils with learning disabilities superimposed on deafness in classes. Despite techniques, efforts and interest by all concerned, some deaf children just do not make the progress that might be indicated or expected. They may not become good lipreaders, or develop good auditory skills, speech, language, or academic skills, and yet they are children, who on testing of their intelligence, seem to have good ability. Teachers as well as clinicians have been interested in this problem, and it is one of the basic reasons for the undertaking of this research paper.

Goetzinger indicates that there is still much more concern associated with the seeming retardation of the deaf on certain non-verbal tests of intelligence. Some investigators believe that some non-language tests, such as the Pintner Non-Language, and a performance scale, such as the Grace Arthur, may be measuring different abilities. Others believe from their research that the role of language in problem solving and in relational learning was not as significant as previously supposed.

Some research has also been done by Goetzinger with the Structured Rorschach Test. This test represents an attempt to develop an objective test of personality based upon the Rorschach scoring system.
and interpretative rationale. Goetzinger reports that aside from the major objective of the test which is to measure personality, one also obtains a rating of mental function as in the original Rorschach. He found of particular interest in this connection findings of poorer theoretical functioning and inferior inductive reasoning on the part of the deaf subjects as compared to the hearing controls. In contrast, he found the deaf were the equal of the hearing in practical intelligence and in deductive reasoning.

In conjunction with the Structured Objective Rorschach Test, or SORT, the deaf subjects were also administered the full scale WAIS and the Terman Non-Language Multi-Mental Test. Results indicated below average scores were obtained in theoretical function and in inductive reasoning, which he indicates presumably reflects weakness in abstract ability or capacity to develop a principle from particulars. These findings were similar to those found in the SORT results. In a similar vein, Goetzinger indicated, practical intelligence and deductive reasoning appear to be associated with ability to function mentally in concrete situations, and to go from the general to particulars.

Goetzinger believes that these factors may explain the reason for deaf subjects consistently showing retardation on the non-verbal tests, the Progressive Matrices Test by Raven, and the Terman Non-Language Multi-Mental Test. He states that recent research at the Kansas Medical Center has indicated that language as indirectly measured by reading tests is only minimally related to success on the Raven's and Terman Tests. He indicates the latest research done in
this respect appears to support the conclusion of Furth, that 
language per se is only slightly related to non-verbal abstract 
problem solving, and that the discrepancy when it occurs, is 
related to lack of experience. The Terman and Raven Tests seem 
to be more inductive in principle than those of some other tests, 
such as the Chicago Non-Verbal Examination, which has consistently 
through the years shown the deaf to be within normal limits.

Areas are cited by Goetzinger in which the research indicates 
the deaf to be inferior to the hearing. These particular aspects 
are included in most preschool tests and are thus important to parts 
of this paper which will follow. In the study concerned with the 
concepts of "Sameness" and "Opposite", the deaf were the equal of 
the hearing on the former but inferior on the latter. From a 
personal viewpoint, this writer might report that young deaf children 
are given many, many matching of like objects as a part of their 
sense training program basic to developing imitative skills in lip-
reading and speech. Hence, the concept of same or like is not 
difficult, but teaching the concept of different or opposite is 
extremely difficult with young deaf children.

On tests involving immediate recall of digits the deaf were 
poorer than the hearing. This finding, he indicates, has been con­
sistent since the time of Pintner. However, he reports that from 
the clinical point of view he has consistently observed that 
children who have had preschool training in conjunction with an 
oral-auditory approach do better on the "memory for digits" subtest 
on the Nebraska Scale than those who have had no preschool training.
Many studies of concept formation with the deaf have and are being undertaken, but because of differences in definition among psychologists of the term concept, and the language deficit of the deaf, no definite research is presented.

The facts presented by Goetzinger in regard to psychological assessment have contrasted the Pintner era with those of the post-Pintner era, or the period since about 1945. He has conveyed the breadth of psychological assessment then and now, together with some of the problems encountered and implications involved which tend to affect test results. In presenting these factors, he is also presenting important implications for both the learning and teaching process in an educational program for deaf children.

Myklebust (14) presents other information of importance in testing or working with the deaf. He believes it is the task of the student of the psychology of deafness to ascertain the extent and the nature of the relationships between loss of hearing and each of the basic ways in which the individual matures, namely, physically, emotionally and mentally. It is the concern in this paper to determine the relationship between loss of hearing and mental development, and the implications of such in intelligence testing and scores.

There has been particular interest on the part of Myklebust in whether deafness influences mental development, and he reports that this is the area of the psychology of deafness which has been studied most extensively. He points out that these studies began around 1900 with Pintner and his associates, and that from these early studies Pintner concluded that children deaf from early life
were below average in mental capacity. This same fact was cited by Goetzinger in regard to Pintner's findings, but Myklebust discusses this fact in terms of Pintner's explanation of causative factors influencing the mental development of the deaf. Pintner believed that his findings, indicating that the general level of intelligence of deaf children was below that of normal children, could be explained in that diseases causing deafness also affected the brain and caused mental retardation. That such a relationship exists in some instances can readily be verified according to Myklebust. Such a dual involvement can derive from any disease causing loss of hearing. On this basis, he reports, a higher incidence of mental retardation might be expected in a random population of deaf and hard of hearing individuals than in the normal.

Both Pintner's and Myklebust's opinions are of great interest to all teachers of the deaf today. For example, in this writer's classroom during the year 1965-66, nine of thirteen children had a history of rubella in pregnancy, Rh or ABO incapatabilities, prematurity or meningitis. During the year 1966-67, nine of thirteen had such a history, and during 1967-68, eight of eleven had this history. With the recent rubella epidemic, almost all of the thirteen new children entering in the fall of 1968 will be entering with a history of rubella during the mother's pregnancy. Certainly one cannot ignore these facts. However, this writer does not feel that one can just view these children as retarded, as might be inferred from the above findings by Pintner and Myklebust. Rather, it is felt that one must look upon them as children with specific
learning needs, provide teaching techniques to meet these needs, and attempt to prevent later learning disabilities if at all possible. Many teachers of the deaf will need to change or improve their teaching techniques to meet these needs, just as teachers in the regular classroom must do to meet these problems in learning disabilities which may have the same causative factors, but be of a lesser degree of severity.

Some workers, according to Myklebust, have suggested that if endogenous deafness is present, other defects, such as mental retardation, will be present more frequently than in families without a history of such deafness. He points out that the presumption is that endogenous deafness and endogenous mental retardation will occur in the same person at a certain given rate of frequency. This presumption, he continues, has not been completely verified or denied. He believes that to accept such generalizations uncritically is to minimize the problem, as the nature of the relationship between deafness, mental capacity, and intellectual functioning is more complex. Myklebust believes that generalizations regarding the intellectual capacities of this group cannot be made only on the presumption of relationship to etiology, that is, only on the basis of exogenous and endogenous factors.

He suggests that perhaps disease and hereditary factors cause mental retardation without deafness with the same frequency that they cause mental retardation with deafness, and if so, then the incidence of mental subnormality would be equal.

Of particular importance to this paper is Myklebust's discussion
of the fact that the question of relationship between deafness and intelligence raises fundamental issues concerning the nature of mental development and intellectual capacity. In light of Chapter II of this paper, which discusses current concepts of the development of intelligence in the preschool hearing child, and Chapter III, which discusses the measurement of such intelligence, Myklebust's discussion of this aspect of development in preschool deaf children is very important. He compares this relationship between deafness and intelligence of the child who has marked deafness from birth or from the pre-language age and such a child's experiences and opportunity for mental growth to those of the normal child. He believes that if the deaf child's mental development parallels that of the normal child, the significance of auditory experiences in growth of intellectual processes can be denied. However, he believes that the fact that auditory experience is unrelated to such psychological development is unlikely.

Myklebust points out that many workers have emphasized the importance of stimulation and experience in the mental development of children with normal sensory capacities. Many have shown relationships between early life experience and intellectual behavior. He cites Piaget, especially, as stressing the significance of hearing, vision, and symbolism as the foundations of intelligence. This aspect was discussed in Chapter II of this paper. Myklebust points out that the child having deafness from infancy lacks auditory experience and verbal symbolism. He indicates that presumably non-verbal auditory experience is of importance in mental development.
However, the question raised most frequently concerns the connection between language and intelligence. He cites a philosophical position commonly held is that without language, there is no thought and inferentially, there is no intelligence of the type associated with the human being. This implies that if language development is precluded, mental development will be affected. He thus concludes that if normal language development is necessary for normal development of psychological processes and learning, then the mental growth and intellectual functioning of the deaf child will not parallel that of the hearing child. He continues that on a broader basis, even the preverbal experience of the child deaf from infancy is different from the hearing. His experience does not include audition, hence his non-verbal behavior, such as perceptual processes, is established and structured differently. According to Myklebust, when both the verbal and the non-verbal experiences of the child with early deafness are considered, one cannot avoid the probability that such a handicap might preclude actualization of true intellectual potential. Important as such a conclusion might be, he reports, it is significantly different from the assumption that deafness and mental retardation are present as separate and distinct entities.

Myklebust believes the problem of cause and effect, of poor language acquisition as a result of inferior intelligence or inability to actualize mental potential because of limited language, is a major concern in the study of the psychology of deafness. This is, he states, a basic question when the deafness is of great extent and when it occurs in early childhood. Hence, these factors are of
basic importance as they relate to the children in this study, namely, the two to seven-year-old endogenous or exogenous deaf child.

Myklebust provides other very valuable and pertinent information. He notes that the question of relationship between deafness and intelligence involves other considerations. One of the more important of these is the way in which the mental ability is measured. He points out that discussion of intelligence must include analysis and criticism of the means and techniques whereby it has been ascertained. He believes such consideration is critical when the study concerns those having deafness and that the difficulties in measuring intelligence non-verbally is a complex and involved problem in itself. Myklebust indicates that non-language mental tests must be used with those whose deafness dates from the prespeech age if the deafness precluded the use of hearing in acquiring language. This, he points out, is true irrespective of the age of the individual being studied because this type of hearing impaired person characteristically continues to have a language handicap throughout his lifetime.

