

DETERMINATION OF RELIABILITY AND VALIDITY OF
STANFORD - BINET INTELLIGENCE SCALE AND
THE CONSTRUCTION OF NORMS FOR USE IN BANGLADESH

Ph.D.

SHARMIN HUQ
DEPARTMENT OF PSYCHOLOGY
UNIVERSITY OF DHAKA

OCTOBER, 1991

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DETERMINATION OF RELIABILITY AND VALIDITY OF STANFORD-BINET
INTELLIGENCE SCALE AND THE CONSTRUCTION OF NORMS FOR USE IN
BANGLADESH.

A Dissertation Submitted in Partial Fulfillment of the
Requirements for the Degree of Doctor of Philosophy in
Psychology.

SHARMIN HUG

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UNIVERSITY OF DHAKA.

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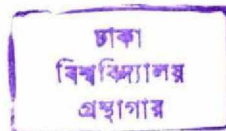
The undersigned certifies that she has read a thesis entitled "Determination of Reliability and Validity of Stanford-Binet Intelligence Scale and the Construction of Norms for use in Bangladesh", submitted by Sharmin Huq in partial fulfillment of the requirements for the degree of Doctor of Philosophy and recommends to the University of Dhaka for its acceptance.

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15 October, 1991.

Sultana Sarwatara Zaman

Supervisor



Abstract

The purpose of the present study was to determine the validity and reliability of five non-verbal subtests of Stanford-Binet Intelligence Scale 4th edition and further to construct norms for use in Bangladesh. The subjects for this study were 1841 children ranging in age from 3 to 9 years. The children were selected from 4 urban towns and 3 villages of Bangladesh.

A pilot study was conducted on 233 children (116 children were from urban area while 117 were from rural area) for trying out and pretesting the test items.

The validity and reliability was determined during the pilot study. A contrasted group validity (when test scores on normals were correlated with contrast group of known handicapped children) was computed and the result indicated significant difference between the two groups at .001 level. On the other hand the test-retest reliability was computed and the correlation between the two tests were found to be .81.

Next an item analysis was carried out with the scores of 233 subjects, i.e. on the same pilot study sample for the five subtests of the Stanford-Binet Intelligence Scale. The 'difficulty index' and the 'discriminating index' was found out for each item of the test. The difficulty index ranged from .99 to .004 in the urban sample while it ranged from .009 to .55 in the rural sample. Based on the results of item analysis the items were rearranged in order of difficulty for further administration. However no items were eliminated or substituted.

The validity and reliability was again determined with the sample of the main study. The validity of the scale was determined by finding out the coefficient of correlation between the PCSAS scores of Stanford-Binet Scale and three tests (i) the Wechsler Intelligence Scale for Children-Revised (WISC-R) (ii) Adaptive Behaviour Scale (ABS) and (iii) the Denver Developmental Screening Test (DDST). The validity coefficient when correlated with WISC-R was found to be .66, it was .71 when correlated with ABS and finally it was .56 when correlated with DDST. The reliability of the present test was determined by applying the Kuder Richardson Formula-20 and by the test-retest reliability method. The internal consistency of each item was calculated with the Kuder Richardson Formula -20. The highest consistency were found for the subtest 'Copying' which was .82 with the 9 year olds, while the lowest was .58 in the subtest 'Memory for Digits' for 6 year olds. For test-retest reliability correlation was found to be .97 and .44 for the urban and rural sample respectively. The subtest wise correlation for the two administration ranged between .88 and .92. Finally the age norm for interpretation of the raw scores were developed. The Partial Composite Standard Age Score (PCSAS) for the urban sample ranged from 32 to 166 while for the rural sample it ranged between 28 to 168.

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Evidence is abundant in this project that host of people contributed directly or indirectly to its successful completion.

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CHAPTER I

INTRODUCTION

Intelligence has been defined as the capacity to profit from experience and to go far beyond the given to the possible. It was in our intellectual development that we humans have been able to transcend our physical frailty and gain dominance over more powerful or numerous animals. The attempt to measure human intelligence has entailed more continuous, long term, intensive effort than any other projects in psychological measurement. In the study of human intelligence philosophical curiosity interacts with practical demands. For centuries men have been puzzled over the enormous differences in sheer intellectual capacity that separates a Socrates from an ordinary citizen, a retarded from a normal child. They are asked whether biological or educational factors are more influential in producing them. Eventually because of the practical needs of civilized societies, it became more and more urgent to find some way to evaluate the intelligence of individuals as accurately as possible. The advent of universal education brought all sorts of children, talented and untalented into the schools. Clearly, teachers needed to be able to distinguish between different mental capacities in order to educate children suitably.

Intelligence a common word today, was almost unknown in popular speech a century ago. During the later part of the nineteenth century, the philosopher Spencer and Francis Galton stimulated by Darwin's writings on the "Origin of Species Differences" reintroduced the ancient latin term "INTELLIGENCE" to refer to individual differences in mental ability. They believed that there was an inborn human characteristic of general intelligence distinct from special abilities. Intelligence has been defined in many ways, beginning with Boring's (1923) assertion that intelligence is what the test tests and culminating in a variety of more or less complex definitions of intellectual functioning.

Definitions of Intelligence :

Attempts to define intelligence has been a popular endeavour among psychologists. A satisfactory definition should have atleast two features; it should not grossly violate the folk use of the word, and it should be objective and operational rather than simply being a list of synonyms as is customary in most dictionary definitions.

Among the basic approaches to defining intelligence were as follows :

"Intelligence is the ability to learn:. Superficially, such an approach in defining intelligence makes sense. The more people are able to learn, the smarter they probably are. The faster people can learn, the more they can learn by a given age, and thus the better they can score on intelligence test. These approaches also have some difficulties. Since there were many different kinds of learning, one individual might do good in one and might not do well in another. Guilford (1967) reviewed a number of experiments addressed to this question. The general approach to such research was to determine the rate of learning in several different kinds of learning tasks for a number of subjects. If there were such a thing as general learning ability then those subjects who do the best on some learning tasks ought to do well on others also, but this was not the case. Almost universally, correlations between learning rates for various tasks were quite small.

A second problem was that learning ability does not seem to be related in any direct way to the more complex sort of problems found on many intelligence tests. Zeaman and House (1966) have reviewed the research on the relationship between learning and intelligence as measured by the performance on standard intelligence tests and they concluded that as long as the learning task was simple enough, subjects of low intelligence were not poor learners than subjects of higher intelligence. An important exception to this generalization was school learning. Numerous studies report a high relationship between school grades and intelligence test performance (Bond, 1940).

"Intelligence is what has been learned". An example to this approach was Wesman's (1968) definition, "Intelligence is a summation of learning experiences". This definition implied that intelligence tests were not measuring an ability or potential as much as they were measuring achievement. In a sense they were measuring our knowledge. One difficulty with such an approach was that it does not fit in with popular notions of what intelligence is. Most people think that an intelligence test should be some thing other than an achievement test, reflecting not so much what a person has learned so far but rather measuring some sort of potential for future achievement.

"Intelligence is the ability to adapt to the environment", particularly to new situations in the environment. For example Stern (1914) the developer of IQ, defined intelligence as "general adaptability to the new problems and conditions of life". The difficulty with this definition was that it was difficult or impossible to define "adapt". There were some people who were not very intelligent yet they adapted well to their environment. Certainly what was a successful adjustment for one individual would be a poor adjustment for some one else, since different people have different goals and aspirations. This problem was magnified when a variety of different cultures were considered, since each culture reinforced different skills and talents. It has been suggested that intelligence was a culture specific ability, but this was not consistent with popular usage.

"Intelligence is the ability to carry out abstract thinking". Terman (1921) the developer of Stanford Binet Intelligence Test defined intelligence in this way. As a result, there were number of items on his test directly measuring the capacity to think abstractly. Research on the relationship between learning and intelligence showed little relationship between simple learning and IQ, but when the material to be learned was complex or abstract, high IQ subjects performed better than low IQ subjects. Such a definition was not as general as the others mentioned, since it limited intelligence to one mental ability rather than encompassed all mental functioning. Recently Jensen (1970) has proposed two kinds of intelligence, Level I and Level II. Level I referred to basic associative abilities and would be best measured by a test such as digit span while Level II referred to abstract problem solving, and thus corresponded closely to the capacity for abstract thinking.

A number of people have defined intelligence in global terms rather than in terms of specific ability. "Intelligence" according to Wechsler (1944) is the aggregate or global capacity of individual to act purposefully, to think rationally, and to deal effectively with his environment. On the other hand Stoddard (1943) defined "intelligence as the ability to undertake activities that are characterized by (1) difficulty (2) complexity (3) abstractness (4) economy (5) adaptiveness to a goal (6) social value (7) the emergence of originals, and to maintain such activities under conditions that demand a concentration of energy and a resistance to emotional forces".

For Jean Piaget (1952) the function of intelligence like that of all biological abilities, was adaptation to the environment. As children advanced through stages of development and adapted to their environments old cognitive structures were reorganized and extended and intelligence increased.

Similarly Spearman (1927) and Thurstone (1938) in their analysis of many individuals on a wide variety of test items concluded that individuals have different strengths and weaknesses in facets of intelligence ranging from verbal fluency to adeptness in seeing spatial relationships. Whereas Thurstone (1938) placed emphasis on the specific facets of intellectual behaviour, Spearman (1927) maintains that an overall global capacity or innate intelligence accounts for variations in test scores. In contrast to Wechsler, Thurstone, and Spearman, Burt (1958) views intelligence as "an innate general cognitive ability". Differences in intelligence seemed to depend on the combined action of numerous genes whose influence was 75% of measured variance in IQ. Burt's work laid the ground work for Jensen's (1969) thesis that retarded and low functioning children could not be helped intellectually by earlier intervention. In contrast to all others mentioned, Wesman (1968) views intelligence "as the summation of learning experiences".

Like Piaget, Reid Tuddenham (1964) and Roger Webb (1974) have suggested that the key to intelligence was adaptation. Intelligence, Tuddenham holds was not a trait but how adaptive a person's behaviour was. The virtue of this view was that it centers on performance and was less culture bound than some other definitions.

Intelligence has been variously defined in terms of ones ability to think abstractly, to acquire knowledge, to adapt to ones environment, to profit from experience, and to acquire new abilities. Recently Sternberg (1982) has defined intelligence as "goal directed adaptive behaviour", which he believes represents a common theme in research on intelligence.

More Recently Sternberg (1984) has defined intelligence very broadly calling it purposive or successful adaptation in a real world context. By this definitions intelligence includes whatever characteristics lead to such adaptations, if it was understood that "adaptation" covered changing the environment or selecting a new one if necessary.

Theories of Intelligence :

The notion of an easily identifiable attribute of mind often called intelligence is an extremely popular and historically entrenched theoretical conceptualization. Two major views of intelligence have competed for supremacy : a single trait or attribute versus a set of skills.

In common with many others, Galton (1884), Goddard (1912), Spearman (1904) and Terman (1906) considered intelligence to be a single, easily measurable factor. It was Burt, Jones, Miller and Moodie (1934) who articulated the concept of 'g'. It was from their theory that the basic features of a single factor theory of intelligence could be extracted. Their theory included five basic assumptions :

1. 'g' a single factor within individuals, subsumes all mental ability.
2. 'g' predicts all mental performance to a significant degree.
3. 'g' can be easily measured by assessing a relatively limited subset of behaviours.
4. 'g' is innate and therefore genetically determined to a significant degree.
5. 'g' is not subject to qualitative changes or to environmental influence.

A corollary to this last point was that 'g' did increase with age up to some innately determined maximum as the child developed, hence the necessity of expressing intelligence as a ratio of mental ability over chronological age. While the absolute amount of 'g' may increase, the ratio (MA/CA) should remain stable within the bounds of measurement error.

The first theory of trait organization based on a statistical analysis of test scores was the two-factor theory developed by the British psychologist Charles Spearman (1904, 1927). He examined the interrelationships among tests of various abilities and concluded that all intellectual abilities have a general underlying factor 'g' in common and a number of specific factors (s) that are unique to each ability. Spearman conceptualized the 'g' factor as general mental energy. The 'g' factor was thought to be in operation of deductive nature, linked with skill, speed, intensity, and extensity of a persons intellectual output. Spearman hypothesized that 'g' is a function of heredity and that 's' is a measure of specific learning and experiences acquired by the individual (Fructher, 1954). This two-factor theory has been a useful conceptual base for measures of general and specific abilities.

E.L. Thorndike (1927), another pioneer in developing theories of intelligence, thought of intelligence to be composed of a multitude of separate elements, each representing different abilities. Thorndike believed certain mental activities may have some common elements that form clusters; he identified three such clusters of mental abilities : social abilities (dealing with people) concrete intelligence (dealing with things), and abstract intelligence (dealing with verbal and mathematical symbols).

A third pioneer, L.L. Thurstone (1938), was one of the first to use factor-analytic methods to probe the construct of intelligence. He identified eight primary mental abilities : verbal, perceptual speed, inductive reasoning, word fluency, number facility, memory, spatial relations and verbal fluency. Thurstone later discovered these primary factors had moderate inter correlations, leading him to postulate the existence of a second-order factor that permeates the eight primary abilities. This factor resembles Spearman's 'g'.

J.P. Guilford (1967) became the most prominent multifactor theorist in the United States. He developed a three dimensional structure-of-intellect model that consists of five operations categories (cognition, memory, divergent production, convergent thinking and evaluation); four content categories (figural, symbolic, semantic, and behavioural); and six product categories (units, classes, relations, systems, transformations, and implications). He believed that intelligent activities could be understood by the kinds of mental operations performed, the type of contents on which the operations were performed, and the resulting products.

The most significant theoretical impact has been made by Jean Piaget (Ault,1977, lavell,1977) who viewed intelligence as a form of biological adaptation between the individual and the environment. He theorized that biological adaptation was extended by cognition, which allowed the individual to move from an immediate action level to a symbolic level through the process of internalization. Piaget saw cognitive processes emerging as a result of reorganization of one's psychological structures, resulting from interactions between the individual and his environment.

Modern conceptions of intelligence stress the importance of both innate and developmental influences. Intelligence was characterized as a more global concept than was earlier believed with the unique learning histories of individuals determining how intelligence was used. Among the modern theorists, Jensen (1970,1980) has suggested two major classes of mental abilities : associative (level I) and cognitive (level II). Associative ability involved reasoning and problem solving. Little transformation of input took place within level I, whereas level II processing involved a conscious manipulation of the stimulus input in producing the correct output.

A second modern theorist, Jagannath Das categorized cognitive ability by way of information processing model. Das model has two primary modes : simultaneous processing and successive processing. Stimuli were arranged either in a simultaneous manner or sequential manner in order to make decisions. Equal status was given to both modes as a given task could be solved by more than one mode. Das perceived intelligence as the ability to use information procedures in order to plan and structure behaviour effectively for goal attainment (Das, 1972; Das, Kirby, & Jarman, 1975; Das & Molloy, 1975; Jarman & Das, 1977).

Intelligence has been viewed by some as culturally determined, implying that the qualities that constitutes intelligence were a product of time and place. This view of intelligence known as cultural relativism, was closely related to the idea of intelligence as a set of specific acquired skills or strategies. Jensen (1980) depicts this interpretation as confusing intelligence or 'g' with the instrument measuring it. Instruments that measure intelligence were undoubtedly cultural in the sense that persons must have had some experience with the basic contents of the test. The trait of intelligence seemed to represent a single 'g' factor in all human groups even though it may not always be valued. To know the presence of 'g' span in all of human history, it would be difficult to believe that the geniuses of the great civilizations of the past were not well above average in the kinds of behaviour that best characterize 'g' of present intelligence test.

Measurement of Intelligence :

Various types of measuring instruments should ideally be used for the assessment of the strength and weakness of the mental abilities and intellectual functioning of an individual.

Assessment has been described as "scientific art of arriving at sufficient conclusions from insufficient data" (OSS Staff, 1948). Scientific psychology attempts to formalize the procedures by which such predictions about individual behaviour can be made with a minimum of error and a maximum of accuracy.

Assessment is the use of specified testing procedures to evaluate or differentiate individuals on the basis of certain characteristics (Kelly 1967). Psychologists use assessment techniques to make sense of the incredible range of individual differences. They want to understand how different traits go together to form a unique personality. By testing, classifying and categorizing individuals who share similar traits, psychologists can correlate behavioural differences. They are interested to know about how people develop. How important are sex, race, intelligence and other human characteristics in predicting specific behavioural outcomes.

In all such testing the goal was to find out more information that would further the development of psychology as a theoretical and applied science. Among these instruments general intelligence tests, achievement and aptitude tests were the most important and commonly used ones. The scores obtained by an individual on any one category or more of these tests might be used for a variety of purposes.

All these measuring tools were often used for a diagnosis and prognosis of the individuals behaviour patterns in a variety of settings. In a country wide search for talented individuals or mentally handicapped ones, tests of intelligence, aptitude and achievement should ideally be used in conjunction with other significant informations, for the purpose of proper identification and classification of those individuals.

One of the most important characteristics of the concept of intelligence was that people differed in it. These differences could at least in theory be measured and quantified, hence there was the necessity for the development of intelligence test. The first modern intelligence test was developed around the turn of the twentieth century and within a few decades these tests became widely used in virtually all school system in Britain, America and in many other Western countries. They have been used to place children in appropriate classes in school, they have been used to determine the effectiveness of school curricula and other training programmes, they have been used as a screening device for hiring in a wide variety of occupations. Intelligence test scores have been either, the dependent and independent variable in thousands of projects and experiments.

Intelligence tests were typically printed tests containing items (usually in multiple choice form) intended to measure such abilities as vocabulary, reading comprehension, arithmetic computation, inductive and other kinds of reasoning, spatial ability and ideational fluency. In general the skills were academic-they were those that were taught in school or were thought to predict success in school. The test items were well constructed (Simon 1973, 1978) in the sense that they were clearly stated, all the information needed were available and there was only one correct or "best" answer. The score was the number correct. These tests provided a single summary score such as an IQ as an index of the individuals general level of performance. The tests were validated against measures of academic achievement, and were often designated as tests of scholastic aptitude.

Intelligence tests were frequently employed as preliminary screening instruments to be followed by tests of special abilities. This practice was normally prevalent in the testing of normal adolescents or adults for educational and occupational counseling, personnel selection, and similar purposes. Another common use of general intelligence tests were to be found in clinical testing, specially in the identification and classification of the mentally retarded.

The use of the psychological tests in the United States has had the expectations of even wild dreamers a half century ago. Newsweek once stated that the annual scale of the test booklets and answer sheets to schools were 122 million five years earlier (Reported in Goldman 1961, P.1).

Survey of the test usage in business, industry and government would be impressive. Testing in the large organizations were used mainly for the institutional decision making. Even in clinical settings, where testing was done much more on an individual basis, there was a great amount of testing going on. In public clinic services it has been estimated that there were at least 700,000 individuals tested every year (Sundberg 1961 a).

Intelligence Test Development - A Historical Perspective :

The study of intelligence and its measurement traces its roots to physicians, educators and psychologists who were deeply involved with population at the extremes of intellectual continuum. Esquirol (1838) and Seguin (1867) were committed to the study of mentally retarded individuals, and Galton (1869) was fascinated by the mental abilities of geniuses. The separate contributions of these pioneers have been profoundly felt in the field of intelligence testing, it was the innovative research investigations of Binet (1903) who focused on the mental abilities of typical or average children at each age, that have had the longest, lasting and most direct effect on individual intelligence testing as we know it today .

Esquirol and Seguin :

Esquirol made several important contributions, most notably by distinguishing "between the idiot, whose intelligence does not develop beyond a very low level and the demented person" (Peterson 1925). This distinction between mental retardation and emotional disturbance reflected a vital breakthrough for assessment and indicated the primitive state of the art in the early nineteenth century. Esquirol also described a hierarchy of retardation (or feeble mindedness, as it was known in earlier times) with "idiots" occupying the bottom rung, followed by "imbeciles" and peaking with "morons" (Peterson 1925). He was well ahead of his time in concluding that the use of language was the most dependable criterion for inferring a retarded individuals intelligence level (Anastasi, 1976). Esquirol (1828) was also credited with developing a precursor of the mental age concept by pointing out that an idiot is incapable of acquiring the knowledge common to other persons of his own age (Peterson 1925).

Seguin was heavily influenced in his work with mentally retarded individuals by Itard, of Wild Boy of Aveyron fame. Like Esquirol, Seguin (1867) tried to establish criteria for distinguishing between different levels of retardation, although he focused on sensory discrimination and motor control. Optimism regarding treatment of retarded individuals characterized Seguin's approach and he instituted a comprehensive programme of sense training and muscle training techniques much of which live on in present day institutions for the mentally retarded (Anastasi, 1976).

The Galton-Cattell Approach to Testing :

Francis Galton (1869) transformed his enthusiasm for gifted men and genius and the study of the genetics of intelligence into the development of what was apparently the first comprehensive individual intelligence test. Based on Galton's (1883) belief that intelligence must be intimately related to sensory abilities because environmental knowledge comes to us via the senses, he developed a series of tests such as weight discrimination, reaction time, visual discrimination, steadiness of hand, keenness of sight, and strength of squeeze. His empirical justification for this test battery came from comparisons between gifted and retarded individuals that, not surprisingly, showed obvious superiority in favour of the gifted (Peterson 1925). Galton's influence spread far beyond his laboratory as Galton type tests were developed throughout Europe and the United States.

James McKeen Cattell an assistant of Galton set up a laboratory in 1890 at the University of Pennsylvania and moved it to the Columbia University the following year. Cattell coined the term "mental tests"; Galton's influence was clearly evident in Cattell's 40-60 minute individual examination, as after-images, colour vision, sensitivity to pain and the like (Peterson; 1925). Cattell elaborated on and improved his mentor's methodology by emphasizing the vital notion that administration procedures must be standardized to obtain results that were strictly comparable from person to person and from time to time.

Later a challenge was issued to the Galton view of sensory and motor intelligence from Alfred Binet of France. In collaboration with Simon and Henri, Binet conducted numerous investigations of complex mental tasks rejecting the Galton notion that performance on simple, elementary sensory discrimination and motor co-ordination tasks equates to intelligent behaviour.

The downfall of the Galton-Cattell approach, and the concomitant upswing of the Binet methodology, came oddly enough as the result of two very flawed investigations. Stella Sharp (1898-99) directly compared sensory-discrimination tests with tests of complex mental functions and concluded that the simplest mental processes yielded comparatively unimportant information, whereas the tests of Binet and Henri showed much value in assessing "individual psychical differences".

