CHAPTER 5
DISCUSSION OF RESULTS
CHAPTER 5

DISCUSSION

The present study has sought to develop a battery of memory tests for children. In this study, the results and integration of some of the findings with associated factors are discussed in the following sections.

1. Socio demographic variables.
2. The Influence of Intelligence on Memory
3. The Effect of Age and gender on Memory Development.
4. The factor structure of Memory.
5. Memory Deficits in Clinical conditions.
6. Psychological Approaches to the Management of Memory Impairment.

SECTION I: SOCIO DEMOGRAPHIC VARIABLES

In the main study, the scale developed was administered on a large representative sample of both sexes as per the inclusion and exclusion criteria. Children between the age group of 7-11 years were drawn from four schools. These children were from urban, middle, socio economic background. It is possible to chart a profile for each subtest and estimate a memory quotient reflecting an overall test performance. The subtests of memory scores correlated positively (0.14-0.58) with the scores on the Raven's Coloured Progressive Matrices test. Test-retest reliability was also found to be high. Agewise norms were developed
across 7-11 years age groups. An attempt was made to find out the clinical validity.

As stated earlier the test was administered to children of the age group 7-11 years. The reason for testing children of this age group was that developmental changes in "ordering" reflect the growth of certain grouping differences during the early concrete operational period (Piaget and Inhelder, 1963). Due to the development of "concrete operations" around 7 years of age, they can accomplish tasks easily from this age onwards (Flavell, 1963).

One environmental variable that can influence an individual's developmental performance, which has attracted considerable interest, is formal schooling. The powerful effects of schooling have been found in a number of studies. The child's school experiences play a significant role in the developmental changes, in strategies used and in cognitive processing skills. Over the elementary school years, children become increasingly adept at planning and executing appropriate memory strategies and also become more aware of their own memory processing. There are suggestions from cultural research that exposure to formal schooling plays an important role (Schneider and Pressley, 1989; Wagner 1978). Urban and rural school going children were more likely to conserve than non-schooled rural children. The position effects of formal schooling on memory have also been studied.
It was hypothesized that the high performance of urban schooled children was a function of mnemonic strategies such as verbal rehearsal. Cole, Gay, Glick and Sharp (1971) found that schooled children show enhanced memory abilities over non-schooled children. Among the important differences was the spontaneous use of clustering strategies in free recall by schooled children which was a common behaviour. In the present study four English medium government aided schools were selected, so that there would be uniformity in their syllabus and the instructional patterns would be more or less comparable. Children came from the middle socio-economic status family background were able to take the test in English. Children who grow up in poverty may not have the skill they need to use (De Angelis, 1993).

In the present study 573 normal children and 75 epileptic children were assessed. It was possible to chart a profile for each subject and estimate a memory quotient reflecting an overall test performance. A comparison of the performance on each subtest administered in the normal and the clinical children revealed a wide scatter. The profile variance is a better index of profile variability because it utilizes all subtest scores rather than the extreme and is based on a constant set of observations for each individual within all groups of concern. Employing the test statistics described herein, it is possible to assess statistically the
equality of profile variance across several groups. This allows researchers to ascertain statistical significance of observed differences in profile variability. Profile variability measured through the technique described here also may have substantial diagnostic utility. Similar findings have been reported in previous researches (Matarazzo, 1972; Sattler, 1974). While statistically significant differences in the range of subtest scores have been shown to occur between normal and epileptic children, small difference was noticed on Word Recall Meaningful and Cattell's Retentivity Test. Other measures such as variance of the total scores, are also less sensitive to profile variance.

In clinical practice as well as in schools, psychologists involved in assessment believe that a large degree of test scatter characterizes certain types of psychological disorders (Wangu & Bush, 1971; Zimmerman and Woo Sam, 1973). The concept of abnormal scatter has been especially prevalent in the epileptic group in the current research work.

The present study supports the utilitarian nature of the battery of memory tests. Normative data reported in this study may be helpful for comparing clinical groups with memory impairment.
The Influence of Intelligence on Memory

Whatever role memory plays within the wider faculty of cognitive ability, a very high correlation with tests of intelligence would render memory tests insensitive. Various studies though of interest, fail to prove the existence of separate memory ability. In the first place, general intelligence has not always been partialled out, so that the relative contribution of intelligence and the hypothetical memory factors cannot be determined (Erickson and Scott, 1977).