It is necessary to use non-verbal tests in some instances even with those whose deafness dates from later life, after language has been firmly established and used normally for a period of years, according to Myklebust. He indicates that the assumption that such persons can comprehend instructions by speech reading and reading, and that they can express themselves with equal facility in speech and by writing, does not hold in many instances.
This writer believes that this is such important information for anyone testing the deaf to realize, yet through experience, it is realized that there are many who do not. As was pointed out in the Introduction of this paper, so often psychologists or diagnosticians, though fully qualified and competent, have had little or no experience in the area of testing the deaf. Thus, they are sometimes misled by their assumptions that the deaf child understands their directions or comprehends the test at hand, because of his "seemingly" good language, comprehension through lipreading or the use of his hearing aid, and his frequent agreement in response to the examiner.

It is indicated that because non-verbal tests must be used as a rule, the problems of similarities and differences between verbal and non-verbal tests must be critically evaluated. Here Myklebust points out that although these tests correlate significantly, it is apparent that they measure different aspects of intelligence. Goetzinger's research also indicated this finding. In addition, tests requiring verbal facility correlate most closely with those abilities required for learning academic materials, and non-verbal tests are not as useful for predicting this type of learning. Myklebust indicates that this limitation has presented complex problems for the psychologist who is working with the deaf and hard of hearing individuals.

There is an even more critical problem in the use of psychological tests with the deaf who have language limitations. It is the question of the assumption made in the use of a given test. For
example, Myklebust points out that a common assumption is that all non-verbal tests are equally non-verbal. He expresses, as did Goetzinger, that it is becoming increasingly obvious that this is not true. Some mental tests classified as non-verbal involve considerable ability of the type commonly referred to as verbal ability. Furthermore, there is the problem of the extent to which identical or similar test scores for those with deafness and for the normal can be interpreted as having the same meaning, and the extent to which such scores can be used to predict the same type of success or failure in learning and adjustment. Myklebust states that this issue is confronted in all psychological test studies with persons having extensive deafness from early life and to a certain extent with the hard of hearing.

Another extremely important aspect of intelligence is reviewed by Myklebust. He indicates that in some instances, although the hearing impaired earn the same test scores as the hearing, they require specialized interpretation. Interpretation on the basis of the test manual does not lead to the expected outcome. He indicates a common example to be the lower correlation between intelligence test scores and academic achievement for the deaf as compared to the hearing. Apparently the individual with marked limitations of language solves the test problem by different psychological processes even though he earns the same score. Although both individuals are presented with the same problem, the mental task becomes a different problem on the basis of the abilities available for solving it. This, too, is in agreement with what Goetzinger indicated on the basis of
his research. Myklebust explains that this means that the assumptions of the test, derived from its standardization and use with the hearing, do not necessarily hold when the same tests are used with the hearing impaired, and this generalization seems to apply to both verbal and non-verbal tests.

Therefore, Myklebust indicates that psychological tests should be standardized also on the deaf and hard of hearing to be most effective. He believes that in addition, the psychologist using these tests in this specialized area needs specific training and experience if he is to do work which is scientifically and clinically valid. This is an extremely important factor to this paper, in that it will help a teacher of the deaf to share information regarding and to help choose tests for administration to preschool deaf children which will not violate these factors.

"Deaf and Dumb". How many, many times one hears this expression even today. Myklebust answers a question which this expression prompts many people to ask, due undoubtedly, to the slang usage of the word "dumb" as meaning unintelligent. He points out that the range of mental abilities, the intelligence levels, of the deaf and hard of hearing does not differ from the hearing. He states that this is true irrespective of the degree of deafness or of the age of onset. There are brilliant, average, dull, and mentally retarded deaf and hard of hearing just as there are in the population of the normally hearing.

Of importance in testing and understanding, Myklebust discusses deafness and memory. Seven types of memory have been studied in
deaf children: memory for design, tactual-motor memory, memory for movement patterns, object location, dot patterns, picture span and digit span. The highest level of memory was for designs while the lowest memory level was for digits. The deaf were found to be superior to the hearing on memory for design, tactual memory, memory for movement, equal to the hearing on object location, and inferior on memory for dots, picture span and digit span. These results reveal that deafness influences retention and recall abilities but that the influence varies from one type of memory function to another. Apparently auditory experience is not necessary for retention of design and object location, nor for retention of movement patterns, such as the Knox Cube Test. On the other hand, Myklebust believes that when auditory associations are deprived, it is not possible to remember numbers, dot patterns, or pictures with equal facility as compared to those who can rely on auditory associations.

This research is of particular interest to this writer, in that it has been observed on tests such as the Frostig Test of Visual Perception and the Valett Developmental Scale of Basic Learning Abilities, that pupils have almost always done well on the memory for design, tactual memory, and memory for movement such as in block patterns, but they have consistently done poorly in memory for dots and digit span. This writer readily understood the reason for poor performance in digit span, but had never made the association between memory for dots and audition.

What is the relationship between deafness and abstract abilities? Myklebust indicates that from the research it is clear
that some types of abstract abilities and conceptualizing processes are not influenced by deafness. Nevertheless, he points out, it must be assumed that deafness is related to the development of abstraction. This relationship seems closely associated with the verbal language limitation which deafness imposes. Therefore, he believes, it is logical to conclude that at least to some degree this inferiority in abstraction is a secondary, reciprocal condition to the language limitation and is not a true mental retardation.

Of importance in reviewing the research studies done on the intellectual abilities of hearing impaired children, Myklebust points out that much of the work has been done on small samples, often from the population of one school. With the exception of the Pintner and Reamer's Survey, use of a wide geographic distribution, children from different types of schools and of various ages ranges have not been customary. He considers these to be some of the hazards of research. In this writer's own review of the research, it has been surprising to find that so much of the research has involved residential school pupils as opposed to very limited research with day school students. This has also been true in regard to standardization of intelligence tests for the deaf. This writer realizes that this is a matter of convenience, but does wonder how it affects results. This point and small numbers plus extropolation might affect validity and reliability of the tests.

In general, Myklebust reports, there is no apparent difference in intelligence between deaf and hearing males, but a significant difference between deaf and hearing females, the deaf being inferior.
This difference must be considered a factor in the psychology of deafness. However, its actual importance remains obscure because deaf females seem not to be inferior to deaf males in adjustment. Likewise, he states, the females are not inferior to the males in language or academic achievement.

Can a mental test be used to predict general learning or brightness in the deaf child in the same way as for hearing children? Myklebust cautions that a risk is involved in concluding that because a deaf child scores as being of normal mental capacity on a given test, that his mental functioning, the way in which he manifests his intelligence, and his mental processes, can be equated with those of the hearing. This writer feels that this information could be of help to any teacher who has a hearing impaired child in her regular classroom on an integrated basis, or to a resource room teacher who has several students integrated in the regular classroom. Certainly, it should help them to understand that deaf children may not learn in the same way as the hearing children.

The development of intelligence and a history of its traditional and current measurement in preschool hearing children has been considered, together with a history of the measurement of the intelligence of the deaf with pertinent psychological factors and problems involved in such testing. With this rather extensive background of information, essential to understanding both the preschool hearing child and the intelligence and psychology of the deaf in general, this writer will consider specifically those psychological tests which are used with the preschool deaf child.
Dr. Alathena J. Smith, Diplomate in Clinical Psychology, and Director of Research at the John Tracy Clinic in Los Angeles, has done extensive research in this area. She devoted her doctoral dissertation at Ohio State University to the study of intelligence tests for preschool deaf children. Her dissertation is entitled, *Performance of Subjects Aged Two to Four on Nonverbal Tasks Presented in Pantomime: A Phase in the Development of a Test for the Clinical Appraisal of Hypacusis and Other Language-Handicapped Children*. This work was published in 1960, and appears to be the most extensive research available in regard to psychological testing of the preschool deaf child. Hence, several subsequent references will be made to this dissertation (17).

It is Smith's premise that it is important to study deaf children with special reference to their intellectual ability at a younger age than has been scientifically documented to date in the United States, and that the existence of any tests normed at suitable levels and appropriately based for the study of the intellectual potential of deaf children, from two to four years of age, is questioned. Her study indicates that most research has centered on school age children and that these children have arrived at a stage of development where the ability to function may have been sharply altered not only by maturational factors, but by exposure to divergent educational methods, and to the increasing decrements sequential to lack of language development.

Smith cites Pintner, on the occasion of the International Congress on the Education of the Deaf in 1933, as stating that as of
this date, there had been developed no suitable tests for the deaf child, but that there was great need for such tests. One will recall from an earlier presentation of the history of the development of preschool tests in this paper that many of the tests of intelligence currently in use with normal preschool children had already been developed by 1933. Smith also cites Pintner as believing that it is important to obtain an estimate of the ability of the young deaf child as early as possible in his life, in order that one may do more intelligent planning for him, and that he also believed an adequate scale for the measurement of the capacities of the young deaf child was indispensable.

What had happened in twenty years? Smith's very comprehensive search of the literature twenty years after Pintner's declaration pointed out the absence of suitable tests and experimental studies concerned with the preschool deaf child. For example, she cites one of her references as presenting sixty-nine research studies concerned with the somato-psychological significance of impaired hearing in children, and in only one study was any reference made to the preschool child, and this had to do with his social competence.

Failing to find preschool children in the well-known studies in the literature, Smith was referred in 1960 to the National Index on Deafness, Speech, and Hearing. She reports that this index consists of 20,000 entries, compiled by the American Speech and Hearing Association and Gallaudet College. She reports that Dr. Stephen P. Quigley, then Director of the Index, graciously cooperated, and that
considerable energy was expended in his search with the result that they had:

"...not discovered any literature on performance testing at the age levels you are interested in.
...I do not think you will find much literature at the age level you are working with. If you do I shall certainly appreciate knowing about it. The project you outline appears to be an excellent one and certainly a much needed one in our area. I hope you will be able to pursue it to a successful conclusion (17, p. 87)."