The second study that spelled doom for the Galton approach was Wissler's (1901) correlational analysis at Bernard College based on data for 250 freshmen and 35 seniors. Even though initial reaction to the two studies was predominantly antitesting causing a lack of enthusiasm for the Galton-Cattell as well as the Binet-Henri approach in the United States, the methodology of Binet eventually triumphed first throughout Europe and finally in America (Peterson 1925).

Interestingly, recent research by Jensen (1979) and his students (such as Vernon, 1981) has revitalized the early work of Galton to some extent. Although they confirm that simple reaction time measures contribute little to variation in intellectual function, these researchers have found substantial relationship between intelligence and complex reaction time over repeated trials of the same task. Thus adaptations of Galton's work might yet be found to impact on objective intellectual assessment in future.

Alfred Binet's legacy in the United States :

In addition to recognizing the inevitability of some variability in test performance, Binet discarded the specific test for the specific ability and took a group of tests which seemed to cover in general the chief psychological characteristics that go to make up intelligence. And further more, as the norm or standard of intelligence he took what the average child at each age could do" (Pintner & Patterson 1925). The age-level approach characterizes the Stanford-Binet Intelligence Scale (Terman & Merrill, 1973) to this day, and the nature of the tasks developed by Binet and his colleagues were very similar to the specific tasks constituting every major intelligence test in current use (Kaufman 1983).

The Binet-Simon scales, including the 1911 revision, which extended through adulthood, were welcomed in Europe and the United States, and their translation and adaptation had begun almost immediately. Town directly translated the Binet-Simon Scale into English, in 1913 early revisions and adaptations were developed by Bobertag in Germany, Johnston and also Winch in England and several investigators in the United States : Goddard, Kuhlman, Wallin, Terman, Yerkes (Pintner and Patterson, 1925).

Terman's (1916) Stanford Revision and Extension of the Binet-Simon Intelligence Scale later shortened to Stanford-Binet:

Terman publishing a revision of the Binet Scale that he termed "tentative" (Terman & Childs, 1912), spent four years painstakingly and thoroughly standardizing the scale. Terman also introduced the term IQ in his 1916 scale, borrowing Stern's (1914) concept, and making his revised Binet even more attractive to individual mental examiners.

The 1937 revision of the Binet (Terman and Merrill, 1937) produced two forms : L and M and corrected many of the problems with the earlier version. for example, more nonverbal tests were added at the preschool levels, the standardization was much improved, and additional levels were added at the lower and upper ends of the scale. Later in the 1960 revision Forms L and M were combined into Form L-M and the deviation IQ (a standard score with a mean of 100 and standard deviation of 16) replaced the ratio IQ (Terman & Merrill 1937). There were no restandardization of the 1960 Stanford-Binet. The 1972 Stanford-Binet represented a restandardization of the instrument, but no modifications of existing items (except for a couple of trivial substitutions) or switching of tasks from one level to another.

David Wechsler's Contribution to Intellectual Evaluation:

The biggest challenge to the Stanford-Binet monopoly came from David Wechsler in 1939, when he published the Wechsler Bellevue Scale (Wechsler 1939). All the Wechsler Scales included 10-12 separate subtests with about half included on a verbal scale and half on a performance scale, yielding three IQ's a verbal IQ, a performance IQ and a full scale IQ. The yielding of a global IQ, despite the separate subtests and scales were consistent with Wechsler's (1958) notion about the existence of the construct of a global intelligence.

Wechsler followed four procedures before selecting 11 subtests for his original 1939 Wechsler Bellevue Scale " (1) careful analysis of all existing standardized tests regarding functions measured and reliability (2) empirical assessment of each tests validity claims (3) subjective judgment of each tests clinical values and (4) tryout data collected over a two-year period on individuals with "known" level of intelligence (Wechsler 1958, p, 63). By limiting his test to those already in existence, Wechsler selected the test measurement tools available in the mid 1930's, in actuality all his tasks were taken from the work of Binet and the others in United States who adopted the Binet scales from 1900 to 1915. The intelligence scale developed by David Wechsler included several successive editions of three scales, one designed for adults, one for school age children, and one for preschool children. The main differences among the scales were the age group for which it was intended.

The first form of the Wechsler scale known as the Wechsler-Bellevue Intelligence Scale was standardized on 670 white children whose ages ranged from 7 to 16 and 10,081 white adults whose ages ranged from 17 to 70.

The Wechsler-Bellevue Scale (1939), though a useful and popular instrument, had been supplanted by the Wechsler Adult Intelligence Scale (WAIS) published in 1955 and Wechsler Intelligence Scale for Children (WISC) published in 1949. The total standardization sample of WAIS consisted of 850 males and 850 females who ranged in age from 16 to 64 years. A special standardization sample of 475 subjects were utilized in order to develop a norm for persons who were beyond 64 years of age. The earlier scale had a number of technical deficiencies, particularly with regard to size and representativeness of normative sample and reliability of subtests which were largely corrected in the later revisions. The latest edition was the Wechsler Adult Intelligence Scale-Revised (WAIS-R) published in 1981.

The WAIS-R standardization was chosen with special care to ensure its representativeness. The normative sample consisted of 1880 cases, including an equal number of men and women distributed over nine age levels from 16-17 to 70-74 years. Participants were selected so as to match as closely as possible the proportions in the 1970 U.S. Census, with regard to geographical region, urban-rural residence, race (white vs non white), occupational level, and education. The standardization sample was designed so as to include only "normal adults".

The Wechsler Intelligence Scale for Children (WISC) has been used extensively by psychologists in clinics, school, and various other institutions. The WISC was standardized on a sample of 2200 white American children. It was designed for use with children whose chronological age ranged from 5 through 15 years. The WISC was later revised in 1974 and was named Wechsler Intelligence Scale for Children - Revised (WISC-R). The WISC-R consisted of the same 12 tests that constituted the 1949 WISC. One principle change involved was the age in the battery : the WISC-R was intended for use with children 6 through 16 years of age. All the items from the 1949 digit span, mazes and coding tests were included in the WISC-R. At least half of the test items from all the other tests except picture arrangement were retained intact or with slight modifications. Picture arrangements were substantially altered. The standardization sample contained 2200 cases- 1100 boys and 1100 girls. The WISC-R IQ were based on scaled scores derived separately for each age group. To construct the IQ table for the WISC-R, three sums of scaled scores (verbal, performance and full scale) were obtained for each child in the standardization sample.

Finally the Wechsler pre-school and primary scale of Intelligence (WPPSI) was published in 1967. This test was used for children whose ages ranged from 4 through 6 1/2 years. This scale was standardized on a sample of 1200 boys and girls. The WPPSI was similar to the WISC in organization and content.

Binet and Wechsler translated in European countries :

The Wechsler Intelligence Scale for Children was translated, adapted and standardized in Scotland. Scottish version of WISC made amendments in the WISC manual of the Psychological Corporation 1949 and amendments to the scoring instruments given in the WISC manual. Norms were derived from 1974 children of 5-15 years of age. (Liikert 1949).

Joanhim (1958) standardized the Hamburg Wechsler Intelligence Scale for Children in German language. In 1973 Flammer, Grudernmann, Inaven and Schuler administered the Hamburg Wechsler Intelligence test for kinder gatten along with other intelligence test and found that reliability estimates of the total scores were reasonably high, their discriminative power differed for various sections of the scales as well as between the different tests. In addition the test displayed a heterogeneous factor compositions.

The Stanford-Binet Intelligence Test was translated by Leuckert in German language. Amelang (1967) made a comparative study with Hamburg WISC and the Stanford-Binet Intelligence Leuckert Scale. Presentation of statistical results includes tests of normal distribution of scores, means, standard deviation and range of IQ, interest correlation and the mean IQs of professional categories.

In (1972) Hans J. Nerup translated the Wechsler Intelligence Scale for Children in Danish language. He has presented results of his work with the standardization of Danish version. He also states that the Danish norm would help in evaluating properly the extremes, except in the verbal part above mean.

Seisdedos, Nicholas (1972) was concerned with the norming sample and verbal aspects in the adaptation of an intelligence scale (WISC) in Spanish language. Later Lopez-Soler, Concha, Romero-Medina-Augustin in (1988) studied the factorial structure of a Spanish-language version of the WISC, which was translated in 1976. In another study in 1978 by Rodriguez, Maria-D, Prewett-Diaz, and Joseph, the reliability of the WISC-R Spanish translation was studied. It was suggested that the Spanish translation of WISC-R would be ready for norming with minor modifications.

In Italy Bazzo, Maria, Zecca and Graziella (1966) worked with the Italian revision of the Stanford-Binet Scale Form L-M 1960. They also discussed the third revision of the Stanford Binet Scale by Terman and Merrill in 1960 and reported minor modifications adopted for use with Italian children as a result of research conducted in Genoa.

The Wechsler Intelligence Scale for Children (WISC) was also translated in Italy. The result of the Italian version reported that the odd even reliability coefficients of the Italian version of the WISC were similar to those for the English version. It was suggested that the difference between the two versions, reported by G.G Giordano and A. Lama (1960) confirmed that the present data cannot be attributed to a lack of reliability of the Italian version of the WISC.

The two version of the Wechsler Intelligence Scale for Children (WISC) and the Wechsler Intelligence scale for Children-Revised (WISC-R) have been translated in French language. The French WISC-R demonstrated the material accuracy of this test Verbal, Performance, and total IQ means did not significantly deviate from 100 for any age level, although standard deviations differed from 15 for some ages. Age and total IQ did not effect scores on the verbal and performance subscales. A difference of ± 12 points could be considered statistically normal and could be used as a criteria for computing and interpreting scatters (Pierre Dague, 1982).

Binet and Wechsler Scales Translated in Asian African and Other Countries :

Modern psychology is moving east with increasing rapidity. Spawned by British mental philosophy and evolutionary biology in interaction with German physiology and philosophy, and conceived against the rising swell of nineteenth century positivism, modern psychology arrived in Asia specially in Japan, almost as early as it did in United States. The subject was introduced into a Japanese University around 1890. It made an appearance in China before 1920, and in some of the colonized countries, such as India and Vietnam before World War II, some what later in the Australian and New Zealand colonies, where the intellectual life and educational institutions of the new population were little influenced by the original inhabitants.

India had a rich treasure house of psychological knowledge in the ancient philosophical and religious texts. Besides "mental chemistry" of the structuralists, psychoanalysis and mental testing became popular in the sub continent. Similarly, assessment of intelligence and of special abilities as initiated by Binet and early pioneers like Terman, Spearman and others gained popularity and many psychologists began to use various psychological tests current in the west, sometimes making minor modifications to suit the Indian populations. In the field of Intelligence testing till 1921 the work was done by few isolated missionaries engaged in educational work, like E.L. King and D.S. Herrick. In 1921 the Bureau of education and research of the Government of India devised a series of tests based on Stanford-Binet Intelligence Scale. In 1952 C. Herbert Rice devised a Hindustani Binet Scale.

The Bombay-Karnataka revision of the Stanford-Binet by Kamal (1955) and the Lady Willingdon Training College Revision of Binet in Tamil and Telegu turned out to be a sustained experience on the adaptation of intelligence tests. Later Kulshrestha (1971) adapted the Stanford-Binet Intelligence Scale form L-M in Hindi

In 1964 A.J. Malin adapted and standardized Wechsler Intelligence Scale for Children at the University of Nagpur in English (with an armchair translation into Hindi and Marathi languages) with the permission of the psychological corporation.

The task of reviving and developing psychology was currently being organized at different levels by the Chinese Psychological Society, the Institute of Psychology and Universities and Colleges (Xu, Jing and Over, 1980). In China mental testing was forbidden but were now open to research for the first time. Besides developing their own rating scales and other behavioural assessment scales they have also started translating and adapting individual intelligence tests like Wechsler Intelligence Scale for children in Chinese. The Binet-Simon scale was also translated in China by Lu Zhiwei and Wu Tianmin.

Individually administered intelligence tests have also been translated and adapted in Japanese language and the Wechsler Scales have been utilized by standardization of questions and making the scoring and interpretation procedures suitable for the Japanese people. Samejima Fumik developed an Absolute Scale on the basis of the raw scores of the Suzuki-Binet Intelligence Scale (1958).

In 1910 Henry Tasman Lovel, Reader in Psychology was influenced by Binet's work on mental testing (o'Neil 1977, p55). Later on Philips, the Principal of Sydney Teachers College in 1925 published a Sydney revision of the Binet tests (Martin 1925, p.42).

The Stanford-Binet Scale of Intelligence (Form L) was adapted and standardized for Turkish blind children between 1982-84. The findings proved some evidence that the Binet type items at the younger ages at least, holds up well cross-culturally and with the group of handicapped children.

The Wechsler Pre-school and primary scale of Intelligence Test was translated in Hebrew version (Lieblich 1971) which included Jewish Israeli norm. On the other hand the Arab children were tested with an Arabic translation of the Hebrew version (Kugelmass et al; 1974). Their tests were scored using the Israeli-Jewish norm.

Bikayi, and Ernest (1972) reports norm and reliability of the French Version of the WISC performance scale adapted to Congolese school children. The performance tests were also adapted to incorporate materials with which Zairean children were familiar while other subtests were the same as in the French version.

In 1962 Liddacoat and Roberts adapted the Wechsler Bellevue Adult Intelligence Scale for South African people aged 18-44, and thus developed interim norm for using in clinical diagnosis.

The Wechsler Intelligence Scale for Children-Revised was translated in Mexican language and established the norms for the WISC-R. To test the predictive validity of the Mexican version, grades for the 1st semester were obtained from all ss. Results indicated that the mean Full Scale IQ was 83.3, with a standard deviation of 13.7. The mean Verbal IQ was 89.2, and the mean performance IQ was 88.

Description of Stanford Binet Intelligence Scale (Fourth Edition), 1986. :

The Stanford Binet fourth edition (1986) is a revision of the 1960 Stanford-Binet Intelligence Scale : Form L-M. The authors (Thorndike, Hagen and Sattler) of this revision had maintained continuity with the 1960 scale by building on its strengths. At the same time they had made changes in order to produce a more effective instrument for appraising the cognitive skills of individuals from ages 2 to adult. (Stanford Binet, 4th edition manual, 1986).

The fourth edition resembles the 1960 Form L-M in that it covers the same age range, includes many of the same item types and requires the examiner to establish for each examinee both a basal level (two consecutive levels where the examinee passes all of the items) and a ceiling level (two consecutive levels where

the examinee fails all four or three out of four items. The present 1986 revision differed markedly from all previous editions of the Stanford-Binet in the following ways :-

1. Items of the same type were grouped into fifteen subtests with each test requiring a somewhat different cognitive skills and fund of information for successful performance.
2. Four broad areas of cognitive abilities were appraised by the fifteen subtests. These four areas were :
 - (a) Verbal Reasoning.
 - (b) Abstract Visual Reasoning.
 - (c) Quantitative Reasoning and
 - (d) Short-Term Memory.
3. The composite score that appraised 'g' or general reasoning ability was retained in the 1986 fourth edition. In addition the following scores were now available : score for the four areas described above, and combination of these four area scores and individual test scores for all fifteen subtests.
4. The vocabulary test, together with chronological age, is used to locate the level on each test at which testing should be started so that the difficulty of each test could be adjusted to the ability level of the examinee.

The changes that had been made in the fourth edition gives it certain advantages over the previous editions of the Stanford-Binet. These advantages include:

1. Broader coverage of the cognitive skills and information processing capabilities of examinees.
2. More flexibility in administration. Norms have been provided for various combination of tests. The examiner could give all tests suitable for a particular chronological age or could administer only specific tests that yield the most relevant information for making decision about the examinee.
3. Higher reliability and precision in the test score were obtained because examinees were tested with tasks that were neither too difficult nor too easy for them.
4. The opportunity to obtain a more detailed diagnostic assessment of the cognitive functioning and information - processing skills of the examinee.

The authors have constructed the fourth edition to serve the following purposes :

1. To help differentiate between students who were mentally retarded and those who have specific learning disabilities.
2. To help educators and psychologists understand why a particular student was having difficulty in learning in school.
3. To help identify gifted students.
4. To study the development of cognitive skills of individuals from age 2 to adult.

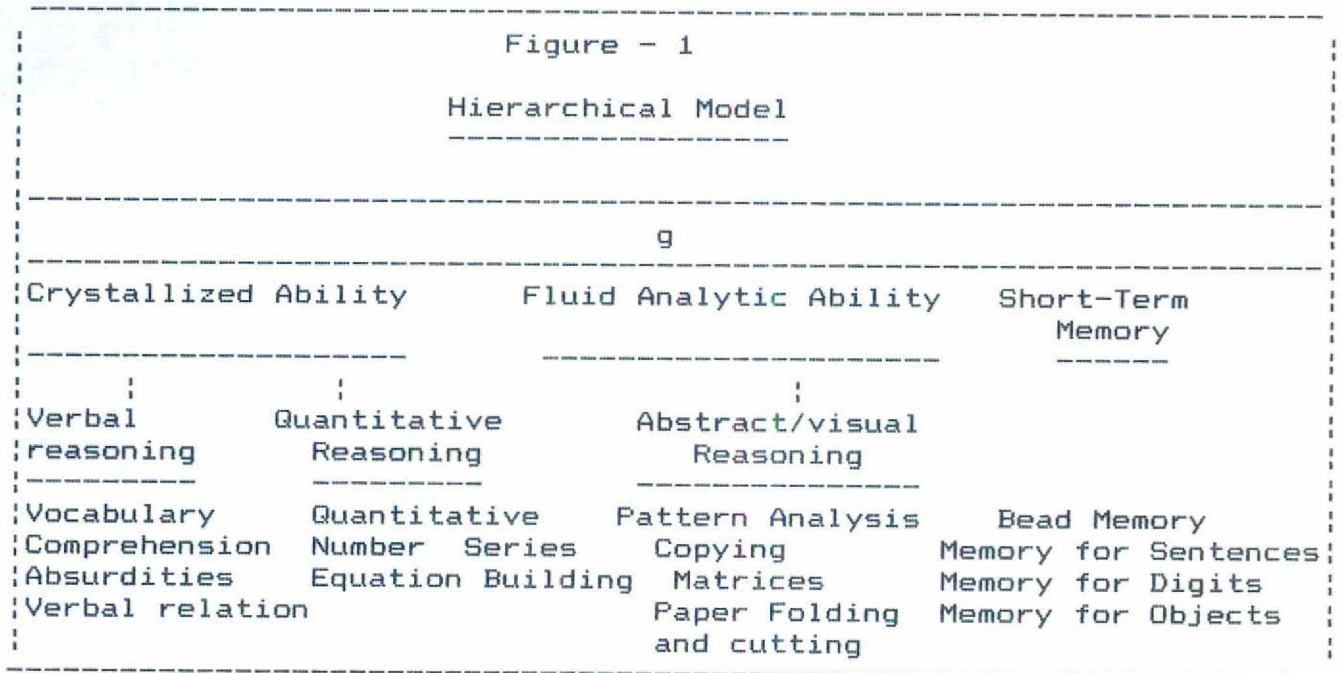
The ultimate effectiveness of the fourth edition was to help the educators and psychologists make decisions and understand students depending upon the skills of the examiner in administering and scoring the test and in observing the behaviour of the examinee during testing. The Stanford-Binet Intelligence Scale has had long held a unique place in mental measurement. The test has had a long history and tradition, and a large volume of scientific literature associated with it.

The authors of the fourth edition have strived to maintain historical continuity, but over all, the fourth edition was thoroughly a modern test in terms of content, scales and testing procedures. The authors recognized that today's assessment need required an instrument for measuring cognitive abilities that provided an analysis of the pattern as well as the over all level of an individuals cognitive development.

Therefore, they decided from the outset to abandon the "age-scale format", used in previous editions and to replace it with tests that each use a single item type. In the theoretical model of the cognitive abilities, each test was designed to measure at least on major factors.

To guide the construction of the fourth edition, the authors adopted a three--level-hierarchical model of the structure of cognitive abilities with a general reasoning factor, 'g' at the top. Three broad factors - Crystallized Abilities, Fluid-Analytic Abilities and Short-Term Memory constituted the second level. Three more specific factors verbal reasoning, quantitative reasoning, abstract/visual reasoning make up the third level. The fourth edition had 15 tests. Nine tests evolved from the item types used in the 1960 Form L-M and 6 tests were based on new item type.

The first level : General ability or 'g' is shown as the first level. The authors of the fourth edition has defined it as consisting of the cognitive assembly and control processes that an individual uses to organize adaptive strategies for solving novel problems. In other words 'g' is what an individual uses when faced with a problem that he or she has not been taught to solve (figure -1).



Cognitive-Abilities Factor Appraised in the Stanford-Binet Fourth Fourth Edition (taken from the Stanford Binet 4th edition manual)

The second level : There were three second level factors on the chart. The crystallized-abilities factors represented the cognitive skills necessary for acquiring and using information about verbal and quantitative concepts to solve problems. These abilities were greatly influenced by schooling, but they were also developed by more general experiences outside of school. The crystallized abilities factor could also be called a scholastic or academic ability factor since these verbal and quantitative skills have had high positive correlations with school achievement.

The fluid analytic abilities typified the cognitive skills necessary for solving new problems that involve figural or other non-verbal stimuli. The knowledge base necessary for this type of problem solving was acquired more from general experiences than from schooling. This factor involved the invention of new cognitive strategies or the flexible reassembly of existing strategies to deal with novel situations.

The third factor at the second level of the cognitive abilities model was short-term memory. Memory tests have always had positive correlations with total score on the Binet scales. The information processing emphasis in modern cognitive research relates short-term memory to more complex aspects of cognitive performance. According to this research short term memory serves two functions:

(1) to retain newly perceived information temporarily until it could be stored in long term memory and (2) to hold information drawn from long term memory that was being used for an ongoing task. The relationship between short-term memory and long-term memory and between memory and more complex learning and problem solving justify the inclusion of short term memory in the cognitive abilities model.

The third level: Three factors verbal reasoning, quantitative reasoning, and abstract/visual reasoning have been identified by the authors at the third level of the cognitive abilities model. These factors were more specific and more content-dependent than factors at the first and second level.

The fourth edition of the Stanford-Binet uses a wide variety of item types to assess each area of cognitive abilities in the theoretical model. Each type (e.g. vocabulary items or bead memory items) had been placed in a separate test to make administration easier and to provide for a more detailed diagnostic assessment of the examinee. Each of the 15 subtests had been designed to appraise one of the major factors in the theoretical model.

The items in the sub tests were arranged in levels designated by the letters A through Y. Each level had two items of approximately equal difficulty. In most tests, items were identified by a single-letter level; in some tests some items were identified by more than one letter. Within each test, the difficulty of the items increased as an examinee moved from a lower to a higher level. The number of levels in the tests varied. Six of the tests have had 20 or more levels and covers the entire age range from 2 to adulthood. The other nine tests have had 7 to 16 levels and had been designed to function over a narrower range of chronological ages.