Smith summarizes her quest for research data by pointing out that her search was concerned with available tests and instruments for the assessment of intellectual functions or more general criteria of development, and with experimental, theoretical, and empirical studies of sensory, perceptual, and intellectual organization in children with some level of neurological dysfunction. She reports that her search for information was confronted with apparent consistent absence of data based on the performance of preschool hypacusis subjects.

From this exhaustive search and review, Smith concludes that norms on non-verbal tasks presented in pantomime to preschool children would be of immediate practical utility both in the clinical assessment of language handicapped children and in research that is concerned with comparative evaluations of special behavioral and perceptual functions of the deaf and normal hearing groups which differ on primary functions but which await equating on general performance levels.

Smith's search for information has been included in this paper in detail for a special reason. In reviewing the research since
1960, the point at which Smith's stopped, this writer has met with the same lack of research studies in regard to the preschool deaf child. The book, *Behavioral Research on Exceptional Children*, published in 1963 by the Council of Exceptional Children, NEA Monographs, and edited by Dr. Samuel A. Kirk and Dr. Blauma B. Weiner, both authorities in the research field, provides selected reviews of relevant studies in each major category of exceptionality. This monograph, according to the authors, is one of a series of publications of the Council of Exceptional Children dealing with contemporary problems and issues in the education of children and youth who require a variety of special services. This particular edition covered the research of the past two decades, with future issues to be published each three to five years to include the interim research.

In the twelve research studies cited (10) which have been done on the intelligence of deaf children in the past two decades, none were done on preschool children as a comparative group. Rather, those included in four of the research studies cited were among groups such as 6-12, 5-11, 3-13, and those included in the number and age range of Hiskey's Standardization of the Nebraska Test of Learning Aptitude. In this writer's opinion, the number of young children involved in these studies, together with opinions rendered by authorities in the field regarding interpretations of this research, would not be an adequate sampling to make any generalizations regarding deaf children two to seven, the interest level of this paper.

A personal communication was sent to the above editor, Dr.
Weiner, regarding any research from 1963 to date that might have been submitted on this topic. Information received as a result of this communication, and forwarded from the Educational Research Information Center Clearinghouse on Exceptional Children, indicated that no new studies specific to the request had been reported during this period. A communique was sent to the Health, Education and Welfare Department, Department of Research Projects, requesting information in regard to research projects that the department might be sponsoring in this area. Although the communique was sent six months ago, no reply has yet been received. A search for research studies in regard to the intelligence of the preschool deaf child in the Directory of Services for the Deaf in the United States, published by the American Annals of the Deaf, revealed no Masters' Theses or Doctors Dissertations published on this topic since 1960. A communication was forwarded to Dr. Stephen Quigley, Director of the National Index on Deafness, Gallaudet College, in regard to research since Smith's report in 1960. Quigley has now moved from this position to the University of Illinois. However, the letter was forwarded, and his response indicated that he did not personally know of any such research studies specific to my request that had been conducted since that time.

One other interesting and profitable source of information was explored. Personal communiques were sent to persons at eleven well-known centers working with the deaf or on research throughout the United States. Namely, they were sent to:

Dr. Miriam Pauls Hardy         John Hopkins University
Replies were received from nine of these institutions. The request centered about the kinds of intelligence tests used at these centers with young deaf children two to seven years of age, and information regarding any research projects being carried on by their institution in this area or knowledge of any such projects being carried out at other centers. Although all who responded graciously replied in regard to the tests in use at their center, which will be discussed at another point in this paper, none had knowledge of any such research projects. Many of the letters read quite like Smith's...
letter from Quigley, expressing a great need for such a research project and wishing this writer well in the quest for such information.

Thus, insofar as this writer has been able to ascertain, Smith's research seems to be the most comprehensive to date in the field of intelligence tests for the two to four-year-old deaf child. Hence, this writer will review her findings, and use them as a guide in the selection of or recommendation for tests to be used with this age deaf child.

Smith presented her findings as reported in her dissertation and her work in this area since 1960 in a paper presented at the International Convention on Oral Education of the Deaf held in the summer of 1967, at the Clarke School for the Deaf, Northampton, Massachusetts. This paper was entitled, "Psychological Testing of the Preschool Deaf Child".

Smith's premise in this presentation (19) is to the effect that the audiologist has cleared the way to accurate determination of hearing acuity at very young ages, and she then presents the question of whether the psychologist will be ready with instruments of more respectable standardization than those instruments which they have had in the past for use with the preschool deaf child. Smith's presentation concerns itself with intelligence scales which would be applicable to those children less than four years of age. She points out that for some authorities, four years has been regarded as the low end of the range of preschool children, but that no longer can we wait until that age for educational planning. This writer agrees
with Smith on this point. Children enter the deaf nursery school program at Upjohn School, Kalamazoo, Michigan, at age two, and many have already been in the nursery program at the local speech and hearing center for a year or more prior to admission to this program.

The need for a tool to evaluate the intellectual potential of preschool children suspected of a hearing loss and/or other language disorder, is expressed by most clinicians, many audiologists, speech pathologists, teachers, and physicians, according to Smith. She indicates the question is raised whether or not educational plans for deaf and hard of hearing young children should be made when such planning is based on judgments of intelligence derived from existing tools. Smith indicates that there are few such tests in existence, and that a careful study of their standardization process leads to skepticism as to their validity at the preschool level. She reports that a review of the literature and the tests, scales and schedules used to evaluate the preschool deaf and hard of hearing child suggests that there may be serious gaps, especially with respect to norming population, in those instruments habitually used for reporting on and evaluating these children today.

Smith reiterates her plea for a communicable entity in the field of interclinic referrals, just as she did in her 1960 research, at which time she felt so strongly that the lack of such a tool was definitely one major reason for the great lack of research data in the area of psychological measurement of the preschool deaf child. She points out the practical need for such a tool. Many times parents of very young deaf children will seek a facility for their
child to attend school. This may mean change of job, change of residence, or both. Much is at stake for such a family. This has been the case with many children whose parents have moved to Kalamazoo for such service. Smith points this out with people who want their children to attend the Tracy Clinic for the summer. She feels that it is essential that something be known about the level of the child before moves or trips of great distance occur, and that it is equally important that the clinic have some indication that the child will profit by the program offered. It is at this point that a psychological test which would serve as the communicable entity between the referring source and a clinic or school would be most helpful, according to Smith. Tracy Clinic does request this as a prerequisite to admission, and it is from her experience in this particular situation, on the receiving end, that much of her interest and concern in the field of intelligence tests for young children has arisen.

Smith has compiled a list, in order of frequency, of the tests which have been used in evaluating preschool deaf children who have applied for admittance to John Tracy Clinic Summer Schools, 1955-67. This information is included in a copy of her Table I (see p. 77).

In conjunction with Smith's Table I, it seems appropriate to include at this point a table of frequency of tests recommended by the nine various institutions which replied to this writer's request for information regarding intelligence tests which they administered to the preschool deaf child. It may be noted from this table (Table I, p. 79) that eleven of the tests which appear are included
## TABLE I

THE FIFTEEN MOST FREQUENTLY PRESENTED TESTS USED IN EVALUATING PRESCHOOL DEAF CHILDREN APPLYING FOR ADMITTANCE TO THE JOHN TRACY CLINIC SUMMER SCHOOLS (19, p. 177) 1955 - 1967

<table>
<thead>
<tr>
<th>Test Name</th>
<th>Number of Times Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stanford-Binet</td>
<td>84</td>
</tr>
<tr>
<td>Vineland Social Maturity Scale</td>
<td>70</td>
</tr>
<tr>
<td>Leiter International Performance Scale</td>
<td>34</td>
</tr>
<tr>
<td>Cattell Infant Intelligence Scale</td>
<td>28</td>
</tr>
<tr>
<td>Merrill-Palmer Scale of Mental Tests</td>
<td>22</td>
</tr>
<tr>
<td>Smith Nonverbal Performance Scale</td>
<td>21</td>
</tr>
<tr>
<td>Gesell Developmental Schedules</td>
<td>17</td>
</tr>
<tr>
<td>Hiskey-Nebraska Test of Learning Aptitude</td>
<td>14</td>
</tr>
<tr>
<td>Randall's Island Performance Series</td>
<td>11</td>
</tr>
<tr>
<td>Columbia Mental Maturity Scale</td>
<td>6</td>
</tr>
<tr>
<td>Goodenough Draw-a-Man</td>
<td>4</td>
</tr>
<tr>
<td>Arthur Point Scale of Performance Tests</td>
<td>3</td>
</tr>
<tr>
<td>C A L (Australia)</td>
<td>2</td>
</tr>
<tr>
<td>Griffiths Mental Development Scale (England)</td>
<td>2</td>
</tr>
<tr>
<td>Ontario School Ability Examination (Canada)</td>
<td>1</td>
</tr>
</tbody>
</table>

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on Smith's Table I, and it has in addition five tests which do not appear on her table. However, these five tests are not specific tests for the deaf, and would thus fall into the same general category for constructive criticism by Smith which follows.

As a diplomate in psychology, and in view of her extensive experience with testing young deaf children, this writer feels Smith's observations and comments regarding these tests to be valid and pertinent. In Smith's Table II (p. 80-82), she presents the tests, the number of children involved in the standardization of the test, whether they were hearing or deaf subjects, the number of two and three-year-olds involved in the norming process, the age range of the sample, and the mental age norms. Attention is directed toward the age level used in standardization, and how few actual children have been studied as the basis for such. She points out that the manifest unsuitability of these tests is most easily caught by the column headed "Number of 2- and 3-Year Olds" used in the norming population. She indicates that extrapolated norms are the rule and that actual flesh and blood children, aged two and three years, appear to be absent from most of the standardizing populations of all of these well-known and broadly used performance tests. She indicates that the Hiskey-Nebraska has only 9 four-year-olds and none younger.

The new manual, Revision and Restandardization of the Hiskey-Nebraska Test of Learning Aptitudes (8), published in 1966, points out that in the revision and restandardization of this test begun in 1962-63, Hiskey used 25 three-year-old deaf and 78 three-year-
TABLE I

THE MOST FREQUENTLY RECOMMENDED TESTS FOR USE WITH DEAF CHILDREN 2-6 YEARS OF AGE IN A PERSONAL SURVEY OF ELEVEN CENTERS PROVIDING SUCH SERVICES FOR DEAF CHILDREN 1968

<table>
<thead>
<tr>
<th>Test Name</th>
<th>Frequency of Times Recommended</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattell Infant Intelligence Scale</td>
<td>3</td>
</tr>
<tr>
<td>Gesell Developmental Schedules</td>
<td>1</td>
</tr>
<tr>
<td>Griffiths Mental Development Scale</td>
<td>1</td>
</tr>
<tr>
<td>Hiskey-Nebraska Test of Learning Aptitude</td>
<td>4</td>
</tr>
<tr>
<td>Leiter International Performance Scale</td>
<td>3</td>
</tr>
<tr>
<td>Wechsler Preschool and Primary Scale</td>
<td>3</td>
</tr>
<tr>
<td>Leiter International Scale-Arthur Revision</td>
<td>2</td>
</tr>
<tr>
<td>Smith Nonverbal Performance Scale</td>
<td>1</td>
</tr>
<tr>
<td>Merrill-Palmer Scale of Mental Tests</td>
<td>1</td>
</tr>
<tr>
<td>Columbia Mental Maturity Scale</td>
<td>1</td>
</tr>
<tr>
<td>ITPA</td>
<td>1</td>
</tr>
<tr>
<td>Frostig Test of Visual Perception</td>
<td>1</td>
</tr>
<tr>
<td>Minnesota Pre-School Scale</td>
<td>1</td>
</tr>
<tr>
<td>Drawing of a Human Figure</td>
<td>1</td>
</tr>
<tr>
<td>Randall's Island Performance Test</td>
<td>1</td>
</tr>
<tr>
<td>Cornell-Cox Test</td>
<td>1</td>
</tr>
</tbody>
</table>

Patricia Slesdet

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### PERFORMANCE TESTS AND SCALES
### APPLICATION TO JOHN TRACY CLINIC SUMMER SCHOOL

#### Significant Standardization Data with Special Emphasis upon the Lack of Two- and Three-Year Olds in the Norming Population (19, p. 178)

<table>
<thead>
<tr>
<th>Test</th>
<th>Total Number of Hearing or Deaf Population</th>
<th>Number of 2- and 3-Year Olds of Sample</th>
<th>Age Range</th>
<th>Mental Age Norms Supplied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vineland Social</td>
<td>620 Hearing Subjects</td>
<td>20 -2's</td>
<td>Birth -</td>
<td>Birth -</td>
</tr>
<tr>
<td>Maturity Scale -1935-1947</td>
<td>selected by parental occupation</td>
<td>20 -3's</td>
<td>30 years</td>
<td>30 years</td>
</tr>
<tr>
<td>Parent Interview</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pantomime</td>
<td>560 Middle class Americans</td>
<td>No -2's</td>
<td>(only 12-4's)</td>
<td></td>
</tr>
<tr>
<td>*13 -3's</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arthur Adaptation of Leiter Performance Scale -1949- Pantomime</td>
<td>289 Hearing Children of skilled and semiskilled Middle class Americans</td>
<td>No -2's</td>
<td>3:0 - 7:99</td>
<td>2:6 - 12:9 by extrap.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>*58 -3's</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


*Smith's figures, in her published work (19), differ slightly from the above and are included in the body of this paper.
<table>
<thead>
<tr>
<th>Test</th>
<th>Description</th>
<th>Sample Size</th>
<th>Range</th>
<th>Sample Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattell Infant Intelligence Scale 1940</td>
<td>Observation and Verbal</td>
<td>274</td>
<td>(2) -2's -3's</td>
<td>0:3 - 2:6</td>
</tr>
<tr>
<td>Merrill-Palmer Scale of Mental Tests 1931</td>
<td>Verbal</td>
<td>631</td>
<td>81 -2's 128 -3's</td>
<td>1:6 - 6:6 1:6 - 6:6</td>
</tr>
<tr>
<td>Smith Nonverbal Performance Scale 1960</td>
<td></td>
<td>654</td>
<td>306 -2's 348 -3's</td>
<td>2:0 - 4:0 2:0 - 4:0</td>
</tr>
<tr>
<td>Gesell Developmental Schedules 1925, 1938</td>
<td>Longitudinal study on hearing children of homogeneous class background</td>
<td></td>
<td></td>
<td>4 weeks 6:0 4 weeks -6:0</td>
</tr>
<tr>
<td>Hiskey-Nebraska Test of Learning Aptitude</td>
<td>1941, 1955</td>
<td>466</td>
<td>none</td>
<td>4:0 - 9:8 by extrap.</td>
</tr>
<tr>
<td>Pantomime</td>
<td>466 Deaf, six state residential schools for deaf</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verbal</td>
<td>380 Hearing, (5) public school</td>
<td></td>
<td>none</td>
<td>4:0 - 10:0</td>
</tr>
</tbody>
</table>

(2) Test items were not uniformly presented to every child — number ranged from 39 - 116 for 2's, 3 - 80 for 3's.
(3) Attempt to approximate the 1958 census of parental occupations not entirely successful as sample proved to be skewed towards advantaged professional and technical workers.
(4) Research on clinical and deaf cases in process.
(5) All had scored within average range (90-110) on the Binet Scale.
<table>
<thead>
<tr>
<th>Test Description</th>
<th>Test Administration Details</th>
<th>Age Range 1</th>
<th>Age Range 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randall's Island Performance Series -1930-</td>
<td>Verbal 77 Hearing Subnormals M.A. 2 M.A. 3 M.A. 4 C.A. below 2:0 - 6:0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schick (Lane) Alteration (6) -1931-1932-1947</td>
<td>Pantomime 102 Deaf and Speech Defective Children Attending Central Institute for the Deaf</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Columbia Mental Maturity Scale -1954- (7)</td>
<td>Pantomime 957 Hearing New York City Pupils No -2's 89 -3's 3:0 - 12:0 3:0 - 12:0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revised Form -1960- (8)</td>
<td>None (9)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


(7) Withdrawn from circulation.

(8) Standardization data not published as of April 7, 1960

(9) "3-year-old sample judged so inadequate it was not included in the norming procedure."
old hearing children in developing their respective new norms, as were 38 four-year-old deaf and 85 four-year-old hearing children used. He also indicates that the three-year old group of deaf children is limited, the age ratings above 17 are based on extrapolations, and consequently the norms are somewhat less reliable at both extremes. By letter Hiskey says:

"The original scale had relatively few children at the lower limits since it was designed for entering school children. You will note that the present scale is standardized separately upon deaf children and upon hearing children and that a much more extensive number of children has been utilized at the lower limits. Although the number of younger children was still more meager than we would have liked, such children are difficult to locate and to get involved in the procedure (7)."

This information does indicate that considerably more "flesh and blood" children were used for norming purposes in the revised Hiskey-Nebraska test. It is included at this point to indicate that Smith's criticism was valid. It also indicates the author's realization of the need to restandardize in order to meet the changing use of the test in terms of age of entering school children. This writer does question Hiskey's statement in regard to meager numbers of younger children in the new standardization because of difficulty in locating and getting them involved in the procedure. In that this city has at least 25 of these very young deaf children enrolled in an educational program either at the local speech and hearing clinic or Upjohn School Deaf Department, this writer volunteered this group of children to Dr. Hiskey.

Smith continues her analysis of the tests by pointing out that Leiter had no two or three-year olds in his middle class American
group, and only 12 four-year-olds. The Arthur Adaptation of the Leiter had no two-year-olds and only 53 three-year-olds. She continues that the Vineland Social Maturity Scale, after very thorough work on abnormal subjects, is standardized only on 20 each of two- and three-year-old normal children. She indicates that some of the Cattell's Infant Intelligence items were presented to as few as three subjects, while in the Columbia Mental Maturity Scale, Revised Form 1960, the three-year-old sample was judged so inadequate that it was not included in the norming procedure.

Smith points out some serious problems with many of these tests. She indicated that extrapolation is the rule, but the intelligence of a two-year-old is not half the intelligence of a four-year-old nor is a mental age of two years standardized on a feebleminded population the same entity as a mental age of two derived from a normal child with a chronological age of two. She also points out that anyone with a knowledge of child development can pick up glaring mistakes on these early test materials. As an example, she points out that Leiter places as his first item the matching of colors, which American children do not typically do at two. She feels that picture matching should have come first. She asks a very interesting question as to whether the people who are developing these tests know the children they presume to represent. This very question was discussed earlier in this paper in Chapters II and III, dealing with the development of intelligence in young children and whether or not preschool tests currently in use measure this emerging intelligence as presented by the child psychologists and
the child development specialists.

Smith points out another serious defect in the use of these conventional tests with young deaf children. This serious defect is the variability introduced when examiners improvise different pantomime presentations for performance items where verbal directions were prescribed in the original manuals. She believes that there is no longer anything which is standardized when this quality of erratic presentation is permitted.