The level format was adopted to facilitate adaptive testing for each examinee. In adaptive testing, the examiner adjusts the difficulty level of the test task to the ability level of the individual being tested. When the difficulty of the tasks administered is matched to the ability level of the individual being tested, examinees with poorly developed cognitive skills

are not frustrated or discouraged by having to work on tasks that are much too difficult for them. Examinees with highly developed cognitive skills were not bored by tasks that were too easy and presented no challenge to them. The fourth edition uses a pattern of adaptive testing called multistage testing. In the first stage, the examiner is given the vocabulary test that serves as a 'routing test' to determine the entry for all remaining tests. The vocabulary test has 23 levels A through W, and covers the complete age range from 2 to adult. This is used to determine the entry level. The second stage of the adaptive testing requires the examiner to establish a basal level and a ceiling level for each test administered.

With the adaptive testing format not all examinees of the same chronological age will be given the same items nor will all of them necessarily be given the same test.

Test Development In Bangladesh :

In modern times much of the success of educational system in advanced countries of the world has been due to the development of objective standardized psychological testing of abilities of students.

Need for such instruments can hardly be denied. The possibilities of education for any individual were limited by his aptitude and interest. One of the major causes of failure in schools and colleges and of low standard of achievement was due the lack of proper counseling and guidance offered to our students in the course of their education.

A successful guidance programme develops slowly and was based on the discovered needs of the students. A cumulative record system, objective tests of intelligence and specific aptitudes, use of modern technique for assessing, reporting, recording the students educational progress were basic necessities. Information required by the individuals may vary at different stages, hence appropriate and valid tests should be developed to be useful at different levels.

In order to meet the above criteria of demands and needs of students and to solve the problems of selection and admission some interested teachers and students of the Institute of Education and Research, University of Dhaka and the Department of Psychology, University of Dhaka, have attempted to develop tests for use in Bangladesh.

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Abdus Sobhan was concerned with determining the predictive validity of the translated version of the "verbal reasoning" and "numerical ability" subtests of the "Differential Aptitude Test" (DAT) in 1962. The test was administered on students of class XI. He correlated the test scores with the marks obtained by them in English, Bengali, Social Studies and Mathematics in Secondary School Certificate Examination. The scores on the Verbal Reasoning were correlated with marks obtained in English, Bengali and Social Studies and the coefficient of correlation were .17, .32 and .19 respectively. The scores on the Numerical Ability subtest had coefficient of correlation of .63 and .53 with Mathematics and Social Studies.

In 1963 Matinuddin undertook a study to determine the predictive validity of the "Verbal Reasoning" and the "Numerical Ability" subtests of the original English version and translated and adapted version of the DAT. He also compared the predictive validity of both the versions to ascertain which one could be more useful predictor of success for class XII boys. He concluded that the English version of the subtest was found to have good relationship with academic success compared to translated and adapted versions. He added that the translated version of the test was the poorest among the group as predictor of future academic success. He recommended further revision of the adapted and translated versions.

In 1964 a study was made by Azizullah to determine the item analysis of a short translated version of the "Verbal Reasoning" subtest of the "Differential Aptitude Test" for classes VIII, IX and X. The result of his study indicated that the maximum number of items that could be retained were 39, 40, 41 and 42 for classes VIII, IX, and X and for the total sample respectively. Of these retained items 31 items were common and retainable item for all the groups. He further added that the students were not accustomed to take objective type of tests and the result of the study should be considered as encouraging.

Siddique in 1965 was concerned with the adaptation of the "Verbal Reasoning" subtest of the "Differential Aptitude Test" for the then East Pakistan. The adapted version was administered to 305 class X students of Chittagong. The coefficient of correlation between Verbal Reasoning score under study and the total marks obtained in school subjects ranged from .49 to .79. He concluded that result on the adapted version had shown significant improvement over those obtained on the original version of the test.

Quazi Anwara Mansur (1965) developed Scholastic Reading Test for pre-school and early school children of the then East Pakistan. This was built on the lines of the Metropolitan Reading Test and the California Test of Mental Maturity. The author gave an initial tryout to the test and recommended its standardization.

An Analogies Test of Verbal Reasoning was developed by Ghulam Mustafa (1965). The instrument in the preliminary stage proved to be a good instrument for measuring the Scholastic Aptitude of the Higher Secondary and the College students of our country.

"Intelligence Test Scale" was administered by Nurul Islam (1963) for item analysis and selection of valid test items for the grade levels of class IX through graduation. The validity coefficient of the test came out to be .40 and reliability coefficient +.85.

Mazharul Haque (1967) developed an Individual Performance Scale of Intelligence for Children of East Pakistan of five to eleven years of age". The scales were substantially valid and reliable and could be used for measurement of intelligence.

In 1977 Sharmin Huq and others from the Department of Psychology, Dhaka University conducted a pilot study for translation, adaptation and standardization of Wechsler Intelligence Scale for Children - Revised (WISC-R) for use in Bangladesh. The Bengali version was administered on a stratified random sample of 600 school students from 6-15 years of age from all over Dhaka city. These boys and girls belonged to 15 schools of Dhaka city and 50 students were tested from each age level. In addition the test was also administered on 50 known mentally retarded children for the validity of the test. (Huq, 1980) For validation of the test, the scores were correlated with the students school final examination. The correlation between the performance scale and annual examination of the school ranged from .44 to .75. As for the full scale the correlations were between .06 to .69. The reliability coefficient was found out by the split half technique. IQ norms were developed for Dhaka city based on the scores obtained from the standardized sample. Adaptation and translation into Bengali of the Wechsler Adult Intelligence Scale WISC was also conducted by the same researchers. The Bengali version of the WAIS was administered initially on a stratified random sample of 200 subjects from ages 19-34 years in Dhaka city. In addition the test was administered on 50 rural subjects from Dhamrai and Savar. Item analysis was done on 50 subjects and then the test was administered on 400 urban and 400 rural subjects, ranging in ages from 16 to 64 years. Test-retest reliability was determined by administering the test on a sample of 50 subjects twice with an interval of 3 months. Both the reliability and validity (with school examination results) were found to be fairly high. Separate norms were developed for rural and urban samples.

Denver Developmental Screening Test (DDST) Frankenburg and Dodds, 1967) was also standardized in Bangladesh on 1100 children from birth to 6 years of age taking 50 children from each month level from 1 month to 24 months and then 50 children at 6 months interval up to 6 years. Children were selected in such a manner that they were healthy and belonged to middle class families of Dhaka city. Based on the data thus collected during 1978 to 1980 developmental norms from 1 month to 6 years were constructed and was printed on the scoring sheet for use in Bangladesh. (Ferial, 1980).

The tests so far developed for use in Bangladesh have been standardized on urban samples and were found to be inappropriate for rural population since 90% of the population in Bangladesh live in rural areas. And hence there was a dire need for more reliable and valid test of intelligence suited for rural children to be developed.

The tests that were now in use for urban children were not suitable for rural children, because these children were least exposed to any kind of educational atmosphere. Only a handful of children in the rural villages attend school and that even when they were quite grown up.

Purpose of the Present Study :

At present in Bangladesh only a handful of researchers from the Department of Psychology, University of Dhaka have developed and Standardized few intelligence tests for children. The tests so far developed here appropriate for been the urban children only.

Since the majority of the population live in the rural areas where children have no exposure to any kind of education, these tests standardized on urban children could not be applied to the rural population. As a result very low scores were obtained whenever these tests were administered on the rural children.

In order to overcome this problem and due to a need arising for conducting an epidemiological research on childhood disability it became necessary to develop a more reliable and valid intelligence test for both the rural and urban population.

In 1986 a nation wide research on "Epidemiological Study of Childhood Disability" was planned by a group of researchers in three developing countries which was a part of an international collaborative effort with the Gertrude Sergievsky Center, Columbia University, New York as the consultant.

The three countries involved were Bangladesh, Pakistan and Jamaica and the childhood disabilities to be assessed were : vision and hearing impairment, motor disability, seizures, and mental retardation.

During the planning session the investigators raised an important issue of how to diagnose mental retardation i.e. either by procuring if available in the country a reliable test or developing a reliable and a valid test which could be used both for rural and urban children simultaneously for measuring intelligence and for identifying mental retardation.

Further it was also decided that the test has to be appropriate for both rural and urban children and should be of a nonverbal type, since in rural settings most of the children do not attend school and were not exposed to any type of numerical and verbal materials.

After much discussion amongst the researchers the 1986 fourth edition of the Stanford-Binet Intelligence Scale (only the non-verbal subtests) was selected which needed to be standardized for both rural and urban children of Bangladesh. The 1986 edition of the Stanford-Binet Intelligence Scale was revised by Robert L., Thorndike, Elizabeth P., Hagen and Jerome M. Sattler. After meeting and consultation in New York with Robert Thorndike and Elizabeth Hagen personally by the supervisor of the present study and also consulting the test publisher, Riverside Publishing company it was decided that out of 15 subtests of the Stanford-Binet scale, the present study would utilize and in the process standardize 5 non-verbal subtests of the scale for use in Bangladesh.

The study while conducting a nation wide epidemiological research on childhood disability determined the validity and reliability of the 5 non-verbal subtests of the 1986 Stanford-Binet Intelligence Scale and developed norms for the rural and urban population of Bangladesh and their ages ranged from 3 to 9 years.

The following were the objectives of the present study:

1. To standardize an appropriate intelligence scale for children to be used in rural and urban areas of Bangladesh.
2. To translate, adapt and standardize 5 non-verbal tests of Stanford-Binet Intelligence Scale (1986) for use in Bangladesh for children from 3 to 9 years age.
3. To determine the reliability and validity of the 5 non-verbal tests of the Stanford-Binet Intelligence Scale.
4. To develop the test norm for Bangladesh (rural and urban) for the 5 non-verbal tests of Stanford-Binet Intelligence Scale, 1986.

CHAPTER - II

METHODS AND PROCEDURES

SUBJECTS

The present study was conducted in two phases : The pilot study and the main study.

(i) Subjects for the Pilot Study :

The five non-verbal subtests of the Stanford-Binet Intelligence Scale was initially tried out and pretested on a sample of 233 (116 children from urban and 117 children from rural area) children ranging in age from 3 to 9 years. These children were selected randomly by visiting the households from door-to-door in a village called Dhamrai, situated 45 k.m from Dhaka city. For the urban sample children were again selected randomly from play group schools and junior sections in the high schools in Dhaka city. Of the total 233 urban and rural subjects 12 children were from 3 years age level, 25 from 4 years age level, 39 were from 5 years age level, 41 were 6 years of age, 43 were 7 years of age, 37 were 8 years of age and 36 were 9 years of age. Table I gives the number of subjects tested for the pilot study phase.

Table - I

Number, Age and Sex Distribution of Children tested during Pilot Study.

Urban			Rural			
Age	M	F	Age	M	F	
3	6	6	3	-	-	12
4	6	8	4	7	4	25
5	8	11	5	12	8	39
6	8	9	6	11	13	41
7	10	10	7	9	14	43
8	8	10	8	10	9	37
9	9	7	9	10	10	36
55			59			233

Table -II and III shows the father's education, occupation and S.E.S. for urban and rural children respectively of the pretesting sample in the pilot study. There were 35.34% children from lower class, 44.82% were from middle class and 19.82 children from upper class families from urban area. There were 62.39% children from lower class and 37.60% from the middles class families in the rural area. There were however no children from upper class families from the rural area.

Table - II

Distribution showing father's education, occupation and S.E.S of the urban sample in the pilot study.

Occupation	Lower Class				Middle Class				Upper Class			
	I	P.E	S.E	H.S.E	I	P.E	S.E	H.S.E	I	P.E	S.E	H.S.E
Service	9	3		3		1	2	30				6
Business	3	2				3		5	1		1	12
Teacher								10				3
Labour	2				1							
Rick.Puller	7	2										
Vendor	5											
Carpenter	2		1									
Driver	2											

Lower Class = Monthly income Tk. 1500/- and below.

Middle Class=Monthly income between Tk.1600/ to Tk.6000

Upper Class = Monthly income Tk. 6000/- and above

I = Illiterate, P.E = Primary Education, S.E = Secondary Education.

H.S.E = Higher Secondary Education.

Table - III

Distribution showing father's education, occupation and S.E.S for the rural sample in the pilot study.

Occupation	Lower Class				Middle Class				Upper Class			
	I	P.E	S.E	H.S.E	I	P.E	S.E	H.S.E	I	P.E	S.E	H.S.E
Teacher				1			8	1				
Service	2	2	3	3			2	4				
Business	2	4		2	1	5		2				
Labour	9	4										
Rick.Puller	2	2										
Fisherman	1	4										
Farmer	9	10			5	7	1					
Boatman	5	1	1			1						
Weaver												
Goldsmith		1			2		1					
Carpenter		3	1		1	2						
Driver		1					1					

Lower Class = Monthly income Tk. 1500/- and below.

Middle Class=Monthly income between Tk.1600/ to Tk.6000/-

Upper Class = Monthly income Tk. 6000/- and above

I= Illiterate, P.E = Primary Education, S.E = Secondary Education,

H.S.E = Higher Secondary Education.

In the first phase i.e. during the pilot study the Stanford Binet scale was validated against the scores obtained in the same scale by a contrast group of known handicapped children. Stanford-Binet Intelligence Scale was administered first on twenty normal children and again administered on 20 known mentally retarded children matched in age and sex with normal children. Children of both the groups belonged to middle class urban families. Normal children were drawn from pilot study sample and handicapped children belonged to a special school named "Kalyani" in Dhaka City. The total number of subjects with their age and sex for determining validity in the pilot study has been shown in Table IV below. It needs to be mentioned that the youngest child in each group was 5 years old as it was difficult to test a mentally retarded child below that age.

Table - IV

Number, Age and Sex distribution of subjects selected for determining the contrasted group validity of the Stanford-Binet Intelligence Scale in the Pilot Study.

Age	Normal Children		Handicapped children		Total
	M	F	M	F	
5	2	2	2	2	8
6	2	2	2	2	8
7	2	2	2	2	8
8	2	2	2	2	8
9	2	2	2	2	8
Total	10	10	10	10	40

Reliability of the five subtests of the Stanford-Binet Intelligence scale was also determined during the pilot phase. In the pilot study test-retest reliability was conducted on 22 subjects on whom the Stanford-Binet was administered twice within an interval of one month to determine the reliability of the test. All the 22 children belonged to middle class urban families drawn from the pilot study sample. Table V gives the number of children tested for determining the reliability of the test during pilot study.

Table - V

Number of children with age and sex tested for determining the test-retest reliability of the Stanford-Binet Scale during Pilot Study.

Age	Subjects for the 1st and 2nd administration of the test	
	M	F
3	2	1
4	-	1
5	1	2
6	2	3
7	3	-
8	3	1
9	1	2
	12	10

(ii) Subjects for Item Analysis of the Scale :

The same 233 children of pilot study were utilized as subjects for item analysis. Item analysis of the 5 subtests of Stanford-Binet Intelligence Scale was conducted on the scores obtained by subjects from urban and rural areas. Item analysis was conducted on the scores obtained by children ranging in age from 3 to 9 years, of which 116 were from urban and 117 were from rural areas. The urban sample were selected from Dhaka city (the capital) while the rural sample were taken from Dhamrai a village which was 45 k.m from Dhaka city. The distribution of children according to age and sex with other informations have already been shown in table I, table II and table III.

(iii) Subjects for the Main Study - The Standardization Sample :

In the second phase, the main study was conducted. The subjects for the main study were selected from a nationwide ongoing research entitled : "Rapid Epidemiological Assessment of Childhood Disability" conducted on 10,300 children whose age ranged from 2 to 9 years. From this ongoing research 1357 children were drawn for the present study, on whom the five non-verbal subtests of Stanford Binet Intelligence Scale was administered for determining validity and reliability of the test and for the development of norms for use in Bangladesh. The ongoing epidemiological research was conducted on children from five areas of the four divisions of Bangladesh (Dhaka, Chittagong, Rajshahi and Khulna).

The Epidemiological research followed a two stage design. In the first stage children and their mothers were interviewed by the community workers to collect information on household, mother-child relations and disability. In the second stage all the children who were found disabled and a random sample of normal children already interviewed by the community workers (in the first stage) were medically examined by two paediatricians and psychologically assessed by two psychology graduates with Masters degree who administered the five non-verbal subtests of Stanford Binet Intelligence Scale along with three other tests, i.e. (i) Wechsler Intelligence Scale for Children-Revised (WISC-R) Bengali adapted version (which was already standardized in Bangladesh), (ii) the Denver Developmental Screening Test (DDST) adapted version and (iii) the Adaptive Behaviour Scale (which was in the process of being standardized) were also administered on the children.

Epidemiological research had selected subjects from the four divisions of Bangladesh : two urban towns (Dhaka and Chittagong) and three villages (Dhamrai in Dhaka districts, Babuganj in Barisal districts and Ulipur in Kurigram district). The selection of study sites were based on the following criteria (i) Rural/Urban (ii) Geographical area such as plain, coastal area and hilly region and (iii) Iodine deficient area.

Sampling Technique :

From each of the above mentioned study sites representative samples of 2 to 9 year old children were selected as subjects through cluster sampling method as follows :

(i) In the first step an up-to-date list of "Mohallas/Union" wise number of households within the selected study sites were prepared. These "Mohallas/Unions" were called "clusters" of households and constituted the "primary sampling unit" (PSU). The information about the number of households of selected sites were collected from the Bangladesh Bureau of Statistics (BBS) on the basis of 1981 census report. The sampling procedure was prepared by the teachers of Statistics Department of Dhaka University. After the preparation of the list of site wise number of households, 15 to 10 or desired number of "clusters" were selected systematically out of the total number of clusters (Mohallas/Unions).

(ii) In the second step for selecting children from each cluster the first household was selected at random according to the E.P.I. (Extended programme of Immunization) modified sampling technique and then house to house survey continued until required number of children per cluster were surveyed and screened (Lemeshow, 1980).

At this stage children of 2 to 9 years of age were selected according to E.P.I. method and the procedure was as follows :

- 1) The first sampling unit or household was selected from the chosen cluster at random.
- 2) The selected household was then visited to determine if there were any children living there in the target age range i.e. 2 to 9 (2-9) year olds.
- 3) If yes, required information on those children were collected.
- 4) If no, the interviewer proceeded to the next household which was physically closest to the one just visited. This procedure was continued until a house hold was found with at least one child belonging to the target age group. The process of visiting the next closest household continued until the required number of children from each cluster were interviewed.

In total from the five selected study sites 10,300 children from 2 to 9 years of age were interviewed from all the sites by the community workers in the first stage of the study. In the second stage all children who were found disabled and a random sample of normal children that is a total of 1,625 children were professionally evaluated by the doctors and the psychologists. Of 1,625 children, 1,357 were drawn for the present study who belonged to the normal random sample and whose age ranged from 3 to 9 years. The two year olds were not included in the present study as it was extremely difficult to administer Stanford Binet Intelligence Scale on these children especially on rural children. Of 1,357 children, 755 were from rural area and 602 children were from urban area.

Table VI gives the distribution of number of children screened by the community workers in the five study sites, number of children professionally evaluated and number of children selected for the present study. Table VII and VIII give the distribution of demographic data of the urban and rural samples respectively. There were 23.92% children from lower class, 50.00% children from middle class and 26.07% from upper class families of urban sample. There were 77.61 children from lower class; 19.20 from middle class and 3.18 from upper class families of rural sample.

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Table - VI

Distribution of No. of children in the on-going Epidemiological Research and No. of children selected for the present study.

Study Sites	Number of children screened by community workers	Number of children professionally evaluated	Number of children selected for the present study
Dhaka	466	358	283
Dhamrai (Dhaka)	492	434	385
Chittagong	315	275	319
Ulipur (Kurigram)	174	163	132
Babuganj (Barisal)	458	395	238
	1905	1625	1357

Table - VII

Distribution showing father's Education, Occupation and income range for the urban sample of the main study.

Occupation	Lower Class				Middle Class				Upper Class			
	I	P.E	S.E	H.S.E	I	P.E	S.E	H.S.E	I	P.E	S.E	H.S.E
Service	12	29			51	3	30	47		20		30
Business	12	24			36	50	13	27	12	27	30	16
Teacher							5	7				12
Driver	6	6			4	4	3		1			
Rick.Fuller	10	10			4							
Technician	7	4			5	4			9			
Labour	5	6	1		2	3						
Guard	3	4			3							
Vendor	4											
Farmer	1											

Lower Class = Monthly income Tk.1500/ and below.

Middle Class = Monthly income between Tk.1600/ to Tk. 6000/.

Upper Class=Monthly income Tk. 6000/- and above.

I=Illiterate, P.E=Primary Education, S.E = Secondary Education, H.S.E = Higher Secondary Education.

Table - VIII

Distribution showing fathers Education, S.E.S. and income range for the rural sample in the main study.

Occupation	Lower Class				Middle Class				Upper Class			
	I	P.E	S.E	H.S.E	I	P.E	S.E	H.S.E	I	P.E	S.E	H.S.E
Service	29	15		20	30	15	31					6
Business	18	35			28		5		1		1	12
Teacher						6	10					3
Labour	200											
Rick.Puller	100	4										
Vendor	105											
Carpenter	50											
Driver	10											
Vendor												
Farmer												

Lower Class = Monthly income Tk. 1500/- and below.

Middle Class = Monthly income between Tk. 1600/- to Tk. 6000/-

Upper Class = Monthly income Tk. 6000/ and above

I = Illiterate. P.E = Primary Education. S.E = Secondary Education.
H.S.E = Higher Secondary Education.

In addition to 1357 children drawn from the ongoing Epidemiological research for the present study, 484 children more were selected from two urban towns of Khulna and Rajshahi to make the samples more representative of the country. Subjects were drawn not from visiting households as in the epidemiological research but from schools situated in Khulna and Rajshahi towns. Before starting the work of selecting the samples from Khulna and Rajshahi towns, the first task was to collect the list of names of primary schools in these towns who were registered with the Directorate of Public Instruction (D.P.I) office. Next, 10 schools from each town were selected randomly from the list of names. These schools were visited and children from 3 to 9 years of age were selected randomly on whom the tests were administered (Stanford-Binet, WISC-R, DDST, and Adaptive behaviour Scale). Parents and teachers were contacted to obtain the socio-demographic data.

(i) In total 10 schools from each town Rajshahi and Khulna were selected to draw the subjects. (ii) From the schools thus selected a total of 484 children were drawn at random as subjects for the present study. The age ranged between 3 to 9 years and there were 248 children selected from schools in Rajshahi town and 236 children were selected from Khulna town. Table IX gives the distribution of number of subjects selected from Rajshahi and Khulna towns, and Table X gives the demographic data for the same subjects. There were 10.12 children from lower class, 52.68% children from middle class and 37.19% children from upper class families in the urban sample from Rajshahi and Khulna towns.