Hiskey, perhaps the only other person as experienced and as qualified to speak to this point regarding the young deaf child, has some definite ideas on this subject. These ideas will be included at this point, because they are in complete accord with Smith's belief. He states in his new manual of the Hiskey-Nebraska test, when referring to special techniques for testing deaf children based upon his wide and varied experience in this field, that it is quite important that the examiner understand the pantomimed instructions for administering his test to deaf children. He indicates that pantomimed directions usually appear cumbersome and, perhaps, somewhat unintelligible to most examiners. He continues that they sometimes seem so long that, when written descriptions of the pantomimed directions are given, the examiner is prematurely discouraged with the possibility of learning them or following them. He indicates that it must be kept in mind that it may take a long paragraph to describe a series of motions which require only two or three seconds to execute. He states, though, that after the directions have been practiced a few times with the
test materials, one should be able to execute them without referring to the manual, since they have a decided continuity and significance. Hiskey reports that he instructed each of his examiner's and continued to work with each in maintaining this pantomime technique as per directed during the revision and restandardization of the test in order that this procedure would result in more uniform methods of data collecting and recording.

From this information, one can readily see that perhaps the two leading authorities in the field of testing young deaf children urge the use of standardized pantomime direction for validity of test results. This is an extremely important factor to remember.

Smith also discusses the short-comings of using many of the so-called non-language items that have verbal directions. She believes firmly that to be a valid measure of intelligence of a deaf child, the tests must be truly nonverbal. She presents as an example of extreme abuse in this area, the instruction for the twenty-four month's level of the Cattell which utilizes 209 words, and yet she indicates the uninformed continue to use this for lack of something better.

Interesting information is presented in regard to the Binet by Smith. She points out that Quinn McNemar noted in 1942, when assembling the items for the revision of the Stanford-Binet at that time, that it was hoped that enough nonverbal material could be included to permit the construction of a nonverbal form. She reports that it was not possible to realize that goal, and the directions for these items, as in so many so-called nonverbal tests,
were mainly verbal rather than pantomime. She points out that some understanding of language was always involved and that such non-verbal claims are to no service to the workers in the field of the deaf.

The opinions of both Goetzinger and Myklebust have already been presented earlier in this paper in regard to this same problem of nonverbal tests that still require verbal instruction. All three are in accord as to the problem that these so-called nonverbal tests present when working with the deaf.

The new Wechsler Preschool and Primary Scale of Intelligence, 1967, which offers five performance items, is discussed by Smith. She considers this to be an unexcelled sampling of various classes in the United States with the inclusion of both whites and non-whites and an N of 100 boys and 100 girls at each of its half-year intervals. However, she indicates that the lowest age is four years, and again, the performance items require verbal instruction, so this will be of no service in the area of the deaf.

Smith refers to what she considers to be probably the most up-to-date inquiry into preschool tests in the literature. This referral is to the exhaustive study by Stott and Ball, referred to and discussed at length in an earlier portion of this paper. It is presented at this point again, in Smith's Table III (p. 88), reproduced and presented as a point of reference for discussion of the fifteen most popular preschool tests in use today according to Stott and Ball's findings. Checked against the data in Table II, Smith indicates that the limitations of the tests for use in the
### TABLE III

**THE FIFTEEN MOST FREQUENTLY USED INFANT AND PRESCHOOL AGE MENTAL TESTS SCALES, AS REPORTED BY 217 RESPONDENTS* (19, p. 181)**

<table>
<thead>
<tr>
<th>Test Name</th>
<th>Percentage Frequency of Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stanford-Binet</td>
<td>90</td>
</tr>
<tr>
<td>Goodenough Draw-a-Man</td>
<td>73</td>
</tr>
<tr>
<td>WISC</td>
<td>54</td>
</tr>
<tr>
<td>Cattell Infant Intelligence Scale</td>
<td>44</td>
</tr>
<tr>
<td>Gesell Developmental Schedules</td>
<td>36</td>
</tr>
<tr>
<td>Ammons Picture Vocabulary Test</td>
<td>33</td>
</tr>
<tr>
<td>The Merrill-Palmer Scale</td>
<td>28</td>
</tr>
<tr>
<td>Columbia</td>
<td>21</td>
</tr>
<tr>
<td>Arthur Performance Scale</td>
<td>20</td>
</tr>
<tr>
<td>Minnesota Pre-School Scale</td>
<td>15</td>
</tr>
<tr>
<td>Raven Matrices</td>
<td>15</td>
</tr>
<tr>
<td>Leiter International Performance Scale</td>
<td>12</td>
</tr>
<tr>
<td>Kuhlman-Binet</td>
<td>7</td>
</tr>
<tr>
<td>California First Year Mental Scale</td>
<td>4</td>
</tr>
<tr>
<td>Griffiths Mental Development Scale</td>
<td>3</td>
</tr>
</tbody>
</table>

field of the deaf become evident in terms of norming and standardization.

In considering these fifteen tests and their appropriateness for use, Smith has already presented the reasons for not using the Stanford-Binet, WISC, Cattell, Merrill-Palmer, Columbia, Arthur Performance and the Leiter International Scale. In her verbal presentation of her paper at the Conference on Oral Education of the Deaf, Smith had some added comments to those in the published paper. For example, she reported that she believed the Arthur Adaptation of the Leiter International Performance Scale and the Arthur Point Scale of Performance were scaled incorrectly and that students need perceptual organization and discrimination to be able to do these tests. She believes the Gesell Schedule to be too long to administer. She indicated that the California Mental Maturity sample, when restandardized, was inadequate because it contained no two or three-year-olds.

The Raven Matrices are also included in this list of fifteen most popular preschool tests. In a personal letter from Goetzinger, in reply to my quest for information in regard to a paper presented by him at the 1967 American Speech and Hearing Association Convention having to do with the Terman and the 1938 Raven's Progressive Matrices, he replied:

"...Actually, these two tests cannot be used at the kindergarten and preschool level. I would not recommend the use of the Terman Test before age eight or nine. The same would apply to the 1938 Raven's (6)."

The other tests not mentioned, but remaining among the fifteen,
would also fall into the category of insufficient norming or verbal instruction necessary, thus invalidating results with the deaf.

At this point, considering the advice of the above experts in the field, one knows which tests do not fit the needs of a preschool deaf child, despite the fact that people are using these tests and attempting to adapt procedures. Smith and Hiskey have strongly advised against this technique. One can conclude from the advice of these experienced people that a test meeting the following criteria is best suited for administration to preschool deaf children:

1. a test designed specifically for deaf children
2. a test with standardized pantomime instructions which are to be followed explicitly to eliminate variability
3. a test with adequate norming and standardization on a normal and adequate sampling of both deaf and hearing children, at the age levels for which the test is designed, not dependent upon extrapolation

In regard to this last point, Hiskey indicates that in order to make a scale more usable and to enhance its validity and reliability, the norming process must involve the collection of separate data from deaf children and from hearing children, with separate procedures for administering the test.

This writer has reviewed the history of psychological testing with the deaf, the relationship of intelligence and deafness, psychological factors and problems involved in testing, current tests in use, an evaluation of these tests, and lastly, criteria by which to select the most appropriate tests available for use with the preschool deaf child today. With this information, the last part of this paper will present the matter of selection and administration of certain tests, and relating these to diagnostic teaching.
CHAPTER V

THE SELECTION AND ADMINISTRATION OF SELECTED TESTS

Based upon the principles presented in Chapter IV, there appear to be just three tests which most closely meet the criteria established for tests suitable for administration to preschool deaf children. These three tests are:

(1) Smith Non-Verbal Performance Scale, designed specifically for deaf children two to four years of age

(2) Hiskey-Nebraska Test of Learning Aptitudes, designed specifically for deaf children three to seventeen

(3) Ontario School Ability Examination, for age five to adulthood, and by extrapolation, two to adulthood

Let us examine each of these tests more closely.

The Smith Non-Verbal Performance Scale grew out of Smith's research cited earlier in this paper, and is designed specifically for the younger preschool child, age two to four. The test has been standardized on 654 hearing children with pantomime presentation. This scale does not provide an IQ because of the author's reluctance to label a child this young for fear that this limits or colors the concepts of this child for both parents and teachers. However, Smith points out that it does delineate the functioning for various items in terms of 50 per cent passing. It was standardized at three-month intervals, from twenty-four to forty-eight months, and Smith indicates that a recent doubling of the N at twenty-four and twenty-seven
month levels proves that the original figures were reliable.

Smith describes the scale as being the result of twelve years of selection and elimination of test items with regard to their attractiveness, usefulness, and adaptability to preschool children. It is independent of verbal instructions and is administered through the medium of demonstration and pantomime. It consists of a series of age graded performance tasks adapted from well-known psychological scales, tests, schedules, and inventories. The items are selected with language handicapped children in mind and also for their possible diagnostic potential in the assessment of clinical manifestations of perceptual difficulty and neurological disturbance. Smith notes that in view of the fact that they had at the Tracy Clinic, in a ten-month period, 5.7 times as many referrals of children with rubella background as they had in 1965, she is alerted to a new dimension of this old problem. She indicates this population contains a greater number of multiply handicapped children, with rather severe maturational delay and central nervous system involvement, than before. This experience is the same at Upjohn School, and hence this writer feels strongly that this test might be especially helpful in detecting possible early learning disabilities, and as a diagnostic tool it would be very helpful in educational planning.

In its final form the scale consists of forty-seven items. Derived scores may be reported in either months of mental age or computed point scores. The selection of items is based on experience with a pilot sample of more than 350 preschool children, from eighteen

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months to six years, who were referred to John Tracy Clinic because of possible auditory disorders. Smith indicates this original material was eventually cast aside because the norming population had such variability. In the future, she indicates, it is going to be necessary to do some breaking down of the degree of hearing loss, age of onset, etiology, and so on, if one is going to have specific meaningful measures. The children were tested within seven days plus or minus their third month anniversary dates. She points out that this contrasts with most tests which are based on six-month or yearly steps. As she notes, after all, a six-month interval is 25 per cent of the life of a two-year-old child. This is such an interesting observation to this writer, because each teacher who works with this age child knows the tremendous changes which occur in six-month periods.