Table -IX

Distribution of number of children with their age and sex, selected as subjects from Rajshahi and Khulna towns of urban area.

Age	Rajshahi		Khulna		Total
	M	F	M	F	
3	18	18	15	17	68
4	18	18	17	17	70
5	18	18	17	17	70
6	18	18	17	17	70
7	18	18	17	17	70
8	17	17	17	17	68
9	17	17	17	17	68
Total :	124	124	117	119	484

Table - X

Distribution showing father's Education, S.E.S. and income range for Rajshahi and Khulna sample in urban area.

	Lower Class				Middle Class				Upper Class			
Occupation	I	P.E	S.E	H.S.E	I	P.E	S.E	H.S.E	I	P.E	S.E	H.S.E
Service	8	4			8	5	25	60		45		10
Business	4	7			10	10	10	50	2	35	40	12
Teacher							8	2		20		4
Driver	2	2			2	2	1		1			
Rick.Pullar	2	5										
Technician					4	4						
Guard	3	2			4							

Lower Class = Monthly income Tk. 1500/- and below.

Middle Class = Monthly income between Tk. 1600/- to Tk. 6000/-

Upper Class = Monthly income Tk. 6000/- and above

I= Illiterate, P.E= Primary Education, S.E= Secondary Education, H.S.E = Higher Secondary Education.

(iv) Subjects for Determining Validity of the Scale :

Intelligence. Scale was first administered on a sample of 100 subjects ranging in age from 6 to 9 years and then Wechsler Intelligence Scale for Children-Revised (WISC-R) Bengali version was administered on the same sample of children. All the 100 children were from middle class urban families drawn from the main study sample. Next the five non-verbal subtests of the Stanford-Binet Intelligence Scale was administered first on a sample of 60 subjects ranging in age from 3 to 5 years and then Denver Developmental Screening Test (DDST) was administered on the same sample of 60 children. All the 60 children were from middle and lower class families of rural area. This procedure was followed because WISC-R was applicable to children only above 6 years of age and therefore DDST was utilized for validating the test for children 5 years and below.

Finally the five non-verbal subtests were again administered on a sample of 100 subjects and then Adaptive Behavior Scale (ABS) was administered on the same sample of 100 subjects. All the 100 children were from both urban and rural families belonging to upper, middle and lower class families drawn from the main study sample. Tables XI, XII and XIII gives the distribution of subjects with their age and sex, when the three tests WISC-R, DDST and ABS were used as criterion measures for determining the validity of the five non-verbal subtest of Stanford-Binet Intelligence Scale respectively.

Table - XI

Distribution showing the number, age and sex of children selected for determining the validity of the Stanford-Binet Intelligence Scale when WISC-R scores were used as criterion measure.
(urban sample)

Age	Subjects on whom both Stanford-Binet and WISC-R was administered.		Total
	M	F	
6	12	12	24
7	13	12	25
8	12	13	25
9	13	13	26
Total	50	50	100

Table - XII

Distribution showing the number, age and sex of children selected for determining the validity of the Stanford-Binet Intelligence Scale when DDST scores were used as criterion measure.
(rural sample)

Age	Subjects on whom both Stanford-Binet and DDST was administered.		Total
	M	F	
3	10	10	20
4	10	10	20
5	10	10	20
Total	30	30	60

Table -XIII

Distribution showing the number, age and sex of children selected for determining the validity of the Stanford-Binet Intelligence Scale when ABS scores were used as criterion measure.
(urban + rural sample)

Age	Subjects on whom both Stanford-Binet and ABS was administered		Total
	M	F	
3	14	14	28
4	14	13	27
5	15	15	30
6	14	14	28
7	14	14	28
8	16	14	30
9	14	15	29
Total	101	99	200

(v) Subjects for Determining the Reliability of the Scale :

For the main study the five non-verbal subtests of the Stanford-Binet Intelligence Scale was administered twice with an interval of one month on 100 children to test the reliability of the scale. The sample was drawn from the main study and belonged to upper, middle and lower class families chosen at random. The reliability was calculated separately for urban and rural children. The total number of subjects tested in the main study for determining the reliability has been shown in Table XIV and Table XV respectively.

Table - XIV

Distribution showing number of children with age and sex tested for determining the test-retest reliability of the Stanford-Binet scale (urban sample) in the main study.

Age	Subjects for the 1st and 2nd administration of the test	
	M	F
3	6	6
4	6	7
5	8	7
6	8	8
7	7	7
8	8	8
9	7	7
Total	50	50

Table - XV

Distribution showing number of children with age and sex tested for determining the test-retest reliability of the Stanford-Binet scale (rural sample) in the main study.

	Subjects for the 1st and 2nd administration of the test	
	M	F
3	3	3
4	3	3
5	3	4
6	4	3
7	4	4
8	4	4
9	4	4
Total	25	25

(vi) Subjects for construction of the Norms :

A total of 1841 children were drawn from the main study sample ranging in age from 3 to 9 years from 4 urban towns and three rural villages who were included in the construction of norm for the five non-verbal subtests of the Stanford-Binet Scale. Two separate norms were constructed one for urban and another for rural areas of Bangladesh. Tables XVI and XVII shows the distribution of children selected as subjects for the construction of norms for urban and rural areas of Bangladesh respectively for the five subtests of the Stanford-Binet Intelligence Scale.

Table - XVI

Distribution of children showing their age and sex as selected for the construction of norm for urban area of Bangladesh.

Age	Male	Female	Total
3	58	66	124
4	67	59	126
5	80	63	143
6	98	71	169
7	106	86	192
8	81	76	157
9	100	75	175
Total	590	496	1086

Table - XVII

Distribution of children showing their age and sex as selected for the construction of norm for rural area of Bangladesh.

Age	M	F	Total
3	43	35	78
4	56	42	98
5	75	56	131
6	55	29	84
7	103	54	157
8	58	41	99
9	70	38	108
Total	460	295	755

MEASURES USED :

In the first stage of the ongoing Epidemiological study three questionnaires were used by the community workers who visited the subjects. These were (1) Household Form (HF) (2) Mother Child Form (MCF) and (3) Questionnaire on Disability : Ten Questions (TQ).

1. Household Form (HF) - was used to collect socio-demographic data from each household in which there was a child aged 2-9 years. The form included information regarding education, occupation of the head of the family, types of house, possessions and belongings like electricity, T.V, land, car, bicycle etc.

2. Mother Child Form (MCF) - all questions in this form was regarding the mother. For each set of children in the household who had the same mother, one form was filled out. Questions related to age, educational level, occupation of the mother, birth history of the child, etc. were included.

3. Questionnaire on Disability : Ten Question (TQ) - a childhood disability questionnaire was used as a screening instrument which consisted of 'Ten Questions' on various types of disability.

In the 2nd stage of the Epidemiological study for professional evaluation, one medical form and three psychological assessment procedures were applied on the subjects :

4. Medical Assessment Form (MAF) - developed by Leslie Davidson, Naila Khan, M. Thorburn and Z. Hasan in 1986 comprised of the following:- case history, observation of functions, neurological examination, general examination, anthropometric measurement, vision test and audiometry etc.

5. Psychological evaluation - included administration of three types of measuring instruments.

(a) Adaptive Behavior Scale (ABS) - developed by Shirin Z. Munir (1986) was designed to measure the age appropriate adaptive behaviour necessary to function independently in 4 areas of development (i) Motor Skills, (ii) Social Skills (iii) Communication Skills and (iv) Daily Living Skills. Each of the 4 major categories had a total of 10 sub-categories for providing precise assessment of adaptive behaviour of an individual. This scale used a four point rating procedure. The test items were sequenced in order of difficulty.

(b) Wechsler Intelligence Scale for Children - Revised (WISC-R): (was used as a criterion measure to validate the Stanford-Binet Scale) WISC-R was adapted in Bangla for use in Dhaka city. It consists of 10 subtests which are classified into a verbal and a performance scale and are administered in alternate order.

(c) Denver Developmental Screening Test (DDST) - (was utilized as a criterion measure to validate Stanford-Binet Scale) was administered on those children on whom WISC-R Bengali version could not be administered. DDST is a screening test developed by Frankenburg and Dodds (1967) and adapted for use in Bangladesh for detecting developmental delays in infancy and childhood, which consists of tests in four major areas of behaviour i.e. personal social, fine motor adaptive, language and gross motor.

(d) Stanford-Binet Intelligence Scale (fourth edition) - the 1986 revision of the Stanford-Binet by Thorndike, Hagen and Sattler was used to measure the cognitive skills of the children. Out of the 15 subtests in the present edition, present the study selected 5 non-verbal subtests as follows :

- 1) Pattern Analysis
- 2) Copying
- 3) Quantitative
- 4) Bead Memory
- 5) Memory for Digits

The subtests were selected in consultation with the authors of the test as they appeared to be less culture bound and attempted to measure the specific factors of quantitative reasoning, abstract/visual reasoning and short term memory (Figure - 2).

Figure - 2

g		
Crystallized Abilities	Fluid Analytic Abilities	Short-Term Memory
Quantitative Reasoning	Abstract/visual Reasoning	
(1) Quantitative	(2) Pattern Analysis (3) Copying	(4) Bead Memory (5) Memory for Digits.

Five non-verbal subtests that were selected for the present study and which were representative of the three broad categories of intellectual ability.

The present study utilized the data collected by administering the five non-verbal subtests of the Stanford-Binet Intelligence Scale for standardization purpose, i.e. by conducting item analysis, determining reliability and validity of the tests and developing norms for use in Bangladesh.

Description of the five non-verbal subtests of Stanford-Binet Intelligence Scale :

1. Pattern Analysis - In this subtest there were two sets of test items. First one consisted of a "Three-Hole Form Board" having three different shapes (round, square and triangle) while the second test involved nine blocks (cubes) with two colours (white and black) which were presented in two ways. For items 1 through 6, which were not timed the examinee was asked to insert pieces in three-hole form board. For items 7 through 42, which were timed the examinee used pattern cubes to replicate the examiners modes or picture stimuli. This subtest measured abstract/visual reasoning ability of the subjects.

2. Copying - This subtest consisted of two tests also :

- (a) Green blocks to make various types of geometrical design as presented by the examiner
- (b) Free hand copying of the designs presented in cards, to the child.

For items 1 through 12, the examinee duplicated the examiners block models. For items 13 to 28, the examinee copied designs in the record booklet from the stimuli. This subtest measured the abstract/visual reasoning ability of the subjects.

3. Quantitative - There were two sets of test item in this subtest. The first set involved counting of blocks (dices) and the second set consisted of arithmetic problems. For items 1 through 12, examinees matched, counted or placed in order by using the counting blocks. Items 13 to 40 were read aloud and then shown to the examinee and the examinee then solved the problems presented. This subtest measured the quantitative reasoning ability of the subjects.

4. Bead Memory - This test consisted of coloured beads (red, blue and white). The beads also varied in size and shape - some were round, some were ellipsoid, few were cone shaped and others looked like saucers. The test was presented in two ways - first a card was presented to the child and was asked to identify the colours in the pictures. In the second part the child was exposed to designs in the cards for 5 seconds and later asked to reproduce the same design of beads by beading them in a stick in front of the examinee. This test measured the short-term memory of the subject.

5. Memory for Digits - This subtest involved two sets of tests. (a) Digit forward (b) Digits reversed or backward. In this test the examiner read out a series of digits, and the examiner repeated the stimuli as directed i.e. the examinee had to recall digits he/she could remember. This test measured the short-term memory of the subject.

Translation :

Since the test used was all non-verbal and the subject's task was to perform various activities with simple coloured blocks and shapes, pictures, pencil and paper, the need for translation and adaptation was not necessary. Only the original test instructions were directly translated into Bengali. The instruction section of the five subtests of the Stanford-Binet Intelligence Scale therefore was translated into Bengali. The translation was done under the supervision of the supervisor of the present study and few other teachers of the Department of Psychology, University of Dhaka.

Scoring - The fourth edition of the Stanford-Binet Intelligence Scale has been designed to make maximum use of the principles of adaptive testing. The central principle of adaptive testing was to focus as quickly and as efficiently as possible on tasks most closely suited to the examinees ability level.

In accordance with the manual of Stanford-Binet Intelligence Scale (fourth edition) the scoring was quite straight forward. There was only one correct answer for each item which was given on the record booklet. The examiner only needed to record the examinees response whether it was a pass or fail by making a circle in 'P' or 'F' in the record booklet. When the child scored three consecutive 'F' in two levels the examiner stopped the test and went on to the next subtest.

Each individual child was administered the five subtests and each subtest has a separate raw score. These raw scores were then converted to Standard Age Score (SAS) and Area Standard Age Score (Area SAS). The five subtests which the present study utilized belong to the three broad categories or areas such as (i) Crystallized Abilities (ii) Fluid Analytic Abilities (iii) Short-Term Memory. The Area SAS were finally converted to Partial Composite Standard Age Score (PCSAS). The partial by adding the three area SAS and then converting it to composite SAS.

PROCEDURE

(i) Procedure for the pilot study :

The 233 subjects for the pilot study were chosen from both rural and urban settings. 117 rural children were drawn from Balitha and Beleswar of Sutipara Union of Dhamrai Upazila 45 k.m. from Dhaka city. The Maternity Health Center was utilized as the testing center. Children were brought along with their mothers for testing. Each child was tested individually and a short case history was taken from the mothers. 166 children from the urban setting were selected from three schools and one play group of Dhaka city, having upper and middle income level (parents income) and one school for the slum children with parental income at lower economic level. The reliability of the test was determined by administering the test on 22 subjects twice after an interval of one month. Contrasted group validity of the test was determined by administering the test on 20 normal children and again administering the test on 20 known mentally retarded children (selected from "Kalyani" a special school for the mentally and physically handicapped children) after matching them in age and sex with the normal children.

Meeting and Consultation with Dr.Elizabeth Hagen :

While administering the 5 non-verbal subtests of the Stanford Binet Intelligence Scale during the pilot study as tryout and pretesting it was found that the children were facing problems with the test items i.e. the items were quite unfamiliar, for which the scores were very low. This occurred more when the test was administered on the rural sample, as the children were not exposed to, or were not acquainted with such materials. Most of the children did not attend school and therefore had problem in naming colours and shapes of the beads, solving arithmetic problems and making patterns.

To overcome this problem and to increase the scores of the test, one of the authors of the Fourth edition, Dr.Elizabeth Hagen was consulted personally by the supervisor of the present study, whom she met in New York by the courtesy of Dr. Zena Stein of Columbia University. After scrutinizing the results of the pilot study Dr. Hagen suggested that before the beginning of each subtest children need to be given a brief training to make them familiar with the test which could require several trials. She also suggested that the pretest trials given before each subtest itself needed to be standardized; i.e. the trials needed to have the same procedures for all children to be later tested by the scale.

For each subtest children were given 2-3 trials as pre-test training before the actual administration of the scale. The five subtests of the Stanford-Binet were again tried out on 50 (25 urban and 25 rural) children with pre-training trials before each subtest for standardizing the instructions. Tryouts resulted in better understanding of the test items and an increase in the overall scores for all age groups among urban as well as rural children.

Item Analysis :

With the scores of the tests of the 233 subjects of the pilot study a detailed item analysis was conducted to find the "discriminative index" and "difficulty index" of each item in the five non-verbal tests of the Stanford Binet Intelligence Scale. Based on the results of item analysis the test items were rearranged according to the difficulty level.

(ii) Procedure for the main study :

For the main study the subjects were drawn from an ongoing research entitled "Rapid Epidemiological Assessment of Childhood Disability in Bangladesh". 6 community workers, 2 health workers and 2 clinic assistants were hired in each site and thorough training was given on the survey questionnaires i.e. Household Form, ((HF) Mother-Child Form (MCF) and Ten Questions (TQ). Trial interviews were conducted by the community workers using the three survey forms.

Paediatricians and psychology graduates with Masters degree were also hired and trained in using the Medical Assessment Forms (MAF) and administration of psychological tests (Stanford-Binet Scale, WISC-R, DDST and ABS).

The first survey was made by the community workers (C/Ws) of the randomly chosen clusters in order to locate the households with the target children 2 to 9 years of age. The C/Ws administered the three questionnaires : Household-Forms, Mother-Child Form and Ten Questions. Following the E.P.I sampling method the survey continued until desired number of children of target age, in each cluster were interviewed. On each day on an average 50 households were surveyed. It took about 7-8 hours daily work. Children who would be professionally evaluated i.e. all the disabled children screened and a random sample of normal children were listed. The addresses, names of the children, the names of the head of households were written down immediately. On the following day 2 health workers visited the households of these listed children (to be evaluated by the professionals) and requested their parents to bring them to the center for medical and psychological evaluation. Daily 8 children on an average were brought to the center along with their parents.

Each day after completing the professional evaluation of all children, consensual diagnostic evaluations were made among the paediatricians and psychologists based on the results of Stanford-Binet Intelligence Scale, Adaptive Behaviour Scale and Medical Assessment Form (MAF).

For the purpose of the present study the Stanford-Binet Intelligence Scale scores of the five non-verbal subtests as obtained by all the subjects in the normal random sample and also diagnosed by the professionals as normal children were collected. When these children came to the center for professional evaluation, along with the Stanford-Binet Scale, ABS was administered on 3 - 9 year old children, WISC-R was administered on 6 to 9 year old normal children and DDST was administered on 3 to 5 year old normal children.

In Rajshahi and Khulna town, the HF and MCF were administered on parents, while Stanford-Binet, ABS, DDST and WISC-R were administered on children who were selected for the present study by the psychology graduate with Masters degree.

Computation of Scaled Scores and Norms -

An important step in standardization of a test is the establishment of norms. Without norms, test scores cannot be interpreted. Psychological tests have no predetermined standards of passing or failing. An individuals score can be evaluated only by comparing it with the scores obtained by others. As its name implies, a norm is the normal or average performance. In the present study age norm was calculated for the five subtests of Stanford-Binet Scale.

Raw scores on a test typically have little meaning. It is therefore necessary to convert raw scores to a standard scale so that scores on different tests and scores of different age groups can be compared.

By following the original Stanford Binet Intelligence Scale manual of the fourth edition (1986), the raw scores of each subtests were converted into normalized standard scores. Following procedure was followed in accordance with the original manual to convert raw scores into standard scores :- (i) The weighted mean and standard deviation was calculated for the five subtests separately of Stanford-Binet Intelligence Scale administered on urban and rural children of Bangladesh. The means were close to 50 and the standard deviation were close to 8, based on which the subtest raw score were converted into normalized standard age scores (SAS). (ii) The weighted means and standard deviations were also calculated for scores on each Area and total composite score obtained by the Bangladeshi children. The means were close to 100 and standard deviations were close to 16, based on which normalized Partial Composite Age Scores (PCSAS) were calculated for Bangladeshi children. Partial composite scores were taken because the present study was on five subtests of the total fifteen subtests of original Stanford-Binet Scales (fourth edition).

In order to construct the local age norm from the raw scores the following steps were applied to convert the raw scores to Standard Age Scores (SAS) and the to Area Standard Age Score (Area SAS) and finally Partial Composite Standard Age Scores (PCSAS).

(a) Conversion of raw scores to SAS :-

For the above calculation the following steps were followed:-

In the first step frequency distributions were made for each age group and each subtest separately. Later mean and standard deviation was calculated with the raw scores.

The next step was to find out the small 'z' for each individual raw scores and the formula was :

$$z = \frac{X - \bar{X}}{SD}$$

where

X = Raw Score

$\bar{X}$ = Mean of the raw scores.

SD = Standard deviation derived from the raw scores.

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Finally the big 'Z' was calculated with each individual small 'z' scores. In this computation the weighted mean and standard deviation were applied which was set at 8 and 50 respectively. The formula was as follows :

$$Z = Sz + M$$

S = Weighted Standard Deviation
 z = Small z scores.
 M = Weighted Mean.

(b) Conversion of SAS to Area SAS :-

For the calculation of Area SAS a frequency distribution was again calculated with the sum of subtest SAS. Further again small 'z' and big 'Z' were calculated as before for each area SAS. The weighted area mean and standard deviation were applied to calculate the big 'Z' which were set at 100 and 16 respectively.

(c) Conversion of Area SAS to Composite SAS :-

The sum of the three Area SAS were again calculated to find out the mean and standard deviation and as before the small z and big Z were calculated. The weighted area mean and standard deviation were again applied which was set at 100 and 16 respectively for the calculation of composite SAS.

Computation of validity and reliability

Following procedures were followed in computing the validity and reliability of the Stanford-Binet Intelligence Scale in the pilot study and main study.

1. Contrasted Group Validity :

Anastasi states, "in the validation of an intelligence test the scores obtained by institutionalized mentally retarded children may be compared with those obtained by school children of the same age" when referring to validation by contrasted groups. (Anastasi, 1976; p 144). For the pilot study the validity of the test was determined by contrasted group method.

The following 't' test formula for unmatched group was applied to determine contrasted group validity :

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{SS_1 + SS_2}{n_1 + n_2 - 2} \left(\frac{1}{n_1} + \frac{1}{n_2} \right)}}$$

Where

$\bar{X}_1$ = mean of normal group I,
 $\bar{X}_2$ = mean of handicapped group II
 n_1 = number of cases in group I
 n_2 = Number of cases in group II
 ss_1 = Sum of squares of deviations from $\bar{X}_1$
 ss_2 = Sum of squares of deviations from $\bar{X}_2$

2. Criterion - Related Validation- Concurrent Validity :

In the main study the validity of the Stanford-Binet Intelligence Scale was determined by criterion related validity applying concurrent validity method. This validity indicated the effectiveness of a test in predicting an individual's behaviour in specified situations. For this purpose the performance on this test is checked against a criterion i.e. a direct and independent measure of that which the test is designed to predict. Again in concurrent validity procedure the criterion measure against which test scores are validated may be obtained at approximately the same time. (Anastasi, 1976). In the present study the three criterion measures WISC-R, DDST and ABS were administered approximately at the same time as the Stanford-Binet Intelligence Scale.

Pearson's Product Moment co-efficient of correlation formula was applied :

$$r = \frac{\sum XY - [(\sum X)(\sum Y)/N]}{\sqrt{\sum X \frac{(\sum X)^2}{N} \sum Y \frac{(\sum Y)^2}{N}}}$$

where :

- r = Correlation coefficient
- $\sum X$ = Sum of all scores in variable X
- $\sum Y$ = Sum of all scores in variable Y
- $\sum X^2$ = Square each X score and sum squared scores
- $\sum Y^2$ = Square each Y score and sum squared scores
- X = Variable of one characteristic
- Y = Variable of other characteristic
- N = Number of children

3. Test-Retest Reliability :

Test-retest reliability was computed both for the pilot study and the main study to determine the reliability of the Stanford-Binet Scale. The most common method for finding out reliability of test scores is by repeating the identical test on a second occasion. The reliability coefficient in this case is simply the correlation between the scores obtained by the same persons on two administration of the test. Retest reliability shows the extent to which scores on a test can be generalized over different occasions, the higher the reliability, the less susceptible the scores are to the random daily changes in the conditions of the subject or of the testing environment (Anastasi, 1976)

Pearsons Product Moment Formula was applied to determine test-retest reliability (earlier mentioned).

4. Kuder-Richardson Reliability :

The most common procedure for finding item consistency was that developed by Kuder Richardson (1937). This technique was based on a single administration of the test and an examination of performance on each item. The Kuder-Richardson-20 formula was applicable to tests whose items were scored right or wrong. The reliability was calculated

Kuder Richardson Formula 20 :

$$r_{tt} = \left(\frac{n}{n-1} \right) \frac{SD_t^2 - \sum pq}{SD_t^2}$$

where

r_{tt} = reliability estimate

n = is the number of items in the test.

SD_t^2 = is the standard deviation of the total score on the test.

p = proportion of the persons who passes.

q = proportion of the persons who fails.

pq = the product of p and q is computed for each item and these products are then added for all the items to give $\sum pq$

RESULTS

CHAPTER - III

Pilot Study :

The five non-verbal subtests of the Stanford-Binet Intelligence Scale was administered on 233 children from both urban and rural settings for tryout and pretesting in the pilot study. The raw scores obtained by each subject in all the five subtests were converted to Standard Age Score (SAS) and then to Area Standard Age Scores (Area SAS) and finally to Partial Composite Standard Age Score (PCSAS) following the procedure explained in the method chapter. Table XVIII and XIX gives the raw scores obtained by the subjects of the pilot study in the five subtests of the Stanford-Binet Intelligence Scale and for urban and rural samples separately.

With the raw scores thus obtained from the five subtests of the Stanford-Binet Intelligence Scale separate mean and standard deviations were calculated for urban and rural samples, Tables XX and Table XXI shows the mean and standard deviations obtained by each age and in each subtests respectively.

Table - XVIII

Raw scores obtained by the subjects in the five subtests of Stanford-Binet Intelligence Scale for urban sample by age in the pilot study.

	Quantitative								Pattern Analysis								copying								Bead Memory								Memory for digits							
sub ject	3	4	5	6	7	8	9	3	4	5	6	7	8	9	3	4	5	6	7	8	9	3	4	5	6	7	8	9	3	4	5	6	7	8	9					
1	0	0	12	12	14	11	15	1	2	12	16	12	6	8	0	2	13	5	9	3	8	0	0	13	13	7	12	7			2	2	4	2	5					
2	2	6	4	2	19	15	18	2	8	2	3	18	28	0	1	6	4	3	14	3	19	3	9	8	4	22	20	8			1	1	8	6	2					
3	5	0	13	0	11	16	12	8	1	15	2	9	21	15	4	3	15	3	8	6	5	6	3	5	3	11	5	10			6	0	0	3	4					
4	12	12	3	5	4	19	13	11	3	2	8	12	15	13	7	3	4	6	8	5	6	13	4	6	5	5	13	6			4	2	2	6	2					
5	8	7	4	14	15	0	17	13	10	7	14	9	1	26	8	5	6	19	8	3	0	9	5	6	7	5	4	16			0	7	4	2	2					
6	1	13	13	15	0	16	15	2	10	11	0	12	24	29	0	12	7	19	7	25	22	5	2	7	16	21	20	15			6	8	11	10	2					
7	0	9	5	14	16	17	5	2	15	14	14	26	23	22	0	8	6	7	9	20	5	0	9	14	8	19	16	6			6	5	9	7	9					
8	1	5	16	17	16	14	20	2	6	21	0	0	16	18	3	1	8	14	21	23	23	3	7	15	8	23	18	18			6	5	9	7	9					
9	4	0	11	16	16	10	16	4	1	25	14	24	14	17	3	0	20	18	20	8	19	5	5	18	13	10	8	15			10	7	8	2	2					
10	7	6	17	14	5	21	13	14	2	16	25	11	24	13	8	5	26	26	12	24	11	9	0	19	18	19	26	9			8	9	4	13	3					
11	3	5	17	16	0	14	13	2	7	19	27	21	11	11	6	3	23	8	27	6	15	6	10	19	15	20	6	12			8	12	10	4	2					
12	0	12	12	9	15	12	15	2	7	11	11	23	17	22	9	6	7	13	19	12	9	2	3	6	17	13	12	20			3	13	15	2	8					
13		0	8	14	14	15	0		13	4	23	19	22	23		3	6	18	20	17	2		0	13	16	5	18	22			3	10	9	11	8					
14			7	14	19	13	19		2	9	18	17	17	21		7	16	21	21	19	25		4	13	7	7	12	17			1	6	5	9	11					
15			3	17	0	14	15			0	21	21	13	24			1	19	12	5	14			3	6	6	9	13			0	5	5	3	2					
16		0	16	9	3					7	22	12	5				3	20	15	2			13		14	5					0	5	3	2						
17			16	12	8	11				10	7	10	10				14	9	4	3			15			11					7	7	3	1						
18			17		5	12				23		7	10				21		3	4			7			7					6		1	2						
19			14		12	15				19		8	21				10		8	13						8					9		2	2						
20					14							22							18														4							

Table - XIX

Raw scores obtained by the subjects in the five subtests of Stanford-Binet Intelligence Scale for rural sample by age in the pilot study.

	Quantitative								Pattern Analysis								copying								Bead Memory								Memory for digits							
sub ject	3	4	5	6	7	8	9	3	4	5	6	7	8	9	3	4	5	6	7	8	9	3	4	5	6	7	8	9	3	4	5	6	7	8	9					
1		3	9	0	12	11	12		8	2	2	33	2	7		3	3	3	13	1	13		5	0	5	7	4	5			0	0	3	2	2					
2		9	7	6	4	14	17		12	8	7	3	16	14		12	2	6	3	4	17		6	6	6	1	7	11			0	2	0	6	3					
3		4	4	12	14	19	16		6	7	3	2	3	17		4	4	4	4	8	23		6	3	4	5	7	13			4	2	5	2	8					
4		12	2	0	13	13	12		3	3	4	14	26	7		13	4	9	16	7	13		4	4	3	10	8	9			2	7	5	2	2					
5		9	5	5	11	3	12		15	9	8	8	0	14		12	4	6	2	0	4		9	5	8	8	6	9			0	1	6	3	8					
6		5	13	13	17	5	16		1	15	8	22	2	16		1	17	2	26	0	19		5	13	4	14	5	15			4	2	6	2	6					
7		2	3	5	12	17	12		0	6	2	21	15	3		1	6	3	20	18	5		0	6	2	12	8	6			0	2	5	8	3					
8		0	1	3	19	14	16		2	7	1	21	25	23		3	4	1	27	8	7		0	5	1	17	8	18			1	2	10	4	8					
9		0	0	17	4	17	25		2	0	13	3	12	22		3	1	14	2	8	28		0	1	8	0	7	17			2	5	3	8	20					
10		0	2	3	6	15	22		1	3	10	3	8	23		3	5	2	2	20	26		1	5	2	0	8	20			2	2	2	11	17					
11		3	0	14	5	16	18		2	0	12	9	24	23		1	1	6	4	25	24		1	0	10	1	20	22			1	4	2	3	11					
12			0	5	13	21	15		7	7	3	7	25	9			2	4	6	26	1			1	2	5	13	5			2	1	2	8	5					
13			2	15	5	15	5		2	2	12	5	18	10			2	8	3	6	8			0	8	4	7	9			3	5	2	3	2					
14			5	13	2	17	16		2	7	8	10	15	10			4	7	2	17	6			0	6	7	15	7			2	4	2	5	5					
15			10	2	5	2	13		2	2	3	11	16	9			2	3	1	16	7			6	0	6	16	8			3	1	2	4	3					
16			11	3	13	7	14		18	2	1	1	18	14			1	3	4	18	5			3	0	6	12	7			0	3	2	7	4					
17			0	8	6	5	13		9	2	2	3	8	11			1	4	3	8	9			0	3	4	6	15			0	2	2	1	2					
18			18	13	6	12	9		3	18	7	1	14				18	6	6	4	2			15	7	6	8	0			4	1	1	5	3					
19			11	6	10	13	11			9	2	0	11				17	2	4	15	4			3	3	7	8	11			2	3	1	2	5					
20			0	10	13		12			3	3	14					3	2	6	6	16			4	2	5		7			2	0	5		5					
21				1	19						3	10						3	9						3	14						2	4							
22				12	15						21	12						8	14						7	10						3	3							
23				10	11							10						2	9						3	8						4	4							
24				7														7							6								8	7						

Table - XX

Mean and standard deviation of the raw scores for the five subtests of Stanford - Binet Intelligence Scale obtained by subjects in the pilot study (Urban sample).

Age	Pattern Analysis			Copying		Quantitative		Bead Memory		Memory for Digits	
	N	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
3	12	4.00	4.00	3.83	3.38	3.33	3.70	5.08	3.71	-	-
4	14	6.21	4.42	4.28	2.96	6.28	4.81	5.21	3.46	-	-
5	19	11.63	7.33	10.94	7.20	9.26	6.00	10.10	5.43	4.31	3.30
6	17	13.23	18.55	13.12	6.75	12.47	5.15	10.88	4.70	5.76	3.32
7	20	14.65	6.71	13.85	6.64	10.85	6.38	12.6	6.35	5.45	3.78
8	19	15.68	7.98	10.58	7.98	13.05	4.80	12.11	5.97	4.58	3.68
9	15	16.13	8.20	13.47	7.54	13.07	5.46	12.93	5.14	4.87	3.40

The subtest memory for digits was not administered on children aged 3 and 4 years because the test begins from 5 years age level.

Table - XXI

Mean and Standard deviation of the raw scores for the five subtests of Stanford-Binet Intelligence Scale obtained by subjects in the pilot study (rural sample).

Age	N	Pattern Analysis		Copying		Quantitative		Bead Memory		Memory for Digits	
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
3	11	-	-	-	-	-	-	-	-	-	-
4	20	4.72	4.73	4.90	4.42	4.72	4.13	3.54	3.05	-	-
5	24	5.6	4.62	5.05	5.34	5.6	5.49	4.00	3.99	1.7	1.38
6	23	6.29	4.80	4.79	2.96	7.63	5.01	4.08	2.81	2.75	1.96
7	19	9.70	8.10	8.30	5.04	10.13	5.00	6.82	4.40	3.52	2.28
8	19	13.58	7.99	10.89	7.71	12.42	5.38	9.11	4.05	4.89	2.80
9	20	12.8	6.31	11.85	8.27	14.3	4.26	10.7	5.51	6.1	4.81

The 3 year olds were difficult to test with the Stanford-Binet especially in the rural areas. The subtest memory for digits begin from the age of 5 years.

The PCSAS was also calculated separately for each age group and for both the rural and urban sample. Table XXII shows the total number of children in each age group and their corresponding mean and standard deviation obtained by the PCSAS by administering the five non-verbal subtests of Stanford-Binet Scale on urban and rural samples in the pilot study.

Table - XXII

Mean mean and Standard deviation of PCSAS obtained in the five subtests of Stanford-Binet Intelligence Scale by the urban and rural subjects in the pilot study.

Age	Urban			Rural			Total Rural + Urban		
	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD
3	12	101.83	23.02	-	-	-	12	101.83	23.02
4	14	92.35	17.75	11	63.45	17.46	25	79.63	22.63
5	19	105	24.44	20	71.9	17.76	39	88.02	22.86
6	17	94	22.69	24	63.20	15.99	41	75.95	24.28
7	20	91.35	20.94	23	56.13	8.85	43	72.51	23.56
8	19	84.54	24.03	19	65.73	15.52	38	75.15	22.11
9	20	78	24.88	20	61.5	10.29	35	68.4	19.63

3 year olds were not included in the rural sample of pilot study as it was difficult to administer the test on these children.

Determination of Validity in the Pilot Study :

During the pilot study the five subtests of the Stanford-Binet was validated against a contrast group of known handicapped children matched in age and sex with the normal group of children of 3 to 9 years of age. 't' was computed between PCSAS scores of both the groups. Table XXIII gives the PCSAS scores obtained by the two groups separately by age and sex.

Table - XXIII

PCSAS scores obtained by the subjects in the two contrast groups for determining the validity in the pilot study.

PCSAS scores of Handicapped children			PCSAS scores of Non-Handicapped children	
Age	Male	Female	Male	Female
5	29	36	80	72
	30	38	100	84
6	40	49	84	83
	34	37	80	129
		38		78
7	45	43	104	92
	39	43	82	93
		38		103
8	40	46	108	84
	33	36	96	94
		43		72
9	36	49	104	104
	33	42	93	100

It was difficult to administer the Stanford-Binet Scale on handicapped children who were 3 to 4 years old.

't' test was computed between PCSAS scores of both the groups. Table XXIV gives the mean, SD and 't' test result computed between the contrast group of children with the PCSAS scores of the five subtests of Stanford-Binet.

Table - XXIV

Mean, SD and the 't' value obtained between PCSAS scores of handicapped and normal children in the pilot study to determine contrasted group validity of the test.

Types of sample	N	Mean	SD	't'
Normal	22	92.47	13.23	16.86 *
Handicapped	22	38	7.60	

* $P < .001$

Determination of Reliability in the Pilot Study :

The next step involved was to judge the reliability of the test. 22 children who were tested earlier were again tested for the second time with a gap of one month. These children were selected randomly from the total sample. The Pearsons Product Moment coefficient of correlation formula was employed on the PCSAS scores to determine the test-retest reliability of the five subtest of Stanford-Binet Scale in the pilot study. Table XXV gives PCSAS scores of the subjects in 1st and 2nd administrations of the test and the test-retest reliability coefficient.

Table - XXV

PCSAS scores obtained by the subjects and coefficient of correlation between 1st and 2nd administration of the 5 subtests of Stanford-Binet Intelligence Scale.

Child number	Test	Re-test
1	114	108
2	77	87
3	98	89
4	128	123
5	80	70
6	106	126
7	126	128
8	115	96
9	96	110
10	121	127
11	113	111
12	104	128
13	104	92
14	90	85
15	89	93
16	150	153
17	65	63
18	69	76
19	127	122
20	97	118
21	119	97
22	100	110

Coefficient of correlation was found to be .81

Item Analysis :

After the completion of the work of pilot study and before going into details of further administration and statistical analysis of the results of the five non-verbal subtests of Stanford-Binet Scale a detailed item analysis was carried out in order to scrutinize the strengths and weaknesses of each test item. Examination of each item was done in terms of (i) Difficulty Index (ii) Discriminating Index. Item analysis was computed on the scores obtained by 116 urban and 117 rural subjects drawn from the pilot study for all the five subtests of Stanford-Binet Intelligence Scale. Item analysis results have been included in Appendix 'A'. Appendix A consists of the following tables:

- A(i) Difficulty index of the five subtests of Stanford-Binet Intelligence Scale for urban sample.
- A(ii) Difficulty index of the five subtests of Stanford-Binet Intelligence Scale for rural sample
- A(iii) Table showing the re-arranged items of the five subtests of Stanford-Binet Intelligence Scale (urban sample)
- A(iv) Table showing the re-arranged items of the five subtests of Stanford-Binet Intelligence Scale (rural sample).

Difficulty Index :

The item difficulty was found out by calculating the 'p' which was determined by the total number of individuals who passed each item divided by the total number of individuals who attempted the item. The level of difficulty of an item focuses on the proportion of students who correctly answer an item. The higher the proportion the easier the item. On the other hand as the item gradually becomes more difficult the proportion of answering an item correctly becomes lower. By examining items in this manner, tester can identify items that are (i) more discriminating (ii) more functional and (iii) less ambiguous.

The difficulty index for the urban sample ranged between .99 to .004 for 'Pattern Analysis' subtests, it was .98 to .005 for 'Copying' subtests; .67 to .008 for 'Quantitative' and .79 to .009 for 'Bead Memory' subtests (See Appendix Ai).

On the other hand the difficulty index for rural sample ranged between .55 to .001 for 'Pattern Analysis' subtests, it was .54 to .07 for 'Copying', .42 to .008 for 'Quantitative' and .48 to .005 for 'Bead Memory' (See Appendix - Aii).

Discriminating Index :

The extent to which items separate individuals into two extreme groups is called the discriminating index. The purpose of this index is to provide a measure that would separate each child into upper and lower groups and depends on the extent to which items discriminates group differences.

For the present study, discriminating index was determined on the basis of Partial Composite Standard Age Score (PCSAS) obtained by each individual subjects. PCSAS is a standard score expressing the mental age level of the child.

Discriminating index was determined on the basis of the calculation of PCSAS of the subjects in the present study. The PCSAS of each child were arranged in order of highest to lowest scores to find out the percentile, to select the upper and lower 33 percent for calculating the 'D'. This was done for the rural and urban children separately by age.

The results of item analysis indicated that the range of discriminating index was 1.9 to 100 while difficulty index was .01 to 1.00. As the discriminating index for all the items were within this range it was decided not to eliminate or substitute any of the items of the test. The result however of the difficulty index was utilized for reorganizing and rearranging the items of the subtest in order of difficulty i.e. from easy to difficult items for further administration for determination of reliability, validity and to construct and develop the norms for children from rural and urban areas of Bangladesh.

Main Study :

After rearranging the items of each of the five subtests of Stanford-Binet Intelligence Scale on the basis of the results of item analysis in the second phase of the study, subtests of the Stanford-Binet Intelligence Scale were administered on samples of children both from rural and urban areas of Bangladesh to determine validity, reliability and construction of norms. The five subtests were administered on 1841 subjects (1086 urban and 755 rural sample) ranging in age from 3 to 9 years. These samples were from 4 towns (Dhaka Chittagong, Rajshahi and Khulna) and 3 rural villages (Dhamrai, Dhaka District, Babuganj, Barisal District and Ulipur Kurigram District) of Bangladesh.

Determination of validity :

The five subtests of the Stanford-Binet Intelligence Scale was validated against the following criterion measures:

- (a) Adaptive Behaviour Scale (ABS)
- (b) Wechsler Intelligence Scale for Children-Revised (WISC-R) Benglali version.
- (c) Denver Developmental Screening Test (DDST) adapted version.

The scores obtained from the above three criterion measures were correlated with the PCSAS scores obtained from the five subtests of the Stanford-Binet Intelligence Scale.

The PCSAS score along with the scores from the three criterion measures have been included in Appendix B. The following Tables are given in Appendix B :

- B(i) Table showing the PCSAS scores of Stanford-Binet and ABS for determining the validity.
- B(ii) Table showing the PCSAS scores of the Stanford-Binet and WISC-R Full Scale Scores for the determination of validity.
- B(iii) Table showing the PCSAS Scores of the Stanford-Binet and DDST used for the determination of validity.

Table XXVI shows the co-efficient of correlation between the five subtests of Stanford Binet PCSAS and the three tests used as criterion measures for determining the validity of the scale.

Table - XXVI

Table showing the validity coefficient between the three tests and the PCSAS scores of the five subtests of Stanford Binet Scale.

Correlation computed	r
Stanford-Binet Vs Adaptive Behaviour Scale	.71
Stanford-Binet VS Wechsler Intelligence Scale for Children Revised (Bengali version)	.66
Stanford - Binet VS Denver Developmental Screening Test.	.57

Determination of Reliability :

The reliability of the five non-verbal subtests of Stanford-Binet Intelligence Scale was calculated by the following method.

- (1) Kuder - Richardson Reliability, Formula 20 (KR 20)
- (2) Test - Retest Reliability.

Kuder-Richardson Reliability (KR 20) :

The reliability was calculated separately for each subtest and for each age. Table XXVII gives the interitem consistency of the five subtests and for each age separately for the sample from Bangladesh.

Table - XXVII

Kuder-Richardson Formula - 20 Indices of Internal Consistency of the five subtests of Stanford - Binet (sample from Bangladesh).

Age	Pattern Analysis		Copying		Quantitative		Bead Memory		Memory for Digits	
	KR-20	SD	KR-20	SD	KR-20	SD	KR-20	SD	KR-20	SD
3	.74	3.2	.72	3.04	.61	2.1	.68	2.01		
4	.71	3.0	.75	4.17	.68	2.03	.66	1.93		
5	.66	2.09	.73	4.91	.68	2.31	.71	3.23	.59	1.34
6	.69	2.18	.75	4.16	.71	3.92	.74	3.26	.58	1.93
7	.63	2.01	.80	3.06	.70	3.82	.76	4.31	.63	2.33
8	.68	1.91	.81	4.03	.76	4.23	.81	3.5	.68	2.9
9	.73	4.98	.82	4.93	.69	3.74	.78	4.6	.70	4.4

As a comparison Table XXVIII gives the interitem consistency calculated on children from United States (Stanford-Binet, 4th ed., 1986)

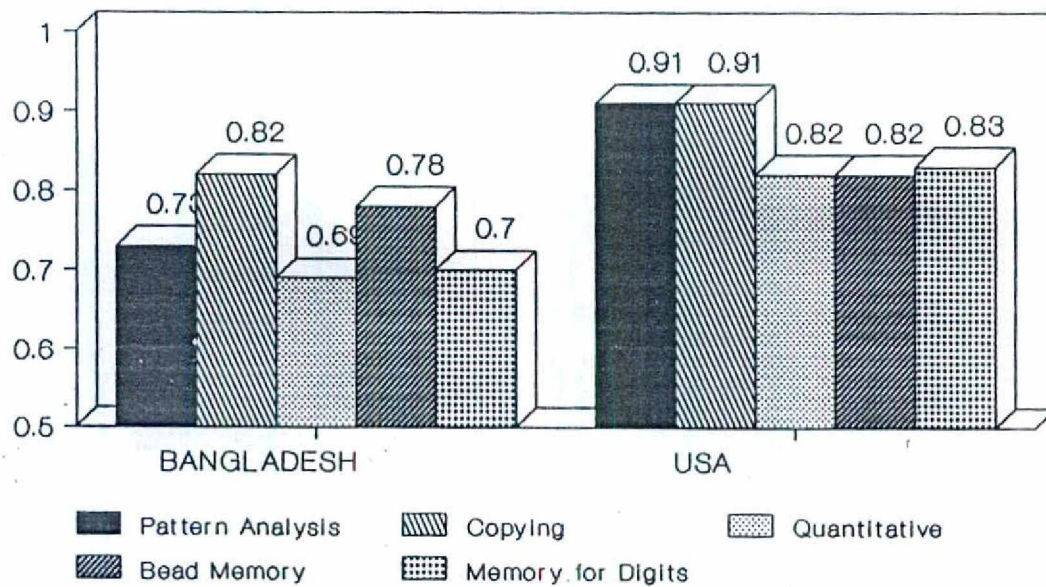
Table -XXVIII

Kuder-Richardson Formula -20 indices of Internal consistency of the 5 subtests of Stanford-Binet (sample from United States).