On the basis of the performance of 654 subjects, 306 two-year olds and 348 three-year-olds, chronological age equivalents were established for each item at the age corresponding to a proportion of 50 per cent passing. Reliability estimates, based on test-retest performance of 229 subjects, were reported for each item. Norms were provided separately for girls and boys, since scores favored girls. This phenomenon of the superiority of the girls appears to be more extreme below thirty-six months, whereas above that age, the discrepancy narrows. It is reported to appear non-significant among the high scorers at the forty-eight month level.

The question of the restandardization of the SNVPS on children with hearing difficulties is not complete at the present time, 1968.
Smith reports that many test protocols are ready, but that the analysis of the etiology, location and severity of loss, age of onset and special conditions of children in clinical populations has not yet been satisfactorily worked out.

The author, in a personal communication (18), reports that this scale is not yet available for general use. Formal publication is dependent upon her time for rearrangement of the forty-seven items selected for the final edition. The only access to this scale, currently, is through the University of Michigan, University Microfilms, Inc. It is included in Smith's dissertation, "Performance of Subjects Aged Two to Four on Nonverbal Tasks Presented in Pantomime: A Phase in the Development of a Test For Clinical Appraisal of Hypacusis and Other Language Handicapped Children" (17).

This writer has obtained the test. In personal correspondence with Smith, she suggests that the test be given by a psychologist for ethical reasons, but suggests the possibility that a teacher of the deaf who knows these children might do a better job of this than a psychologist who has never had to experience pantomime presentations. Her communiqué said, "I look forward to the day when this will be available to teachers, but that day has not yet been soundly established (18)." She does suggest that this writer work with some local psychologist who is interested in preschool children, in going through the instructions and in obtaining the necessary materials. She refers to these materials as, "...the very simplest things that are in any good psychologist's office (18)." Smith suggests that in such a cooperative venture the ethical aspect would be covered, and
this writer would have opportunity to work with the psychologist and to experiment with the presentations. She enclosed some norms which she suggested would be more usefully arranged than those in the dissertation and a list of necessary materials and sources. Smith added that she hoped that this writer would use the test experimentally, and if this writer would send the results, she might eventually get them into her elaboration of the study for use with the deaf.

This writer hopes to be able to work with one of the school diagnosticians or a local psychologist on this project if one can be found who is interested in the preschool child. In the meantime, this writer will only be in a position to recommend this as the test which seems to have been most carefully thought out and constructed for use with the two to four-year-old deaf child. Certainly the Smith Non-Verbal Performance Scale has been constructed for young deaf children as none other has at this age, and is not merely an adaptation of a hearing child's test.

The second test which seems to meet all qualifications in the criteria is the Hiskey-Nebraska Test of Learning Aptitude. This scale, in its original form, the "Nebraska Test of Learning Aptitude for Young Deaf Children," was published in 1941 in response to a need for a scale which could evaluate the young deaf child at the time when he was entering a program for formal education. It was one of the first major individual tests of mental ability in the United States which was designed specifically for acoustically handicapped children and standardized upon them. It could be administered entirely through pantomime, was not a timed test and did not
require verbal responses. It was designed for children four to ten years of age and was an attempt to compare the deaf child with other deaf children of his chronological age. A separate standardization upon hearing children in 1955 permitted the scale's use with the speech handicapped, the retarded, and others who had hearing but had language or communication difficulties. Hiskey reports that by 1960 the distribution of the scale had increased considerably, not only in the United States, but in many counties throughout the world.

In spite of the increased demand for the scale, Hiskey recognized that for professional reasons the scale should be revised and restandardized. He indicates that the pictures needed to be updated, certain sequences needed to be modernized or replaced entirely, new norms were needed, since the performance of children, deaf or hearing, could be affected by experience related to television and other media which were not a regular part of the home, school, and community life at the time the test was originally developed. He also indicated that since the scale had been devised for children four to ten years of age, it was limited in its usefulness and needed to be extended.

The revision and restandardization began in 1962-63. In addition to the importance of revision, is the very important matter of restandardization of this test. It is reported that 1107 deaf and 1101 hearing children between the ages of 2-6 years and 17-5 years were tested. The children came from ten widely separated states. As previously mentioned, 25 three-year-olds were used, and 38 four-year-old deaf children. Hiskey points out that the three-year-old group of deaf children is limited, and the age ratings above age 17 are
based on extrapolations. Despite the limited number of children at the lower age levels, this test is now standardized on children at this level and not by extrapolation. Hence, it is certainly now to be recommended as a test to be administered to young deaf children, designed and normed to meet their needs.

All other factual material regarding this test may be found in the test booklet published to describe the revision and restandardization, entitled, *Revision and Restandardization of the Hiskey-Nebraska Test of Learning Aptitudes* (8).

However, Hiskey suggests some important special techniques for testing deaf children. He had alerted his examiners to these factors continually during the revision of the scale, and wishes to emphasize their importance with all examiners who administer the scale subsequently.

Hiskey explains that the actual testing of deaf and hard-of-hearing children presents problems which are unique. Practically all impressions of the test materials gained by members of this group must be by the use of sight. Hiskey explains that the attention factor is even more important with the acoustically handicapped group than it is with hearing groups. He also notes that in some ways, the hard-of-hearing child may present an even more difficult testing situation than does the so-called deaf child. The hard-of-hearing find it more difficult to accept a completely non-verbal testing approach since they can still hear sounds, yet, their hearing is often so deficient that they do not hear the instructions adequately and accurately. As a teacher of the deaf, this writer agrees
wholeheartedly with this observation.

Based upon his observations made in testing a great many hearing and acoustically handicapped children, Hiskey notes that he is of the opinion that the deaf subject is much more prone than the hearing subject to "jump to conclusions" and to overestimate his abilities or the amount of material which he has grasped. Unless he is restrained, the deaf child frequently takes a quick glance at the material presented and attempts to perform the task. It is often necessary to make him take the allotted time for viewing such materials. Again, this writer is sure that all teachers of the deaf would concur in Hiskey's observation, as this problem continually presents itself in the teaching situation, the "eager beaver" factor.

On the other hand, Hiskey indicates that the examiner must always be on the alert, lest through some slight change in facial expression, he assist the subject in making his response. He indicates the deaf or hard-of-hearing child is continuously seeking visual clues, a frown, an arched eyebrow, the flicker of an eyelash, or a slight change in expression of the examiner's face may speak volumes to him. When this child encounters a difficult problem, he is quite likely to stare intently at the examiner's face in an attempt to attain some such clue. On other occasions he will watch the examiner intently as he, the subject, performs a task in order to ascertain the examiner's reaction to it. Hiskey explains that if unconsciously the examiner expresses lack of approval, the subject will immediately change his response, and naturally this invalidates the test performance. As a teacher of the deaf, this writer is in complete agreement with these
comments, and has seen exactly the same factors at work in everyday teaching situations, reading readiness tests, and audiological testing situations.

The extreme importance of understanding and carrying out the pantomimed instructions for the test is emphasized by Hiskey. This was discussed previously in the paper, and is certainly an important factor in validity of the test.

Hiskey has other interesting advice for examiners, and especially, this writer feels, those not familiar with the deaf. He points out that the fact that the subjects can neither hear nor speak does not mean that the examiner should sit "woodenly" and refrain from vocalization. He has found it desirable to talk to such children since they expect it and are more at ease as a result of it. Hiskey feels that with a deaf child it is even more imperative that the examiner must put the child at ease. He must be even more congenial, friendly, and interested than with the hearing child. Praise is the chief method of keeping him interested and "pepped up." Praise can be expressed by nodding the head and smiling approval, clapping the hands, and so on, adding that clapping the hands is very effective with younger children because it attracts the attention of the subject and has him ready for the next item.

Perhaps these techniques of praise and methods of implementing them may seem a bit unusual to one not oriented to the deaf. However, they are all important and common factors in any learning situation with young deaf children. These suggestions are equally appropriate to teaching as well as testing. They might almost be considered a
form of "operant conditioning" with the deaf.

One more important point, and one that may seem unusual to some, is made by Hiskey in discussing these techniques. He says, that in the main, it has been found advisable to indicate to the younger deaf child when he has made a mistake and to let him correct the mistake. He states that this should be employed especially with the first items in each subtest, for if a subject fails an item because he has not grasped the pantomimed instructions, one of the best ways of getting across what is desired is to see that he corrects his response and then give approval. Hiskey notes that deaf children are accustomed to having teachers and parents correct their responses and show them the proper avenues of approach. Consequently, they are not unduly depressed or upset by correction. If the young deaf child is permitted to assume that his incorrect response is acceptable, he often will continue to respond in this manner. In this respect, Hiskey points out, good psychometric practices sometimes differ from accepted procedures used with the hearing child.

This writer is pleased to see such intelligent, understanding needs of deaf children conveyed by Hiskey in his special techniques instructions. All of these techniques evidence a deep understanding of the deaf and how to work with them. As a teacher of the deaf who has observed the nervousness and apprehension with which some of the diagnosticians have approached the testing situation, this writer believes that instructions of this nature are extremely valuable. Sometimes it has been observed that some of the diagnosticians have attempted to read into, or interpret, some of the behavior described
in these techniques, which is perfectly normal behavior for deaf children, as something else. Thus, it would seem that the examiner should be as familiar with the special techniques involved as with the pantomimed instructions.

This writer is unable to locate any recommendation by Hiskey as to whom would ethically be permitted to administer this new test, but in his new revision and standardization, he was extremely careful to select and continually train his examiners. In the manual for the original test, Hiskey indicated that tests of this type are not devised for use by individuals who have had no training in psychometrics. The person who is unfamiliar with the techniques in testing would be completely lost in the array of test material and the exacting directions for administering. However, he states that it is quite conceivable that the person who has some experience in individual testing and who has some knowledge of deaf children could, after a period of training in which he gave six or eight practice tests, administer the scale quite satisfactorily.