Age	Pattern Analysis		Copying		Quantitative		Bead Memory		Memory for Digits	
	KR-20	SD	KR-20	SD	KR-20	SD	KR-20	SD	KR-20	SD
3	.81	3.5	.81	3.5	.84	3.2	.88	2.8		
4	.85	3.1	.88	2.8	.87	2.9	.87	2.9		
5	.90	2.5	.88	2.8	.88	2.8	.89	2.6		
6	.91	2.4	.85	3.1	.80	3.6	.85	3.1		
7	.88	2.8	.87	2.9	.80	3.6	.82	3.4	.86	3.0
8	.91	2.4	.87	2.9	.84	3.2	.85	3.1	.83	3.3
9	.91	2.4	.91	2.4	.82	3.4	.82	3.4	.83	3.3

Figure - 3

**COMPARISON BETWEEN KR-20 RELIABILITY
ESTIMATES OF STANFORD-BINET SCALE ON
CHILDREN FROM BANGLADESH AND USA
(AGE: 9 YEARS)**



Test-Retest reliability :

Method was employed to determine the reliability of the five subtests of Stanford - Binet Intelligence Scale. The PCSAS scores of the first and second administration of the test was used to compute the reliability. The PCSAS scores of the five subtests of Stanford - Binet Intelligence Scale for determining the reliability of the present study have been included in Appendix E and F separately by age and sex and rural and urban samples respectively.

The correlation of coefficient was also calculated for the two administration of the present test separately for urban and rural samples. Table XXIX shows the reliability coefficients of the urban and rural samples.

Table - XXIX

Test-Retest Reliability co-efficients of the 5 non-verbal Stanford-Binet Test on urban and rural samples.

Correlation computed	r
First and second administration of Stanford Binet urban sample	.97
First and Second administration of Stanford-Binet rural sample	.44

Table XXX shows the test-retest correlational matrix for the five non-verbal subtests of Stanford-Binet Scale.

Table - XXX

Test-Retest correlation Matrix for the five non-verbal subtests of Stanford-Binet Intelligence Scale.

		Second Administration				
First Administration	Subtest	Pattern Analysis	Copying	Quantitative	Bead Memory	Memory for Digits
	Pattern Analysis	.90	.91	.92	.92	.92
	Copying		.91	.82	.90	.89
	Quantitative			.92	.90	.87
	Bead Memory				.92	.87
	Memory for Digits					.92

Table XXXI shows the test-retest reliability coefficient of the five subtests separately for sample from Bangladesh.

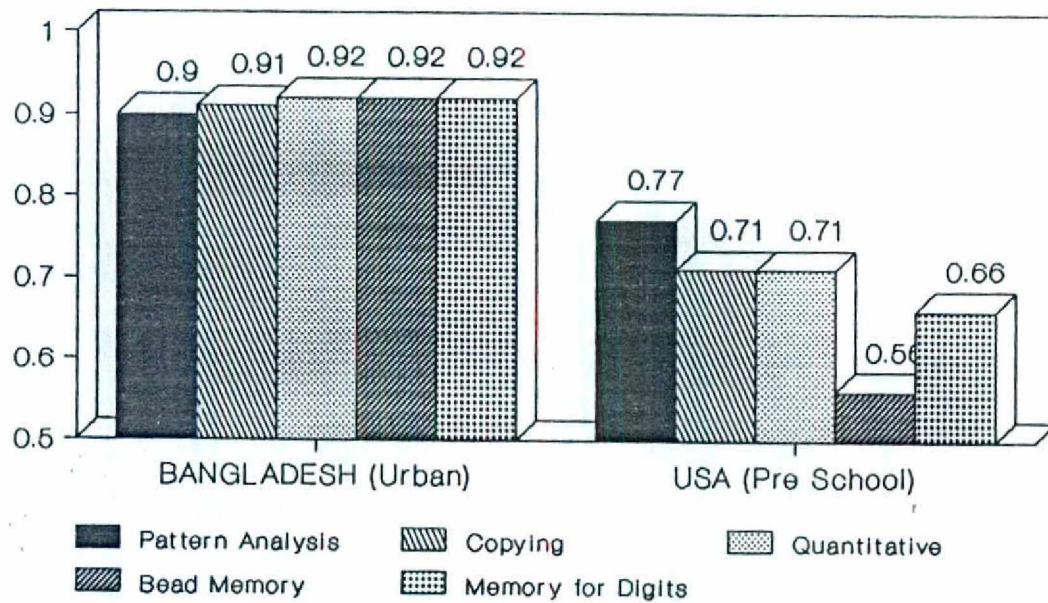
Table - XXXI

Reliability coefficient, mean and standard deviation of the first and second administration of the five subtests of Stanford-Binet Scale (sample from Bangladesh).

Subtests	'r'	N	1st testing		2nd testing	
			Mean	SD	Mean	SD
Pattern Analysis	.90	94	8.05	7.19	9.18	7.53
Copying	.88	94	7.57	8.10	8.39	8.44
Quantitative	.92	94	6.74	6.72	7.38	6.70
Bead Memory	.88	94	5.94	6.27	6.69	6.47
Memory for Digits	.88	94	3.43	3.79	3.49	3.73

Figure - 4

**COMPARISON BETWEEN TEST-RETEST ESTIMATES
OF STANFORD-BINET SCALE ON CHILDREN FROM
BANGLADESH AND USA (Age: 5 Yrs)**



For comparison Table XXXII shows the test-retest reliability co-efficient of separate tests of Stanford-Binet Scale when administered on sample from United States.

Table - XXXII

Reliability coefficient, mean and SD of 1st and 2nd administration of the 5 subtests of Stanford-Binet Scale when administered on sample from United States.

Tests	Reliability	N	1st testing		2nd testing	
			Mean	SD	Mean	SD
Pattern Analysis	.78	55	51.3	6.6	55.0	7.4
Copying	.46	54	50.4	8.6	52.2	9.2
Quantitative	.28	55	50.5	6.0	52.5	6.3
Bead Memory	.62	55	50.2	6.7	53.5	6.4
Memory for Digits	.66	40	50.8	6.4	53.4	7.0

Construction of Norm :

For the present study age norm was computed from the raw scores obtained by the subjects after administering the five non-verbal subtests of the Stanford-Binet Intelligence Scale. This was done separately for each age. The norm thus computed have been included in Appendix D and E separately for urban and rural sample.

Statistical analysis was computed first by converting the raw scores obtained by each subject into normalized Standard scores. Raw scores obtained by all the subjects, subtest wise and age wise were converted first to Standard Age Score (SAS) and then to Area Standard Age Score (Area SAS) and finally to Partial Composite Standard Age Score (PCSAS). Tables XXXIII, XXXIV, XXXV and XXXVI gives the distribution of subtest wise and age wise raw score mean and standard deviation, SAS mean and Standard deviation, Area SAS mean and standard deviation and finally Partial Composite SAS mean and standard deviation respectively for urban sample.

Table -XXXIII

Distribution showing subtest wise and age wise mean and standard deviation of the raw scores of urban sample.

Age	N	Pattern Analysis		Copying		Quantitative		Bead Memory		Memory for Digits	
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
3	124	3.64	6.13	3.44	5.97	2.41	5.64	2.08	4.92	-	-
4	126	3.36	3.93	3.48	4.18	2.45	3.94	2.78	3.14	-	-
5	143	5.60	5.89	5.54	6.37	4.66	4.89	4.77	4.32	2.72	2.60
6	169	7.44	5.10	7.16	5.47	6.99	4.18	6.09	3.44	3.46	2.14
7	192	10.70	5.09	10.08	6.00	10.19	3.88	8.75	5.97	4.76	2.38
8	157	12.55	4.70	13.52	7.05	12.02	3.92	10.12	3.63	6.29	2.72
9	175	13.84	5.19	15.99	7.19	12.90	3.72	11.36	3.96	7.02	2.88

Table - XXXIV

Mean and Standard deviation for each test SAS of the weighted normalized urban sample for the five subtests of Stanford-Binet.

AREAS AND TESTS	N	$\bar{X}$	SD
Abstract/visual R/A			
Pattern Analysis	1086	48.3	8.63
Copying	1086	50.61	7.4
Quantitative R/A			
Quantitative	1086	48.21	6.74
Short-Term Memory area			
Bead Memory	1086	50.4	8.1
Memory for Digits	1086	49.04	6.63

Table - XXXV

Mean and Standard deviation for the Area SAS of the weighted normalized urban sample by age.

Age	N	Abstract/visual Reasoning Area		Quantitative Reasoning Area		Short-Term Memory Area	
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
3	124	99	14.04	98.3	17.4	100.3	15.01
4	126	97.5	18.3	99.4	17.2	99.4	16.32
5	143	100.1	14.03	97.5	18.01	99.71	18.05
6	169	99.7	16.32	98.6	16.32	98.14	16.24
7	192	98.23	16.02	100.1	15.4	100	16.4
8	157	100.5	17.12	99.3	18.42	99.2	17.5
9	175	9.7	17.09	98.42	19.21	100	15.01

Table - XXXVI

Mean and Standard deviation of the Partial composite Standard age scores by age for the weighted normalized urban sample.

Age	N	Partial composite Standard age score (PCSAS)	
3	124	100	14.42
4	126	100	15.21
5	143	99	17.0
6	169	90	14.63
7	192	99	18.32
8	157	100.01	19.7
9	175	100.42	16.3

Table XXXVII, XXXVIII, XXXIX and XXXX gives the distribution of subtest wise and age wise raw score mean and standard deviation, SAS mean and standard deviation, Area SAS mean and standard deviation and finally the particle composite mean and standard deviation respectively for the rural samples.

Table - XXXVII

Distribute showing subtest wise and age wise mean and standard deviation of the raw scores for rural samples.

Age	N	Pattern Analysis		Copying		Quantitative		Bead Memory		Memory for Digits	
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
3	78	1.74	1.03	1.70	1.05	1.00	1.46	1.09	1.87	-	-
4	98	2.54	1.68	2.59	1.29	1.28	2.17	1.67	1.96	-	-
5	131	4.61	2.63	4.02	1.85	3.50	3.12	3.45	2.25	1.95	1.47
6	84	6.57	2.85	5.37	2.03	6.30	3.86	4.61	1.74	2.59	1.38
7	157	7.88	2.86	6.40	2.10	8.34	3.27	5.82	1.96	3.27	1.55
8	99	10.13	2.95	8.43	3.35	11.24	2.28	7.35	2.48	3.92	1.67
9	108	12.64	3.46	10.77	5.08	12.35	2.47	8.77	3.00	4.85	2.37

Table - XXXVIII

Mean and standard deviation for each test SAS of the weighted normalized rural sample for the five subtests of Stanford - Binet.

AREAS AND TESTS	N	$\bar{X}$	SD
Abstract/visual R/A			
Pattern Analysis	755	48.3	6.31
Copying	755	50.6	8.04
Quantitative R/A			
Quantitative	755	48.02	6.31
Short-Term Memory area			
Bead Memory	755	49.91	7.42
Memory for Digits	755	48.62	8.11

Table - XXXIX

Mean and standard deviation for the Area SAS of the weighted normalized rural sample by age.

Age	N	Abstract/visual Reasoning Area		Quantitative Reasoning Area		Short-Term Memory Area	
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
3	78	97.3	19.0	97.1	18.5	99.4	15.4
4	98	96.1	19.7	98.4	16.40	98.6	17.23
5	131	99	17.0	96.3	15.01	98.01	19.14
6	84	99.01	16.8	987.41	16.24	97.92	18.01
7	157	97.4	15.41	99.23	18.01	99.61	17.5
8	99	99.31	19.2	98.04	17.43	99.11	18.3
9	108	98.2	14.9	97.3	16.21	99.24	19.34

Table - XXXX

Mean and standard deviation of the partial composite standard age scores by age for the weighted normalized rural sample.

Age	N	PCSAS $\bar{X}$	PCSAS SD
3	78	100	13.93
4	98	99.02	16.23
5	131	97.4	18.4
6	84	96.6	16.05
7	157	98.1	19.41
8	99	99.5	18.62
9	108	98.0	19.34

CHAPTER - IV

DISCUSSION

The purpose of the present study was to adapt and standardize five non-verbal subtests of "Stanford Binet Intelligence Scale" (4th ed.) for use in the urban and rural areas of Bangladesh.

Pilot Study :

To pretest and tryout the items on the children of Bangladesh the Stanford-Binet Intelligence Scale was administered initially on 233 children ranging in age from 3 to 9 years both from urban and rural areas. The mean and standard deviation was calculated for each age group, each subtest and for each site separately. The mean score obtained from the present calculation showed gradual increase with age, with an exception of one case where the mean (copying subtest) was less for age 8 than for age 7 (Table - XX). The reason for this variation could be due to small sample size. The mean and standard deviation calculated with the scores of PCSAS (Table - XXII) indicated that the mean obtained by urban local children were much lower than US norm (as given in the Manual). Further it was also found that the PCSAS mean scores of rural children were even lower than that of the urban children and that the mean varied from age to age. There was no systematic increase of mean with the increase of age. This could have been due to the unfamiliarity of items, in the test because the children especially from rural areas were deprived of even the minimum standard of living and education. They were not exposed to these things (i.e. the things included in the items of the Tests) in their surroundings.

Pretraining with trials before test administration :

For the purpose of improving the test scores the pretraining procedure was developed. The pretraining procedure was applied to each child for each subtest. It was found that there was some improvement in the responses of the children tested after giving the pretraining. To assess the effects of pretraining the test was again administered on a small sample in Dhaka city. The subjects were selected randomly (all normal children). The result showed that there was an increase in mean PCSAS in different subtest as compared to the scores when administered in the pilot study.

Validity and Reliability in Pilot Study :

During the pilot study the test scores obtained by a group of normal subjects was validated against a contrasted group of known handicapped children 't' test was computed and the result indicated significant difference in test scores between normal and handicapped children at .001 level (Table XXIII and XXIV).

The test-retest reliability was also computed to find the correlation between scores obtained by 22 children, when the test was administered twice with an interval of one month. These children were selected randomly from the total sample of 233 children. The coefficient of correlation was found to be .81 (Table XXV). As the validity and reliability measures were satisfactory, the next step was to conduct item analysis to further evaluate the test items.

Item Analysis :

After the completion of the work of pilot study i.e. after pretesting and tryout of the test, and before going into details of further administration and statistical analysis of the results of the five non-verbal subtests of Stanford-Binet Scale a detailed item analysis was carried out in order to scrutinize the strengths and weaknesses of each test item. Examination of each item was done in terms of (i) Difficulty Index and (2) Discriminating Index.

Difficulty Index :

The difficulty index 'P' for the five subtests : Pattern Analysis, Copying, Quantitative, Bead Memory, Memory for Digits (forward) ranged between .001 and .99 while for the second portion of the reversed Memory for Digits 'P' was from .002 to .14 for urban children. On the other the 'P' for the five subtests when administered on rural children was found to be lower than the urban children. The 'P' for the five subtests ranged between .0009 to .55 for rural population. Based on this finding the items of each subtests were rearranged for further administration. For the urban population the 'P' for item numbers 7, 8 and 9 were higher than item numbers 5 and 6, and 'P' for item numbers 12 was greater than item number 11. These 4 items were rearranged in 'Pattern Analysis' subtest. For the subtest 'Copying' 'P' for item 15 were higher than item 14 which was also rearranged. The rest of the 'P' for items in 'Copying' subtest had a systematic decrease. In 'Quantitative' subtest 'P' for item number 4 and 5 were higher than items 1 and 2 and 'P' for item 9 were greater than items 6, 7 and 8. Lastly 'P' for item 13 and 14 were higher than 'P' for item 12. This

showed that item number 12 was more difficult than items 13 and 14. These items were also rearranged. For the rest of the two subtests 'Bead Memory' and 'Memory for Digits' (forward and reversed) the items remained in the same order (See Appendix Ai)

For the rural population also 'P' for items 7, 8 and 9 were difficult as compared to 'P' for items 5 and 6, as well as 'P' for item 12 was greater than compared to item 11 in the 'Pattern Analysis' subtest. These items were rearranged according to difficulty order. In 'Copying' subtest the rural children scored higher in item 15 as compared to item 14 and higher in item 17 as compared to item 16. These two items were also arranged from easy to difficult order. In the 'Quantitative' subtest 'P' for item 4 and 5 was difficult as compared to 'P' for item 3. 'P' for items 9 and 10 were difficult items as compared to 'P' for items 7 and 8, besides these 'P' for item 12 was found to be more difficult compared to the above items and 'P' for item 13 and 14 was also difficult compared to item 11. These items were rearranged in order of difficulty. Lastly the 'P' for item 15 of 'Bead Memory' subtest was higher than item 14, that too was also rearranged. The subtest 'Memory for Digits' remained in the same order. (See Appendix Aii).

It was interesting to note that item analysis of the five subtests of Stanford-Binet Intelligence Scale indicated that for both the rural and urban population the same items were found to be most difficult items. The only variation was that in "Bead Memory" subtest 'P' for item 15 was a bit difficult than item 14 in rural sample, but the order remained same for urban children.

Discriminating Index :

As regards the discriminating index or 'D' was concerned, the 'Bead Memory' subtest showed that item number 8 was not responded by any subject of any age in the rural sample and the item had to be rearranged. Items 2 and 3 for age 7 and items 1, 2 and 3 for age 8 and 1 to 5 for age 9 had '0' discriminating value, i.e. these were too easy items.

The other variations were in the 'Quantitative' subtest in which item number 12 was not responded by children aged 3, 4, 5, 6, and 7 in the rural sample but the children of 8 and 9 years age could answer these items correctly. This means that the items needed to be rearranged for the lower age group. Item analysis also indicated that the sample in the upper age group (for both urban and rural) consisted of children who scored high in the test while the lower age group consisted of children who scored very low. The PCSAS which was the standard age score expressing

the mental age level was taken for separating the upper and lower 33 % of the subjects for calculating the Discriminating Index. The PCSAS ranged between 50 and 157.

Keeping this view in consideration it was decided to keep all the items in and around .50 difficulty level and to rearrange the items from easy to difficult order.

Main Study :

After rearranging the five subtests in order of difficulty, it was then administered on 1841 sample for the main study for the purpose of determining validity, reliability and construction of norms.

Determination of Validity :

The five non-verbal subtests of Stanford-Binet Intelligence Scale was validated against three criterion measures : (Table - XXVI).

- a) Adaptive Behaviour Scale (ABS).
- b) WISC - R (adapted and translated in Bengali).
- c) DDST (adapted in Bangladesh).

It is said that a test is known by its correlations. Correlations always vary between zero and one. It may either be positive or negative or there may be no correlation. The size of magnitude of the coefficient would make a high or low degree of correlation. A coefficient of .60 might be regarded as high for one type of situation or test and low for another. In other words "high" and "low" have only relative meaning.

i) Stanford-Binet Vs. Adaptive Behaviour Scale (ABS) :

Statistical correlation between adaptive Behaviour and IQ seemed to vary considerably in relation to the nature of adaptive behavior measures and the type of population sampled. Across different adaptive behavior scales IQ has been found to correlate moderately or highly with domains of communication skills as well as cognitive and language development, regardless of the type of population sampled.

Somewhat higher AB-IQ correlations have been found among heterogeneous groups of individuals, such as the residents in state institutions than among more homogeneous groups of children in special education programmes. The AB-IQ correlations tends to be higher among profoundly retarded individuals (Meyers, Nihira, & Zetlin, 1979). This is understandable since, for this range of development, the measures of IQ and AB both share similar clusters of items (for example, sensory development, fine and gross motor coordination and so on). These items are different from the type of test items designed to assess the ability to handle the abstract thought and symbolic processes at the higher level of the IQ continuum. At the lower end of the continuum, the operational definition of IQ tends to blend in with the adaptive behavior construct. In, general the two measures indicate moderate to high degree of statistical correlation (Meyers, Nihira, & Zetlin, 1979).

For the present study the five subtests of Stanford-Binet Scale was validated against the "Adaptive Behavior Scale". The Pearson Product Moment coefficient of correlation was computed between the two test scores. The correlation thus calculated was found to be .71 (Table - XXV). This seemed to be reasonably high.

ii) Stanford-Binet Vs WISC - R :

Since 1972, these two test have been widely used to test the intelligence of the mentally retarded, either with the revised or with the restandardized versions. Kaufman and Van Hagen (1977) compared the WISC-R, (1974 edition) and restandardized 1960 Stanford-Binet in 45 educable mentally retarded children and adolescents. The correlation of WISC-R verbal, performance and full scale IQs' with Stanford-Binet IQs' were .73, .65 and .82 respectively. Two other studies on children referred for suspected mental retardation or learning disability also reported similar correlations (Bloom, Raskin, & Reese, 1976; Raskin, Bloom, Klee and Reese, 1978). These recent figures were of the same order of magnitude as the corresponding correlations between the 1949 WISC and the 1960 Stanford-Binet for the mentally retarded children (Silverstein, 1970; Zimmerman and Woosam, 1972).

The fourth edition of the Stanford-Binet Intelligence Scale was also validated against WISC-R and was found that scores on the Verbal Reasoning Area of the fourth edition correlated .72 with WISC-R verbal scores, .60 with the WISC-R performance scores, and .73 with WISC-R Full Scale Scores. The correlation between the composite scores on the fourth edition of Stanford-Binet and WISC-R verbal scale was .78; with WISC-R performance scale .73 and WISC-R full scale it was .83. (Stanford-Binet Manual, 4th ed., 1986).

The present study also correlated the partial composite SAS of the non-verbal subtests of Stanford-Binet Intelligence Scale with the WISC-R full scale score (adapted Bengali version) on children aged 5 to 9 years. The result indicated a reasonably high correlation between the two tests, it was .66. (Table - XXVI)

iii) Stanford-Binet Vs DDST :

The third criterion measure against which the validity of the five subtests of Stanford-Binet Intelligence Scale was determined for the present study was the Denver Developmental Screening Test (DDST) adapted version on children aged 3 to 4 years. Coefficient of correlation was also calculated between these two tests and the coefficient was found to be .57. (Table - XXVI). The PCSAS score along with the scores from the three criterion measures have been included in Appendix Bi, Bii and Biii.

Determination of reliability :

The reliability of the five subtests were computed by the following methods.

1. Kuder-Richardson Formula - 20
2. Test-Retest reliability

1. Kuder-Richardson Formula - 20

was applied to determine the internal consistency of each item. This was done separately for the five subtests and for each age group (Table - XXVII). The KR - 20 calculated on the scores of children from United States has also been shown in Table - XXVIII and Figure - 3. The mean of KR-20 calculated from the scores of Bangladesh sample ranged from .63 to .74 in pattern analysis subtest whereas it was .85 to .91 for United States sample. Next the mean for the copying subtest ranged between .72 to .82 for Bangladesh sample and it was .81 to .91 for United States sample, the Quantitative subtest had a mean of .61 to .76 for Bangladesh sample while the United States mean ranged from .80 to .87. For Bead Memory the mean was .66 to .81 for Bangladesh sample but it was .82 to .89 for American sample. Lastly for Memory for Digits it was from .58 to .70 for children from Bangladesh while .83 to .86 for United States children. Though there was a difference of 10 points or somewhat more between the Bangladeshi and United States mean, the mean thus calculated with the Bangladesh scores were found to be reasonably high i.e. when the test was applied on children from Bangladesh, it showed a reasonably high indices of inter item consistency.

2. Test-Retest reliability :

Test retest reliability was calculated separately for the rural and urban sample. The PCSAS scores of the 1st and 2nd administration of the test have been included in Appendix Ci and Cii. The correlation computed between the first and second administration of the five subtests of Stanford-Binet for the urban sample was found to be .97, on the other hand the correlation was found to be .44 when test-retest was conducted on rural sample (Table - XXIX). The test-retest reliability coefficient seemed to be quite high for the urban sample, but it was not satisfactory for the rural sample. The interval between the first and second administration was two months for the rural sample and could be the reason for low correlation.

Again the mean and standard deviation for each subtest was also calculated with the first and second administration of the five subtests on urban children (Table - XXX and XXXI & Figure - 4). Compared to the reliability coefficient obtained on samples from United States the correlation of the Bangladeshi sample was higher (Table - XXXII). The correlation of two test for pattern analysis was .78 for the American sample while it was .90 for Bangladeshi sample. The correlation was .88 for 'Bead Memory', 'Copying' and 'Memory for Digits' with the Bangladeshi sample while it was .62, .46 and .66 respectively for the 3 subtests with American sample. Lastly the subtest Quantitative had a correlation of .28 for American sample and it was .92 for Bangladeshi sample. The lower test-retest reliability for American sample could be because the test was administered on pre-school children where many subject could have been from poor background on the other hand Bangladesh sample was randomly selected from the city.

Construction of Norm :

The final step in the Standardization of a test is the construction of norm. The five non-verbal subtests of the Stanford-Binet Intelligence Scale (fourth edition) which was administered on 1841 sample from both rural and urban settings were utilized for the construction of the norms for rural and urban children of Bangladesh. For the present study the age norm was calculated. The norm was calculated separately for urban and rural population. In the first stage the raw scores obtained by the sample were calculated to find out the mean and standard deviation by age and by rural urban population. For example the mean thus obtained for Pattern Analysis subtest for the urban children were 3.64 for 3 year olds, 3.36 for 4 year olds, 5.60 for 5 year old children, it was 7.44 for 6 year olds and 10.70, 12.55 and 13.84 were for 7, 8 and 9 year olds. The mean thus found showed that there was a systematic increase with age. The standard deviation did not increase with age but varied from age to age. (Table - XXXIII)

With the mean obtained by the raw scores the weighted mean was first calculated for the five subtest of the Stanford-Binet Scale for the total urban sample. The weighted mean thus obtained from the five subtests ranged between 48.3 to 50.61; while the standard deviations were from 6.63 to 8.63 for the urban sample. The weighted mean was again calculated for the three areas separately by age and total number of sample in each age group. The mean for the "Abstract/Visual Reasoning Area" ranged from 97.5 to 100.5; the mean for the "Quantitative Reasoning Area" were between 97.5 to 100.1, and for the "Short-Term Memory Area" the mean scores were from 99.4 to 100.3 (Tables - XXXIV and XXXV).

Finally the weighted mean and standard deviation was calculated for the Partial Composite Age Scores for each age group separately for urban sample. The mean was 100 and above for ages 3, 4, 8 and 9. For ages 5 and 7 the mean was 99 and for age 6 mean was found to be 98. (Table - XXXVI).

The same calculations were also conducted for the rural sample. The raw scores in the similar way was calculated to find out the mean and standard deviation. The mean for the rural sample also increased with age. The mean was 1.74 for the 3 year old children, it was 2.54 for the 4 year olds, 4.61 for the five year olds, 6.57 for the 6 year olds, and 7.88, 10.13 and 12.64 for the 7, 8 and 9 year old children respectively in Pattern Analysis subtest. The standard deviation also varied within the age group like the urban children. The weighted mean for the total sample of the five subtests were also calculated for the rural children. The weighted mean ranged between 48.3 to 50.61. The standard deviation of the weighted mean ranged between 6.31 to 8.04. In the same way the weighted mean was also calculated for each age and for each area. The weighted mean for the "Abstract/Visual Reasoning Area" ranged between 96.1 to 99.31 for the 7 age groups. The mean was from 96.3 to 97.3 for the 7 year age groups in the "Quantitative Reasoning Area" while for the "Short Term Memory" area the mean scores were between 97.92 to 99.61 for the 7 age groups. (Tables - XXXVII and XXXVIII).

The weighted mean and standard deviation were also calculated for the "Partial Composite Standard Age Scores" of the rural sample. The mean was 100 for age 3 year olds, and between 96.6 to 99.5 for ages 4, 5, 6, 7, 8 and 9 year old samples. (Table - XXXX).

Two separate age norms were calculated from the raw scores obtained from the present study :

- i) Norm for the urban population
- ii) Norm for the rural population

Since the age range of the children were from 3-9 years, the norms were also calculated separately for each age group. The norm thus calculated showed a slight variation between the rural and urban sample. The range of the Partial Composite Standard Age Score which represents the IQ of the child for the urban population was between 32 - 168 while for the rural population it was from 28 - 160. The PCSAS of a similar age group belonging to samples from United States ranged from 36 to 165, which was closer to our urban sample. (Appendix D and E).

Thus the above mentioned norms which were calculated for rural and urban samples indicated that as a child grows older in age the intelligence of that child also increases. This was because, as the child develops, he/she was exposed to more complex and new situations in life where he/she has to deal effectively, and thus the child acquires new ideas and knowledge about the world around her/him. The present test results also showed a gradual increase of mean along with the increase of age. (See Appendix D and E).

In the present study the five non-verbal subtests of Stanford-Binet was validated against three criterion measures and all the three tests against which the present scale was validated showed fairly high correlation. On the other hand the reliability coefficient was also relatively high for the test-retest reliability except for the reliability co-efficient obtained in rural area. The standard deviation and mean calculated to see the internal consistency of each item (KR - 20 Formula) also showed high mean value for all the ages and for all the subtests. Thus the results of the present study indicated that the five non verbal subtests of Stanford Binet Intelligence Scale was reasonably valid and reliable for use in Bangladesh.

The findings of the present study supported the results obtained by previous investigators that there were rural and urban differences in IQ (Ref.). The result demonstrated that urban children had a higher mean IQ. The differences were found when the mean and standard deviations of the raw scores of both rural and urban sample was compared. In all the seven age levels and in all of the five subtests the mean was lower for rural children as that of the urban sample.

In a study Boger (1952) showed that when rural children were given training in answering current intelligence test items, they have a much higher score than those children who were not trained. In other words, he felt that rural children have lower intelligence test scores because of the nature of the tests of mental ability being used. The results of the present study also supports the finding. The scale when administered first for the

pilot study the scores were low for rural children. The scores increased as the children were given pre-test training trials before the beginning of each subtests during the main study. Eells (1951); Havighurst (1944); Terman (1916); Sherman and Key (1923); Asher (1935) and Wheeler (1942) have shown that there are differences in the intelligence test performance of children coming from different socio-economic strata.

It has been found that intelligence tests play a significant role in assessing both groups and individuals in educational settings. Their use has been and will continue to be influential in shaping educational policy and practice. In the past, scores from intelligence tests had led to wide spread ability grouping. The results of these intelligence measures have at least three major areas of educational application :

1. Selection and Placement :

Application related to selection or placement in classes or programmes based on assessed learning rate (intelligence).

2. Screening, Diagnosis and Remedial Planning :

In addition to affecting decisions related to selection or placement, screening is used to rule out questions of general intelligence in understanding other learning problems. Besides this the most important place where intelligence tests are used, is for the screening of the mentally retarded children and adults, in order to give them proper guidance. In the diagnostic process intelligence measures are used not only to determine the general level of cognitive functioning, but also to formulate hypothesis regarding relative strengths and weaknesses that might lead to planning effective learning strategies and remedial programmes. In addition an intellectual evaluation helps in determining appropriate levels of expectation for school achievement.

3. Accountability, Research and Evaluation :

IQ measures are often included among outcome measures related to programme effectiveness. In addition they are among the measures used in research to account for pupil characteristics. Besides these intelligence tests are one of the important tools of psychological assessment used by professional psychologists in a variety of settings such as private offices, public and private schools, private and public mental health clinics and institutions, hospitals, the personnel offices of industrial companies and the counselling centres of colleges or universities are among others.

There has been no such tests developed or standardized in Bangladesh for use in schools, clinics, industries etc. The few tests that have been standardized could only be applied on children from urban area. But the present test have opened an avenue for screening and testing rural children as well as because the test has been standardized on a well representative sample of rural population.

The present test developed could be considered a unique achievement in the field of testing for a country like Bangladesh. The Stanford-Binet has been standardized, translated and adapted in many languages and in many developing countries including India. It was therefore encouraging that it has finally been standardized in Bangladesh. The present adaptation of Stanford Binet would definitely fulfill the future requirements of 'Intelligence Testing' in the country especially it could be fruitfully utilized in research, hospitals and clinics for diagnosis of mentally retarded or learning disabled children, both in urban and rural areas. However the present form needs to be revised with larger as well as older age groups of subjects and with more representative samples of the country. Other subtests could also be standardized in similar manner to make the test complete, so that both verbal and non-verbal areas of intellectual functioning of an individual could be assessed. The present adaptation and standardization of Stanford-Binet Intelligence Scale was the beginning, hopefully of a large scale work in this regard in future.

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APPENDIX - A

APPENDIX - Ai

Difficulty Index of the five subtests of Stanford-Binet
Intelligence scale for the urban sample.

No. of Item	Pattern Analysis	Copying	Quantitative	Bead Memory	Memory for Digits	
					F	R
1	0.99	0.98	0.67	0.79	0.70	0.14
2	0.80	0.82	0.60	0.72	0.69	0.14
3	0.74	0.74	0.54	0.69	0.41	0.06
4	0.63	0.64	0.69	0.6	0.24	0.05
5	0.40	0.51	0.59	0.54	0.11	0.02
6	0.36	0.45	0.36	0.4	0.07	0.013
7	0.61	0.35	0.36	0.34	0.009	0.006
8	0.48	0.27	0.29	0.26	0.002	0.002
9	0.34	0.24	0.46	0.16	0.001	
10	0.23	0.21	0.34	0.15		
11	0.16	0.23	0.21	0.14		
12	0.20	0.20	0.13	0.14		
13	0.16	0.18	0.28	0.12		
14	0.13	0.15	0.25	0.10		
15	0.08	0.19	0.14	0.09		
16	0.09	0.09	0.15	0.07		
17	0.09	0.08	0.1	0.08		
18	0.08	0.09	0.05	0.09		
19	0.07	0.03	0.06	0.08		
20	0.02	0.04	0.008	0.06		
21	0.04	0.04	0.008	0.06		
22	0.006	0.04	0.007	0.05		
23	0.004	0.004	0.02	0.04		
24	0.004	0.005	0.008	0.009		

Difficulty Index of the five subtests of Stanford-Binet
Intelligence scale for the rural sample.

No. of Item	Pattern Analysis	Copying	Quantitative	Bead Memory	Memory for Digits	
					F	R
1	0.55	0.54	0.42	0.48	0.41	0.05
2	0.49	0.50	0.41	0.46	0.42	0.05
3	0.46	0.47	0.41	0.43	0.28	0.02
4	0.41	0.41	0.45	0.41	0.23	0.005
5	0.35	0.36	0.40	0.41	0.15	0.001
6	0.34	0.34	0.29	0.34	0.12	0.002
7	0.41	0.29	0.28	0.23	0.03	
8	0.33	0.23	0.24	0.14	0.03	
9	0.26	0.20	0.33	0.15	0.005	
10	0.24	0.16	0.27	0.14	0.0018	
11	0.20	0.14	0.23	0.12	0.0009	
12	0.23	0.14	0.12	0.12		
13	0.20	0.16	0.27	0.10		
14	0.16	0.14	0.25	0.07		
15	0.13	0.15	0.10	0.09		
16	0.13	0.14	0.10	0.07		
17	0.08	0.15	0.05	0.05		
18	0.09	0.14	0.06	0.05		
19	0.07	0.13	0.008	0.03		
20	0.02	0.09	0.007	0.03		
21	0.004	0.08	0.02	0.03		
22	0.003	0.06	0.008	0.02		
23	0.002	0.08		0.008		
24	0.001	0.07		0.005		

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Distribution Showing the re-arranged
items of the five subtests of Stanford Binet
Intelligence scale (urban sample).

No. of Item	Pattern Analysis	Copying	Quantitative	Bead Memory	Memory for Digits	
					F	R
1	0.99	0.98	0.69	0.79	0.70	0.14
2	0.80	0.82	0.67	0.72	0.69	0.14
3	0.74	0.74	0.60	0.69	0.41	0.06
4	0.63	0.64	0.59	0.60	0.24	0.05
5	0.61	0.51	0.54	0.54	0.11	0.02
6	0.48	0.45	0.46	0.40	0.07	0.013
7	0.40	0.35	0.36	0.34	0.009	0.006
8	0.36	0.27	0.36	0.26	0.002	0.002
9	0.34	0.24	0.34	0.16	0.001	
10	0.23	0.23	0.29	0.15	0.001	
11	0.20	0.21	0.28	0.14		
12	0.16	0.20	0.25	0.40		
13	0.16	0.19	0.21	0.12		
14	0.13	0.18	0.15	0.10		
15	0.09	0.15	0.14	0.09		
16	0.09	0.09	0.10	0.09		
17	0.08	0.09	0.06	0.08		
18	0.08	0.08	0.05	0.08		
19	0.07	0.04	0.008	0.07		
20	0.04	0.04	0.008	0.06		
21	0.02	0.04	0.008	0.06		
22	0.006	0.03	0.007	0.05		
23	0.004	0.005	0.002	0.04		
24	0.004	0.004	0.002	0.009		

Distribution Showing the re-arranged
items of the five subtests of Stanford-Binet
Intelligence scale (rural sample).

No. of Item	Pattern Analysis	Copying	Quantitative	Bead Memory	Memory for Digits	
					F	R
1	0.55	0.54	0.45	0.48	0.42	0.05
2	0.49	0.50	0.42	0.46	0.41	0.05
3	0.46	0.47	0.41	0.43	0.28	0.02
4	0.41	0.41	0.41	0.41	0.23	0.005
5	0.41	0.36	0.40	0.41	0.15	0.001
6	0.35	0.34	0.33	0.34	0.03	0.002
7	0.34	0.29	0.29	0.23	0.03	
8	0.33	0.23	0.28	0.15	0.005	
9	0.26	0.20	0.27	0.14	0.0018	
10	0.24	0.16	0.27	0.14	0.009	
11	0.23	0.16	0.25	0.12		
12	0.2	0.16	0.24	0.12		
13	0.2	0.15	0.23	0.10		
14	0.16	0.15	0.12	0.09		
15	0.13	0.14	0.1	0.07		
16	0.13	0.14	0.1	0.07		
17	0.09	0.14	0.06	0.05		
18	0.08	0.13	0.05	0.05		
19	0.07	0.11	0.02	0.03		
20	0.02	0.09	0.008	0.03		
21	0.003	0.09	0.008	0.03		
22	0.002	0.08	0.007	0.02		
23	0.001	0.08		0.008		
24		0.08		0.005		

APPENDIX - B

Appendix Showing PCSAS Scores of Stanford-Binet
and ABS for determining the validity.

Numbers of Subjects	Stanford Binet	ABS
1	94	342
2	76	431
3	83	562
4	46	311
5	64	404
6	72	286
7	81	333
8	100	243
9	69	321
10	74	289
11	83	415
12	99	312
13	71	219
14	111	317
15	92	381
16	94	362
17	71	411
18	64	217
19	83	346
20	85	326
21	100	234
22	76	245
23	68	313
24	82	301
25	93	217
26	69	266
27	73	326
28	81	327
29	94	341
30	111	276
31	85	216
32	78	242
33	81	258
34	92	326
35	96	415
36	104	405
37	107	378
38	111	294
39	75	346
40	80	347
41	93	291
42	99	321
43	96	423
44	111	264
45	71	512
46	76	314
47	92	410
48	82	316
49	67	329

To be continue

To be continue

Numbers of Subjects	Stanford Binet	ABS
50	95	273
51	63	324
52	74	431
53	96	246
54	99	311
55	100	291
56	83	324
57	86	410
58	94	240
59	81	314
60	97	246
61	98	324
62	74	431
63	100	562
64	83	313
65	85	404
66	96	286
67	71	333
68	73	243
69	65	321
70	59	289
71	101	415
72	83	312
73	74	219
74	90	317
75	95	381
76	81	362
77	84	411
78	72	217
79	68	346
80	59	326
81	111	234
82	112	245
83	83	313
84	91	301
85	96	217
86	94	266
87	88	326
88	72	327
89	75	341
90	91	276
91	83	216
92	91	242
93	92	258
94	74	326
95	81	415
96	99	405
97	85	378
98	91	294
99	74	346
100	68	347

Appendix Showing the PCSAS Scores of the Stanford-Binet
and WISC -R Full Scale Scores for
the determination of validity.

Numbers of subjects	Stanford Binet	WISC - R
1	94	89
2	76	85
3	83	71
4	46	101
5	64	82
6	72	70
7	81	80
8	100	95
9	69	81
10	74	113
11	83	74
12	99	85
13	71	96
14	111	83
15	92	84
16	94	84
17	71	89
18	64	75
19	83	63
20	85	75
21	100	89
22	76	83
23	68	69
24	82	64
25	93	71
26	69	74
27	73	62
28	81	91
29	91	83
30	114	90
31	85	71
32	78	71
33	81	63
34	92	58
35	96	71
36	104	73
37	107	80
38	111	53
39	75	56
40	80	63
41	93	74
42	99	62
43	96	59
44	111	61
45	71	75
46	76	80
47	92	79
48	82	62

To be continue

To be continue

Numbers of subjects	Stanford Binet	WISC - R
49	67	74
50	95	71
51	63	74
52	74	71
53	96	62
54	99	69
55	100	80
56	83	75
57	86	61
58	86	59
59	94	62
60	81	74
61	97	63
62	98	80
63	74	56
64	100	73
65	83	71
66	85	58
67	96	63
68	71	71
69	73	72
70	68	59
71	59	90
72	101	83
73	83	91
74	74	62
75	96	74
76	95	71
77	81	64
78	84	69
79	72	83
80	68	89
81	59	75
82	111	63
83	112	75
84	83	86
85	91	83
86	96	69
87	94	58
88	88	63
89	72	70
90	75	69
91	91	56
92	83	63
93	91	64
94	92	81
95	74	72
96	81	81
97	99	74
98	85	63
99	91	65
100	74	58
	68	

Appendix Showing the PCSAS Scores of the Stanford-Binet and DDST used for the determination of validity.

Numbers of subjects	Stanford Binet	DDST Scores
1	80	74
2	90	92
3	90	83
4	99	64
5	91	53
6	84	63
7	90	44
8	99	71
9	90	81
10	88	55
11	74	63
12	85	77
13	63	76
14	84	61
15	71	72
16	73	69
17	82	80
18	91	58
19	83	72
20	90	64
21	73	73
22	74	72
23	69	61
24	57	59
25	81	82
26	82	97
27	76	63
28	75	59
29	68	91
30	59	93
31	63	84
32	73	73
33	91	77
34	82	75
35	71	81
36	74	69
37	76	84
38	84	58
39	58	64
40	64	71
41	74	56
42	83	63
43	91	58
44	90	71
45	82	72
46	84	80

To be continue

To be continue

Numbers of subjects	Stanford Binet	DDST Scores
47	88	83
48	91	74
49	96	91
50	78	95
51	75	84
52	96	68
53	90	59
54	78	74
55	92	74
56	81	92
57	76	85
58	93	59
59	91	63
60	74	64

APPENDIX - C

Appendix Showing the PCSAS Scores of the first and second administration of the five Subtests of Stanford-Binet Intelligence Scale (Urban Sample).

Child Number	Test	Re-test
1	70	72
2	104	103
3	114	114
4	86	87
5	91	93
6	104	106
7	99	100
8	84	87
9	116	116
10	121	123
11	111	114
12	104	104
13	86	84
14	94	93
15	100	103
16	72	74
17	84	86
18	79	80
19	93	95
20	84	88
21	76	78
22	64	70
23	58	61
24	62	65
25	90	90
26	93	92
27	74	76
28	76	78
29	83	89
30	93	98
31	121	120
32	113	100
33	95	95
34	86	87
35	74	76
36	63	65
37	121	120
38	111	110
39	114	114
40	107	105
41	88	88
42	97	94
43	100	101
44	72	75
45	84	86
46	91	94

To be continue

To be continue

Child Number	Test	Re-test
47	86	88
48	80	81
49	76	78
50	64	70
51	114	114
52	124	123
53	69	72
54	95	96
55	99	99
56	111	114
57	110	111
58	115	116
59	116	116
60	101	104
61	113	111
62	95	97
63	86	86
64	91	95
65	104	104
66	99	110
67	74	74
68	78	78
69	84	86
70	93	95
71	69	70
72	111	110
73	84	86
74	93	95
75	76	78
76	59	62
77	68	68
78	90	90
79	91	91
80	64	64
81	113	111
82	105	105
83	106	106
84	99	99
85	76	78
86	93	95
87	114	116
88	86	90
89	104	114
90	100	104
91	86	88
92	91	93
93	104	106
94	199	100
95	116	121
96	121	124
97	104	111
98	78	82
99	84	86
100	93	99

APPENDIX - D

Subtest Raw Scores 0-42

[illegible][illegible]

Age - 4 year
Subtest Raw Scores 0-42

[illegible][illegible]

Age - 6 years
Subtest Raw Scores 0-42

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Pattern Analysis	40	41	43	45	46	48	49	51	52	54	56	57	59	60	62	63	65	67	68	70	71	73	74
Copying	41	42	44	45	47	48	50	51	53	54	56	57	59	60	61	63	64	66	67	69	70	72	73
Quantitative	39	40	42	44	46	48	50	52	54	56	58	60	62	63	65	67	69	71	73	75	77	79	81
Bead Memory	38	40	43	45	47	50	52	54	57	59	61	64	66	68	71	73	75	78	80	82	85	87	89
Memory for Digits	41	45	48	52	56	60	63	67	71	74	78	82	86	89	93	97	101	104	108	112	116	119	123

[illegible]

Age - 8 years
Subtest Raw Scores 0-42

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Pattern		30	32	34	35	37	39	41	42	44	46	47	49	51	52	54	56	58	59	61	63	64	66	68
Analysis																								
Copying		36	37	38	39	40	41	43	44	45	46	47	48	49	51	52	53	54	55	56	57	58	60	61
Quantitative		28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72
Bead Memory		30	32	34	36	39	41	43	45	48	50	52	54	56	59	61	63	65	67	70	72	74	76	78
Memory for Digits		34	37	40	43	46	49	52	55	58	61	64	67	70	73	76	79	82	85	88	91	94	97	100

[illegible]

Table
Abstract / Visual Reasoning Area
Conversion of the sum of Subtest Standard Age Scores (SAS'S)
to Area SAS (all ages) ,Urban Sample.