The last of the tests to most nearly fulfill the criteria is the Ontario School Ability Examination by Dr. Harry Amoss and copyrighted in 1936 in Canada. The author of this test indicates that the purpose of the examination is to measure present intelligence, native or acquired. The Ontario School Ability Examination was begun through an attempt to discover some means of deciding the eligibility of candidates for admission to the Ontario School for the Deaf. The examination originally began as a composite examination made up from modifications of the Gesell block building, the Drever Collins block...
design, the Drever Collins domino, the Knox cube, the Healy Fernald puzzle, and the Stanford Revision drawing, design, and weight tests. The mental age allotted each item by the original author was provisionally accepted, subject to later adjustment in matters of administration or scoring. As a result of try-out among some thirty deaf pupils in the day classes of Toronto, and some fifty hearing children who had been previously tested by the Stanford Revision Examination, certain modifications were introduced.

It later appeared desirable for Amoss to perfect this rather hastily put together examination in order that a better system of grading students in the Ontario School for the Deaf might be affected, and that a more adequate test of eligibility for admission might be made. The tapping examination was introduced, the drawing examination extended, the Gesell paper folding sequence added, and certain items from the Stanford Revision included. These items and sequences were tried out with hearing pupils who had been previously subjected to a Stanford Revision Examination, and with deaf students who had taken the original form of the test. The manual states a mental age table was then compiled according to the rule:

"An item is placed under the mental age at which seventy-five per cent of the hearing candidates of that mental age as ascertained by a Stanford Revision Examination succeed in passing the test, save when in a sequence examination, such as the Knox cube, fifty per cent of the candidates succeed in passing the second test beyond, in which case the first item beyond will appear at that mental age (1, p. 8)."

The whole test was then reportedly given to 288 students at the Ontario School for the Deaf ranging from five to twenty-two years of age.
age, and from this, tables of intelligence quotients were developed. The scale was standardized in conformity with the Stanford Revision. The author reports that the success attending the use of this test in the Ontario School for the Deaf, together with the fact that it had been established in conjunction with the Stanford Revision Examination among hearing children, gave rise to the hope that its use might have advantage in being extended to survey work in the regular grade schools of the Province. It was thought to have potential with children whose native tongue was other than English, or who because of home surroundings, had not been afforded normal opportunity of acquiring language skills.

It is thus Amoss' conclusion that the Ontario School Ability Examination is set forth as valid in the Province of Ontario and probably valid in other English-speaking areas for the purpose of determining the school ability of deaf children, retarded children and children whose home language is other than English.

This writer's major criticism of this test would be its norming, in that the age range was from 5-0 to 23-0, with no children two, three, or four being used, and yet the norms are given from 2-0 to adulthood, arrived at by extrapolation.

In regard to ethical administration, this writer can find no direct reference to this factor in the manual, but one may note the author's criteria for the test. It is to the effect that if the examination is being standardized with respect to and for use in a school sphere, certain practical requirements must also receive consideration; one of which is specifically that preparatory training
necessary to enable an experienced, competent teacher to efficiently administer the examination should be reduced to a minimum. By inference, then, this writer is assuming that a teacher of the deaf meeting his standards of experience and competence with minimum training in the test procedure should be permitted ethically to administer this examination.

It is apparent from the information provided by the authors of the three tests selected as most appropriate for preschool deaf children that the ideal solution in testing would be to have a psychologist who has extensive experience and training with the deaf, or a teacher of the deaf who has sufficient training in psychometric testing. This writer feels that any of the three above mentioned tests should be administered and interpreted only by such qualified persons. Perhaps one solution might be to have a cooperative program of training and in-service training between the two disciplines.

If a teacher does not have psychometric training or an opportunity for a cooperative program to work with a qualified psychologist, this writer would suggest that one explore some of the newer evaluative scales and tests which are currently being published for use by teachers who are interested in diagnostic teaching as a means of providing better education, learning and adjustment for their pupils.

These tests, which according to authors, are designed to be administered by teachers as well as other disciplines, were discussed briefly at the end of Chapter III. Tests mentioned as examples of
these techniques were the Early Detection Inventory by McGahan, the Evanston Early Identification Scale, the Valett Developmental Survey of Basic Learning Abilities, and the Peabody Picture Vocabulary Test.

This writer has experimented with these tests with preschool deaf children, and has found them to be very helpful for the purpose intended in administration. It is the opinion of this writer that even though they were not constructed for deaf children, the tests were constructed specifically for purposes of helping a teacher in diagnostic evaluation of children, thus giving an objective tool to accompany subjective opinion. If they are used in this manner, with alertness and valid judgment on the part of the teacher in making the proper referral for further diagnostic psychological testing with proper psychological tests, in all cases where this is at all indicated, then the evaluative techniques can serve a very important function in our present evaluative process. It is believed that a brief description of each test will substantiate this premise.

The McGahan Early Detection Inventory (13), published in 1967, is to be used with children about to enter school, children in Head Start programs, nursery school or Kindergarten. It assesses readiness in four areas:

(1) Social and Emotional Development

(2) School Readiness Tasks - involving verbal self-awareness, concept development, awareness of left and right, and awareness of body image

(3) Motor Performance - involving gross motor coordination and fine motor coordination, hand preference and eye preference

(4) Personal History - encompassing family and social history and a medical history
This inventory gives school personnel help in the areas of:

1. giving them an overall view of a child's readiness for school,
2. serving as a screening device to detect a potential underachiever, and pointing up areas in which a child may have later school adjustment difficulties,
3. providing a basis for special help and grouping,
4. providing data that may be used as a basis for continuing study of the child.

Intensive teacher training in administration is not necessary according to the authors, McGahan and McGahan, who believe classroom teachers can administer the inventory once they are thoroughly familiar with the test items, the manual, and the scoring criteria.

The Evanston Early Identification Scale (12), published in 1967, is described as a highly efficient device for identifying children who can be expected to have difficulty in school. The test may easily be administered to a group, or an individual, by the classroom teacher. With young deaf children, this writer would suggest that it be administered only on an individual basis. Children are asked to draw the figure of a person, and this was achieved by showing the deaf children a photograph of themselves, or another member of their family. The drawing is scored by the teacher through the use of a ten-item, weighted scale. Those children who perform poorly may then be referred to the school psychologist or school social worker for diagnosis and treatment of possible perceptual, emotional, or other problems. The authors, Landsman and Dillard, feel that in this way, problems that might otherwise be attributed to low intelligence or poor conduct may be treated for their proper
causes, and secondary emotional problems may be avoided. This test is valid for children between the ages of five years and six years three months.

The Valett Developmental Survey of Basic Learning Abilities (23), published in 1966, was compiled in order to aid teachers and others concerned in evaluating various developmental abilities of children between the ages of two and seven, for the purpose of helping in the planning of individualized learning programs. All or part of the survey can be used as required. The author, Valett, believes that teachers of nursery school classes, special preschool programs, kindergartens, and primary classes for the retarded and educationally handicapped will find the survey helpful in individual evaluation and in concrete curriculum planning. This test is described by the author as being concerned with those all-important developmental tasks prerequisite to more formal learning. It includes separate test areas for motor integration and physical development, tactile discrimination, auditory discrimination, visual-motor coordination, visual discrimination, language development and verbal fluency, and conceptual development. This writer administered it to the kindergarten deaf group, and found it particularly helpful in evaluating the children who were integrated in regular school for part of their educational program.

The Peabody Picture Vocabulary Test (5), published in 1959, was administered to those children in an integrated school program with hearing children, and to those that were thought to have the potential in language skills to do so. Dunn, the author, indicates that the
administration of the test requires no special preparation other than complete familiarity with the test materials, including practice in giving the instrument prior to its use as a standardized measure. He indicates that it is extremely important for the examiner to know the correct pronunciation of each of the words to be administered. With young deaf children, it is extremely important that they can see your face at all times for purposes of lipreading the vocabulary words. The author believes that if all instructions are strictly observed, psychologists, teachers, speech therapists, physicians, counselors, and social workers should be able to give the scale accurately.

This paper has thus far presented information pertaining to concepts of intelligence in the preschool child, a study of intelligence tests used to measure this intelligence in the hearing child, the intelligence of the deaf and its measurement, and a selection of tests most appropriate for the psychological assessment of the preschool deaf child, as well as instruments that may be used by a teacher of young deaf children to determine the need for further psychological study or school placement. It is hoped that all teachers of very young children might be interested in the first two chapters of this paper having to do with concepts of intelligence and its measurement with the preschool hearing child. It is also hoped that both teachers of young deaf children and psychologists or diagnosticians interested in testing young deaf children may find this research paper helpful in their work.
CHAPTER VI

SUMMARY AND RECOMMENDATIONS

The basic premise of this paper has been to explore four major areas in regard to the intelligence of preschool children, and in particular, preschool deaf children, and the measurement of this intelligence.

Chapter II presented current research upon which current concepts of intelligence and mental development are being based by child growth and development specialists in the field. The research indicates that the emerging concepts of intelligence based upon evidence presented by Jean Piaget and Eric Erikson indicate that thinking, language and imagination are intimately associated with one another in such a way that each is necessary to mental life. The child constantly perceives, integrates his perceptions and integrates sensory experience with verbal expression. Strongly dominated by perception in the early years, the child moves toward greater control of his thinking. His earliest concepts of classes, space, numbers, time and causes are rooted in concrete, personal experience, gradually becoming more objective and abstract as he has more experience, especially in interactions with other people, who check his thoughts and conclusions. In all areas of thinking, the preschool child increases in speed and flexibility.

This author was interested in how this current, emerging concept of intelligence compared to the concept of intelligence held
by authors of currently used preschool intelligence tests, and hence
the aspects of intelligence that would be measured by these tradi-
tional tests. In turn, would the aspects of intelligence as measured
by the traditional preschool tests be most helpful to a teacher, or
would the kind of developmental information obtained by using some of
the newer, broader evaluation scales be more appropriate to a
teacher's specific needs in learning about her students and their
particular needs.