Area SAS	Numbr of Subtests		Area SAS	Number of Subtests		Area SAS	Number of Subtests		Area SAS	Number of Subtests	
	1	2		1	2		1	2		1	2
32	16	32_42	67			102	51	102	137		132
33		43	68	34	73	103		103	138	69	133
34	17	44	69		74	104	52		139		134
35		45	70	35	75	105		104	140	70	135
36	18	46	71		76	106	53	105	141		
37		47	72	36	77	107		106	142	71	136
38	19		73		78	108	54	107	143		137
39		48	74	37	79	109		108	144	72	138
40	20	49	75		76	110	55	109	145		139
41		50	76	38	80	111		110	146	73	140
42	21	51	77		81	112	56		147		141
43		52	78	39	81	113		111	148	74	
44	22	53	79		82	114	57	112	149		142
45			80	40	83	115		113	150	75	143
46	23	54	81		84	116	58	114	151		144
47		55	82	41		117		115	152	76	145
48	24	56	83		85	118	59	116	153		146
49		57	84	42	86	119		117	154	77	147
50	25	58	85		87	120	60		155		
51		59	86	43	88	121		118	156	78	148
52	26		87		89	122	61	119	157		149

To be continue

To be continue

Area SAS	Numbr of Subtest		Area SAS	Number of Subtest		Area SAS	Number of Subtest		Area SAS	Number of Subtests	
	1	2		1	2		1	2		1	2
53		60	88	44	90	123		120	158	79	150
54	27	61	89			124	62	121	159		151
55		62	90	45	91	125		122	160	80	152
56	28	63	91		92	126	63	123	161		153
57		64	92	46	93	127			162	81	
58	29	65	93		94	128	64	124	163		154
59			94	47	95	129		125	164	82	155
60	30	66	95		96	130	65	126	165		156
61		67	96	48	97	131		127	166	83	157
62	31	68	97			132	66	128	167		158
63		69	98	49	98	133		129	168	84	168
64	32	70	99		99	134	67				
65		71	100	50	100	135		130			

Quantitative Reasoning Area							
Conversion of the sum of subtest standard Age Scores (SAS'S) to Area SAS (all ages) Urban sample							
Area SAS	Number of Subtest	Area SAS	Number of Subtest	Area SAS	Number of Subtest	Area SAS	Number of Subtest
	1		1		1		1
32	16	67		102	51	137	
33		68	34	103		138	69
34	17	69		104	52	139	
35		70	35	105		140	70
36	18	71		106	53	141	
37		72	36	107		142	71
38	19	73		108	54	143	
39		74	37	109		144	72
40	20	75		110	55	145	
41		76	38	111		146	73
42	21	77		112	56	147	
43		78	39	113		148	74
44	22	79		114	57	149	
45		80	40	115		150	75
46	23	81		116	58	151	
47		82	41	117		152	76
48	24	83		118	59	153	
49		84	42	119		154	77
50	25	85		120	60	155	
51		86	43	121		156	78
52	26	87		122	61	157	
53		88	44	123		158	79
54	27	89		124	62	159	

To be continue

To be continue

Area Number of SAS Subtest	Area Number of SAS Subtest	Area Number of SAS Subtest	Area Number of SAS Subtest	Area Number of SAS Subtest	Area Number of SAS Subtest
1	1	1	1	1	1
55		90	45	125	
56	28	91		126	63
57		92	46	127	
58	29	93		128	64
59		94	47	129	
60	30	95		130	65
61		96	48	131	
62	31	97		132	66
63		98	49	133	
64	32	99		134	67
65		100	50	135	
66	33	101		136	68

Short-Term Memory Area
Conversion of the sum of subtest Standard Age Scores
SAS'S to Area SAS (all ages) Urban Sample

Area SAS	Number of Subtest		Area SAS	Number of Subtest		Area SAS	Number of Subtest		Area SAS	Number of Subtest	
	1	2		1	2		1	2		1	2
32	16	32_43	67		75	102	51	104	137		133
33		44	68	34	76	103		105	138	69	134
34	17	45	69		77	104	52	106	139		135
35		46	70	35		105		107	140	70	136
36	18	47	71		78	106	53	108	141		137
37		48	72	36	79	107			142	71	138
38	19	49	73		80	108	54	109	143		
39			74	37	81	109		110	144	72	139
40	20	50	75		82	110	55	111	145		140
41		51	76	38	83	111		112	146	73	141
42	21	52	77			112	56	113	147		142
43		53	78	39	84	113		114	148	74	143
44	22	54	79		85	114	57		149		144
45		55	80	40	86	115		115	150	75	
46	23	56	81		87	116	58	116	151		145
47			82	41	88	117		117	152	76	146
48	24	57	83		89	118	59	118	153		147
49		58	84	42	90	119		119	154	77	148
50	25	59	85			120	60	120	155		149
51		60	86	43	91	121			156	78	150
52	26	61	87		92	122	61	121	157		

To be continue

To be continue

Area SAS	Number of Subtest		Area SAS	Number of Subtest		Area SAS	Number of Subtest		Area SAS	Number of Subtests	
	1	2		1	2		1	2		1	2
53		62	88	44	93	123		122	158	79	151
54	27	63	89		94	124	62	123	159		152
55			90	45	95	125		124	160	80	153
56	28	65	91		96	126	63	125	161		154
57		66	92	46		127		126	162	81	155

Composite SAS (Age 3-0-0 through 9-0-0)
Conversion of the sum of Area SAS to Composite SAS Urban Sample.

Number of Area				Number of Area				Number of Area				Number of Area			
SAS	Scores			SAS	Scores			SAS	Scores			SAS	Scores		
	1	2	3		1	2	3		1	2	3		1	2	3
32	32	32	46	67	67	145	215	102	102	208	301	137	137	272	389
		82	129			146	216			209	303			273	390
33	33	83	130	68	68	147	217	103	103	210	304	138	138	274	391
		84	132			148	219			211	305			275	393
34	34	85	133	69	69	149	220	104	104	212	306	139	139	276	394
		86	134			150	221			213	308			277	395
35	35	87	135	70	70	151	222	105	105	214	309	140	140	278	396
		88	137				224				310				398
36	36	89	138	71	71	152	225	106	106	215	311	141	141	279	399
		90	139			153	226			216	313			280	400
37	37	91	140	72	72	154	227	107	107	217	314	142	142	281	401
		92	142			155	228			218	316			282	403
38	38	92	143	73	73	156	229	108	108	219	317	143	143	283	404
		93	144			157	230			220	318			284	405
39	39	94	145	74	74	158	231	109	109	221	319	144	144	285	406
		95	147			159	233			222	320			286	408
40	40	96	148	75	75	160	234	110	110	223	321	145	145	289	409
		97	149				235				323				410
41	41	98	150	76	76	161	236	111	111	224	324	146	146	290	411
		99	152			162	238			225	325			291	413
42	42	100	153	77	77	163	239	112	112	226	326	147	147	292	414
			154			164	240			227	328			293	415
43	43	101	155	78	78	165	241	113	113	228	329	148	148	294	416
		102	157			166	243			229	330			295	418
44	44	103	158	79	79	167	244	114	114	230	331	149	149	296	419
		104	159			168	245			231	333			297	420
45	45	105	160	80	80	169	246	115	115	232	334	150	150	298	421
		106	162				247				335				423

To be continue

Number of Area				Number of Area				Number of Area				Number of Area			
SAS	Scores			SAS	Scores			SAS	Scores			SAS	Scores		
	1	2	3		1	2	3		1	2	3		1	2	3
46	46	107	163	81	81	170	248	116	116	233	336	151	151	299	424
		108	164			171	250			234	338			300	425
47	47	109	165	82	82	172	251	117	117	236	339	152	152	301	426
		110	167			173	252			237	340			302	428
48	48	111	168	83	83	174	253	118	118	238	341	153	153	303	429
		112	169			175	255			239	343			304	430
49	49	112	170	84	84	176	256	119	119	240	344	154	154	305	431
		113	172			177	257			241	345			306	433
50	50	114	173	85	85	178	258	120	120	242	346	155	155	307	434
		115	174				260				348				435
51	51	116	175	86	86	179	261	121	121	243	349	156	156	308	436
		117	177			180	263			244	350			309	438
52	52	118	178	87	87	181	264	122	122	245	351	157	157	301	439
		119	179			182	265			246	353			311	440
53	53	120	180	88	88	183	266	123	123	247	354	158	158	312	441
		121	181			184	268			248	355			313	443
54	54	122	182	89	89	185	269	124	124	249	356	159	159	314	444
			184			186	270			250	358			315	445
55	55	123	185	90	90	187	271	125	125	251	359	160	160	316	446
		124	186				273				360				447
56	56	125	187	91	91	188	274	126	126	252	361	161	161	317	448
		126	189			189	275			253	363			318	450
57	57	127	190	92	92	190	276	127	127	254	364	162	162	319	451
		128	191			191	278			255	365			320	453
58	58	129	192	93	93	192	279	128	128	256	366	163	163	321	454
		130	194			193	280			257	368			322	455
59	59	131	195	94	94	194	281	129	129	258	369	164	164	323	456
			196			195	283			259	370				458
60	60	132	197	95	95	196	284	130	130	260	371	165	165		459
		133	199				285				373				460
61	61	134	200	96	96	197	286	131	131	261	374	166	166	324	461
		135	201			198	288			262	375				462

To be continue

To be continue

Number of Area				Number of Area				Number of Area				Number of Area			
SAS	Scores			SAS	Scores			SAS	Scores			SAS	Scores		
	1	2	3		1	2	3		1	2	3		1	2	3
162	162	136	202	97	97	199	289	132	132	263	376	167	167	336	504
		137	204			200	290			264	378				
163	163	138	205	98	98	201	291	133	133	265	379	168	168		
		139	206			202	293			266	380				
164	164	140	207	99	99	203	294	134	134	267	381				
			209			204	295			268	383				
165	165	141	210	100	100	205	296	135	135	269	384				
		142	211				298				385				
166	166	143	212	101	101	206	299	136	136	270	386				
		144	214			207	300			271	388				

APPENDIX - E

Age - 3 year
Subtest Raw Scores 0-42

[illegible][illegible]

[illegible]

Table
 Abstract / Visual Reasoning Area
 Conversion of the sum of subtest Standard Age Scores
 (SAS'S) to Area SAS (all ages), rural sample.

Area	Number of		Area	Number of		Area	Number of		Area	Number of	
SAS	Subtests		SAS	Subtests		SAS	Subtests		SAS	Subtests	
	1	2		1	2		1	2		1	2
28	14	28_36	62	31	66	96	48		130	65	125
29		37	63		67	97		96	131		126
30	15	38	64	32	68	98	49	97	132	66	
31		39	65		69	99		98	133		127
32	16	40	66	33		100	50	99	134	6	128
33		41	67		70	101		100	135		129
34	17		68	34	71	102	51	101	136	68	130
35		42	69		72	103			137		131
36	18	43	70	35	73	104	52	102	138	69	132
37		44	71		74	105		103	139		
38	19	45	72	36	75	106	53	104	140	70	133
39		46	73			107		105	141		134
40	20	47	74	37	76	108	54	106	142	71	135
41		48	75		77	109		107	143		136
42	21		76	38	78	110	55	108	144	72	137
43		49	77		79	111			145		138
44	22	50	78	39	80	112	56	109	146	73	
45		51	79		81	113		110	147		139
46	23	52	80	40	82	114	57	111	148	74	140
47		53	81			115		112	149		141
48	24	54	82	41	83	116	58	113	150	75	142

To be continue

To be continue

Area	Number of		Area	Number of		Area	Number of		Area	Number of	
SAS	Subtest		SAS	Subtest		SAS	Subtest		SAS	Subtests	
	1	2		1	2		1	2		1	2
49		55	83		84	117		114	151		143
50	25		84	42	85	118	59		152	76	144
51		56	85		86	119		115	153		145
52	26	57	86	43	87	120	60	116	154	77	
53		58	87		88	121		117	155		146
54	27	59	88	44	89	122	61	118	156	78	147
55		60	89			123		119	157		148
56	28	61	90	45	90	124	62	120	158	79	149
57		62	91		91	125			159		150
58	29		92	46	92	126	63	121	160	80	160
59		63	93		93	127		122			
60	30	64	94	47	94	128	64	123			
61		65	95		95	129		124			

Quantitative Reasoning Area
conversion of the sum of subtest Standard Age Score
(SAS'S) to Area SAS (all ages), rural sample.

Area SAS	Number of subtest	Area SAS	Number of subtest	Area SAS	Number of subtest	Area SAS	Number of subtest
	1		1		1		1
28	14	62	31	96	48	130	65
29		63		97		131	
30	15	64	32	98	49	132	66
31		65		99		133	
32	16	66	33	100	50	134	67
33		67		101		135	
34	17	68	34	102	51	136	68
35		69		103		137	
36	18	70	35	104	52	138	69
37		71		105		139	
38	19	72	36	106	53	140	70
39		73		107		141	
40	20	74	37	108	54	142	71
41		75		109		143	
42	21	76	38	110	55	144	72
43		77		111		145	
44	22	78	39	112	56	146	73
45		79		113		147	
46	23	80	40	114	57	148	74
47		81		115		149	
48	24	82	41	116	58	150	75
49		83		117		151	
50	25	84	42	118	59	152	76

To be continue

To be continue

Area SAS	Number of subtest 1	Area SAS	Number of subtest 1	Area SAS	Number of subtest 1	Area SAS	Number of subtest 1
51		85		119		153	
52	26	86	43	120	60	154	77
53		87		121		155	
54	27	88	44	122	61	156	78
55		89		123		157	
56	28	90	45	124	62	158	79
57		91		125		159	
58	29	92	46	126	63	160	80
59		93		127			
60	30	94	47	128	64		
61		95		129			

Table
Short Term Memory Area
Conversion of the sum of subtest Standard Age Scores
(SAS'S) to Area SAS (all ages), rural sample.

Area SAS	Numbr of Subtests		Area SAS	Number of Subtests		Area SAS	Number of Subtests		Area SAS	Number of Subtests	
	1	2		1	2		1	2		1	2
28	14	28_37	62	31	67	96	48	96	130	65	128
29		38	63			97		97	131		129
30	15	39	64	32	68	98	49	98	132	66	130
31		40	65		69	99			133		131
32	16	41	66	33	70	100	50	99	134	67	
33		42	67		71	101		100	135		132
34	17	43	68	34	72	102	51	101	136	68	133
35			69		73	103		102	137		134
36	18	44	70	35		104	52	103	138	69	135
37		45	71		74	105		104	139		136
38	19	46	72	36	75	106	53		140	70	137
39		47	73		76	107		106	141		
40	20	48	74	37	77	108	54	107	142	71	138
41		49	75		78	109		108	143		139
42	21		76	38	79	110	55	109	144	72	140
43		50	77			111		110	145		141
44	22	51	78	39	80	112	56	112	146	73	142
45		52	79		81	113			147		143
46	23	53	80	40	82	114	57	113	148	74	
47		54	81		83	115		114	149		144
48	24	55	82	41	84	116	58	115	150	75	145

To be continue

To be continue

Area SAS	Numbrr of Subtest		Area SAS	Number of Subtest		Area SAS	Number of Subtest		Area SAS	Number of Subtests	
	1	2		1	2		1	2		1	2
49			83		85	117		116	151		146
50	25	56	84	42		118	59	117	152	76	147
51		57	85		86	119		118	153		148
52	26	58	86	43	87	120	60		154	77	149
53		59	87		88	121		119	155		
54	27	60	88	44	89	122	61	120	156	78	150
55		61	89		90	123		121	157		151
56	28		90	45	91	124	62	122	158	79	152
57		62	91		92	125		123	159		153
58	29	63	92	46		126	63	124	160	80	160
59		64	93		93	127					
60	30	65	94	47	94	128	64	126			
61		66	95		95	129		127			

Table
 Composite SAS (ages 3-0-0 through 9-0-0)
 Conversion of the sum of Area SAS'S to Composite SAS (Rural Sample).

Area SAS	Nunbr of Area Scores			Area SAS	Number of Area Scores			Area SAS	Number of Area Scores			Area SAS	Number of Area Scores		
	1	2	3		1	2	3		1	2	3		1	2	3
28	28	28	42	62	62	138	1207	96	96	1200	1278	130	130	1262	1345
		78	125			139	1208			1201	1279				1346
29	29	79	126	63	63	140	1209	97	97	1202	1280	131	131	1263	1347
		80	127			141	1210			1203	1281			1264	1348
30	30	81	128	64	64	142	1211	98	98	1204	1282	132	132	1265	1349
			130			143	1212			1205	1283			1266	1350
31	31	82	131	65	65	144	1213	99	99	1206	1284	133	133	1267	1351
		83	132				1214			1207	1285			1268	1352
32	32	84	133	66	66	145	1215	100	100	1208	1286	134	134	1269	1353
		85	135			146	1216				1287			1270	1354
33	33	86	136	67	67	147	1217	101	101	1209	1288	135	135	1271	1355
		87	137			148	1218			1210	1289				1356
34	34	88	138	68	68	149	1219	102	102	1211	1290	136	136	1272	1357
		89	140			150	1220			1212	1291			1273	1358
35	35	90	141	69	69	151	1221	103	103	1213	1292	137	137	1274	1359
			142			152	1222			1214	1293			1275	1360
36	36	91	143	70	70	153	1223	104	104	1215	1294	138	138	1276	1361
		92	145				1224			1216	1295			1277	1362
37	37	93	146	71	71	154	1225	105	105	1217	1296	139	139	1278	1363
		94	147			155	1226				1297			1279	1364
38	38	95	148	72	72	156	1227	106	106	1218	1298	140	140	1280	1365
		96	150			157	1228			1219	1299				1366
39	39	97	151	73	73	158	1229	107	107	1220	1300	141	141	1281	1367
		98	152			159	1230			1221	1301			1282	1368
40	40	99	153	74	74	160	1231	108	108	1222	1302	142	142	1283	1369
			155			161	1232			1223	1303			1284	1370

To be continue

Area	Numb of			Area	Number of			Area	Number of			Area	Number of		
SAS	Area Scores			SAS	Area Scores			SAS	Area Scores			SAS	Area Scores		
	1	2	3		1	2	3		1	2	3		1	2	3
41	41	100	1156	75	75	162	1233	109	109	1224	1304	143	143	1285	1371
		101	1157				1234			1225	1305			1286	1372
42	42	102	1158	76	76	163	1235	110	110	1226	1306	144	144	1287	1373
		103	1160			164	1236				1307			1288	1374
43	43	104	1161	77	77	165	1237	111	111	1227	1308	145	145	1289	1375
		105	1162			166	1238			1228	1309				1376
44	44	106	1163	78	78	167	1239	112	112	1229	1310	146	146	1290	1378
		107	1165			168	1240			1230	1312			1291	1379
45	45	108	1166	79	79	169	1241	113	113	1231	1310	147	147	1292	1380
			1167			170	1242			1232	1312			1293	1381
46	46	109	1168	80	80	171	1243	114	114	1233	1313	148	148	1294	1382
		110	1170				1244			1234	1314			1295	1383
47	47	111	1171	81	81	172	1245	115	115	1235	1315	149	149	1296	1384
		112	1172			173	1246				1316			1297	1385
48	48	113	1173	82	82	174	1247	116	116	1236	1317	150	150	1298	1386
		114	1175			175	1248			1237	1318				1387
49	49	115	1176	83	83	176	1249	117	117	1238	1319	151	151	1299	1389
		116	1177			177	1250			1239	1320			1300	1390
50	50	117	1178	84	84	178	1251	118	118	1240	1321	152	152	1301	1391
			1180			179	1252			1241	1321			1302	1392
51	51	118	1181	85	85	180	1253	119	119	1242	1322	153	153	1303	1393
		119	1182				1254			1243	1323			1304	1394
52	52	120	1183	86	86	181	1255	120	120	1244	1324	154	154	1305	1395
		121	1185			182	1256				1325			1306	1396
53	53	122	1186	87	87	183	1257	121	121	1245	1326	155	155	1307	1397
		123	1187			184	1258			1246	1327				1398
54	54	124	1188	88	88	186	1259	122	122	1247	1328	156	156	1308	1399
		125	1189			187	1260			1248	1329			1309	1400
55	55	126	1190	89	89	188	1261	123	123	1249	1330	157	157	1310	1401
			1192			189	1262			1250	1331			1311	1402

To be continue

Area	Number of			Area	Number of			Area	Number of			Area	Number of		
SAS	Area Scores			SAS	Area Scores			SAS	Area Scores			SAS	Area Scores		
	1	2	3		1	2	3		1	2	3		1	2	3
56	56	127	193	90	90	190	263	124	124	251	332	158	158	312	403
		128	194				264			252	333			313	404
57	57	129	195	91	91	191	265	125	125	253	334	159	159	314	405
		130	197			192	266				336				406
58	58	131	198	92	92	193	267	126	126	254	337	160	160	320	480
		132	199			194	268			255	338				
59	59	133	200	93	93	195	269	127	127	256	339				
		134	201			196	270			257	340				
60	60	135	203	94	94	197	271	128	128	258	341				
			204			198	272			259	342				
61	61	136	205	95	95	199	273	129	129	260	343				
		137	206				274			261	344				