Thus the second phase of this study, Chapter III, explored the
research regarding the nature of the measurement of intelligence in
the preschool child and intelligence tests in use for such measurement
of intelligence. A comparison of the concept of intelligence by
specialists in the field of child development and that of the authors
of intelligence tests for preschool children was presented. Aspects
of mental development being measured by traditional preschool tests
were compared to current concepts of intellectual growth. Research
information was presented in depth regarding the theoretical thinking
that underlies the efforts of the makers of tests and of the persons
who were otherwise interested in the nature of intelligence and how
it develops in children, the relative frequency with which each of
the various preschool intelligence tests is used and for what specific
purposes, and determination of the factor content of the test items
used by means of factor analysis. General conclusions of the research
were presented, and indicated that there is a real need for more ade-
quate means of appraising the mentality of young children, as recent
research has provided a better understanding of the nature of intelli-
Intelligence, its determinants, and the nature of its developmental change, thus furnishing a sounder basis for new scale construction. Another conclusion of the research was that the users of tests which are presently available generally feel the need for improved testing devices and techniques. Research analyses of scale content have demonstrated a great lack of consistency among and within the scales now in use in terms of factor content and meaning, thus pointing up the need for more consistent and adequate test scales. Guidelines emerging from the research data presented indicated that any attempt to develop a new intelligence scale, if it is to be an improvement over what is now available, must be guided by, and consistent with, the best conceived and most solidly based theory of the nature of mentality. This theory, revealed through research, is that the human being, even at very early ages, possesses not just one single general ability factor, but a number of abilities. The structure of the infantile intellect is in its early stages of development, and, therefore, is presumably relatively simple, although its constituent abilities are indeed "intellectual" in nature. Since the young child's intellect is developing, it is changing constantly by the emergence of new abilities. It is indicated that as the repertory of abilities common to children at these different early age levels is determined through continued research, test items for their evaluation can be devised and appropriate scales constructed. In addition, it is clearly indicated from the research that it is always the child's level of "acquired" abilities that is available for testing, not the child's capacity or his mental potentiality. One can only
observe or test what the child can do, what he has "learned" to do. Children, through use of their present abilities, acquire new abilities that are within the level of their developed capacity.

Thus the research presented in Chapter III indicates a true developmental sequence of level of mental functioning is needed as a basis for the construction of better infant and preschool age mental test scales. The research indicated that a mental test, constructed from this point of view, would express the levels of mental functioning for a broad band of abilities, each of which is possibly developing at a different rate depending upon its genetic potentiality and environmental stimulation.

The third phase of the study, Chapter IV, presented a history of traditional and current psychological testing with the deaf, the relationship between loss of hearing and mental development, and the implications of this factor in intelligence testing and scores. Pertinent psychological factors and problems associated with mental development and psychological assessment of the deaf were presented. Some of the major problems discussed in association with mental development and psychological assessment included (1) the prediction of educational achievement of deaf children from psychological tests, (2) the seeming retardation of the deaf on certain non-verbal tests of intelligence, (3) test areas in which the deaf seem to be inferior to the hearing, (4) causative factors influencing the mental development of the deaf, (5) the problems of similarities and differences between verbal and non-verbal tests, (6) the problem of all non-verbal tests being equally non-verbal, (7) the interpretation of test scores
according to "hearing" norms, (8) the need for specialization on the part of the examiner, (9) the range of mental abilities among the deaf, (10) the relationship of deafness and memory, (11) the relationship of deafness and abstract abilities, and (12) equating the performance and intelligence of the deaf from psychological test scores.

With this background in understanding the intelligence and psychology of the deaf in general, attention was then focused upon specific psychological tests used with the preschool deaf child. All research available to this writer, having to do with psychological tests for the preschool deaf child which had been done in this field in the past thirty years to date, was reviewed. The need for a tool to evaluate the intellectual ability of preschool children suspected of a hearing loss was presented. Psychological tests currently being used as this tool were also presented and critically analysed in terms of their limitations for use with the preschool deaf child. From this critical analysis, by experts in the field, the conclusion that a test meeting the following criteria is best suited for administration to preschool deaf children was reached:

(1) a test designed specifically for deaf children

(2) a test with standardized pantomime instructions which are to be followed explicitly to eliminate variability

(3) a test with adequate norming and standardization on a normal and adequate sampling of both deaf and hearing children, at the age levels for which the test is designed, not upon extrapolation

Based upon the criteria established above, Chapter V presented the three tests which were chosen as those most closely meeting this criteria for administration to the preschool deaf child. The tests
selected were:

(1) Smith Non-Verbal Performance Scale, designed specifically for deaf children two to four years of age

(2) Hiskey-Nebraska Test of Learning Aptitudes, designed specifically for deaf children three to seventeen

(3) Ontario School Ability Examination, for age five to adulthood, and by extrapolation, two to adulthood

Information regarding each of these tests, together with techniques and suggestions by the authors, were presented.

It was apparent from the information provided by the authors of the three tests selected as most appropriate for the preschool deaf child that: (1) the ideal solution to administering each of these tests would be to have a psychologist who has had extensive experience and training with the deaf, or (2) a teacher of the deaf who has sufficient training in psychometric testing, to administer the tests. Thus, this writer suggested that any of the three above mentioned tests be administered and interpreted only by such qualified persons.

It was also suggested that perhaps one solution might be to have a cooperative program of training and in-service training between the two disciplines.

It was also suggested that if a teacher does not have psychometric training or an opportunity to work cooperatively with a qualified psychologist, perhaps one might explore some of the newer evaluative scales and tests which are currently being published. They are being published for use by teachers who are interested in diagnostic teaching as a means of providing better education, learning, and adjustment for their pupils. According to the authors,
these tests are designed to be administered by teachers as well as
other disciplines. Four of these tests were used with preschool
deaf children, and were found very helpful for the purpose intended
in administration. The tests used were:

(1) McGahan Early Detection Inventory
(2) Evanston Early Identification Scale
(3) Valett Developmental Survey of Basic Learning Abilities
(4) Peabody Picture Vocabulary Test

The tests and their assessment areas were described. Even though
they were not constructed for deaf children, they were constructed
specifically for purposes of helping a teacher in diagnostic evalu­
ation of children, thus giving an objective tool to accompany
subjective opinion. It was suggested that if they were used in this
manner, with alertness and valid judgment on the part of the teacher
in making the proper referral for further diagnostic psychological
testing with the proper psychological tests where the need was
indicated, these evaluative techniques might serve to fill a very
important void in our present evaluative process.

In view of the research information presented in this paper,
the following recommendations are presented:

(1) Continued research in the development of preschool
intelligence tests that will measure abilities of
preschool children revealed in current concepts of
intelligence.

(2) Continued research in the development and use of pre­
school intelligence tests specifically for the preschool
deaf child that may then be used as a basis for research
studies and data in the area of psychological measure­
ment of this age group that is so lacking in the
research literature today.
(3) Factor analysis study of test items used with the deaf to ascertain aspects of intelligence measured by test items on verbal and non-verbal tests, even though they may correlate significantly, and to help solve some of the problems of similarities and differences in what is measured in verbal and non-verbal tests.

(4) Standardization of appropriate psychological tests on both the hearing, deaf and the hard of hearing, producing three sets of norms, as each of the handicaps, deafness and hard of hearing, is unique unto itself.

(5) The development of norms on non-verbal tasks presented in pantomime to preschool children in clinical assessment of the language handicapped child and in research that is concerned with comparative evaluations of special behavioral and perceptual functions of the deaf as suggested by Smith.

(6) The need for research data based upon larger samples, various age ranges, and wider geographic distribution of children than the population of one school or area, as has sometimes been the case, as well as research needed to include various types of school programs for the deaf, since so much of the research to date has involved residential school pupils as opposed to very limited research with day school pupils.

(7) A psychologist or possibly a teacher of the deaf with a broad background in psychology and psychometrics, using specific tests designed for the deaf, needs specific training and experience if one is to do work which is scientifically and clinically valid. It is suggested that possibly a cooperative program of training and in-service training might be worked out between these two disciplines at either the level of institutions of higher learning or at a local interdisciplinary level, in which experienced teachers might be trained by competent psychometrists to test young deaf children.

(8) If a teacher of the deaf is interested in objective techniques to substantiate subjective observation, it is suggested that one use some of the new evaluative scales and tests being published that may ethically be administered by teachers as an aid in diagnostic teaching and in determining the need for further psychological referral.

(9) The need for teachers and administrators of the deaf to adopt a curriculum and teaching techniques that
will incorporate information revealed by research in regard to current concepts of intelligence and psychological factors pertaining to the intelligence of the deaf. For example, both curriculum and teaching techniques should incorporate such research data as cited revealing that (a) the deaf are equal to the hearing in practical intelligence and in deductive reasoning, both of which appear to be associated with ability to function mentally in concrete situations, and to go from the general to particulars, and (b) results indicated below average scores in theoretical function and in inductive reasoning, which presumably reflects weakness in abstract ability or capacity to develop a principle from particulars. One's teaching might be much more effective if it were based upon this information. Much more of this type of information would be very helpful, and especially to "programmed learning" for the deaf. Another example is the "traditional" calendar work done with young deaf children. Research in current concepts of intelligence reveals that a preschool child's earliest concepts of classes, space, numbers, time and causes are rooted in concrete personal experience, gradually becoming more objective and abstract. This has very real implications for calendar work and other areas of many preschool deaf curriculums.

It is felt that perhaps all teachers of very young children, ages two through six, might find interesting the material in the first two chapters of this paper as it pertains to current concepts of intelligence and its measurement in the preschool hearing child. It is also hoped that teachers of young deaf children and psychologists or diagnosticians interested in the intelligence of the deaf child and its measurement in the preschool deaf child may find this paper of interest.
REFERENCES


7. Hiskey, M. S. Personal communication.