In a review by Erickson and Scott (1977), the Wells and Martin's scale correlated positively (0.81) with the Stanford Binet Intelligence Scale (IQ). Babcock scale had a high correlation (0.83) with the total score as measured by vocabulary. Eysenck and Halstead (1945) intercorrelated 15 subtests of memory with intelligence as measured by the Raver Progressive Matrices. They found that all the memory tests correlated positively with the intelligence scores (0.63 to 0.96). Whatever the place memory holds within the wider field of cognitive ability, memory tests should not correlate so highly with tests of intelligence. The correlation of Memory for Designs with Progressive Matrices was 0.72 and 0.61 with Mill Hill Synonym test. There was also a significant correlation between Memory for Designs and WAIS
Interestingly, the correlation of MQ and IQ were low. Ivinskis et al. (1977) report a correlation coefficient of 0.56 between WAIS Form I IQ and WAIS full scale IQ in older children (10 - 14 years). Also in normal adolescents (16 - 18 years) MQ and WAIS full scale IQ were correlated at (+.44).

In a study by Pershad (1976) the correlation of the scores on P.G.I. Memory scale and Bhatia's Battery scale ranged between (0.22 - 0.55). Correlations are considerably less than the earlier reported correlations to (0.65 - 0.96) by various authors reported in the literature.

Intelligence testing may not provide the information we need about a person's learning and memory capabilities. It is evident that traditional tests are tapping not one but several fairly independent dimensions of cognitive functioning. Learned skills that have been acquired through education and acculturation have more to do with a person's abilities to adapt to the demands of the current situation.

Findings on paired associate task and I.Q. test correlated poorly (Babock & Levy, 1940; Dejovne and Levy 1971, Eysenck & Halstead, 1945; Ivinskis et al., 1971).

The Rivermead Behavioural Memory Test (RBMT-C) for children correlated significantly with intelligence. For 7 - 9 year olds, however, intelligence and RBMT-C scores did not show a significant relationship. It was clear that for the
older children, the (RBMT-C) is within their intellectual capability and any problem they encounter with it arises solely from its demands on memory.

In the present study the five age groups were compared on each of the subtest scores as well as on the total Memory score with the Coloured Progressive Matrices test. The Ravens Coloured Progressive Matrices test was found to have significant positive relationship with memory score ranging from 0.14 to 0.42 except on subtests Word Recall Meaningful and Digit Forward. The effect of intelligence was partialled out in order to arrive at true memory scores.

In the case of boys, except for meaningful and non-meaningful Word Recall and Digit Forward, the tests correlated positively with intelligence. The effect of intelligence was partialled out to get true score of memory on learning and retention. Also in the case of the girls, except on subtests such as Story Recall Immediate, Word Recall Meaningful, Word Recall Non Meaningful and Delayed Response learning the subtests correlated positively with intelligence score. The effect of intelligence was partialled out to get a true score of memory on learning and retention.

The above findings support the view that the interpretation or relationship between intelligence and memory is influenced by variables such as age, gender, and the nature of tests.
The effect of age & gender on Memory Development

In the present investigation, the children's mean scores had an increasing trend on tests such as Mental control, Story Recall Delayed, Delayed Response learning and Cattell's Retentivity test indicating that their performance improves with age. The results provide evidence of developmental differences (Buschke, 1973; Kobasigawa, 1977; Perlmutter and Myers, 1978). The older children retain better than the younger ones. The results reflect that older subjects have the increased tendency to use mnemonic mediators. This indicates that with increase in age less effort is required to use an active rehearsal strategy.

On subtests such as Personal Information, Sentence Repetition, Immediate Story Recall, Meaningful Word Recall, Non-Meaningful Word Recall, Picture Recall, Benton Visual Retention test, Paired Associate Learning and Cattell's Retentivity test, the results of present study indicate that grouping items on the basis of unrelated category labels at input is not sufficient. This presents the possibility of a capacity difference between 7 and 11 year old children in their ability to retain short lists of unrelated items over brief delay intervals. The purpose of the present study was to examine the relationship between children's strategy use and their memory knowledge. The discrepancy between input and output organization found here for young children may
reflect differences in processing requirements of these components of the tasks. One might expect patterns of retrieval to reflect patterns of inter-item associative relatedness in semantic memory, particularly for young children who do not organize their retrieval deliberately along a specific dimension (Lange, 1973, 1978).

On subtests Digit Forward and Digit Backward the performance of the subjects across 7-11 years was uniform. The results are not in line with the earlier findings of Haronson (1967). The children in the present study actively used acquisition and retention strategies. The echoic memory traces resulting from auditory presentation indicate that children translate the codes effectively to auditory memory. The capacity for sustained selective attention and for reflective, non-impulsive responding is affected by both maturation and learning.

Children of the same chronological age often differ enormously on their memory skill. Children have individual mnemonic strengths and weaknesses. A young child's memory deficits can in part, be attributed to his failure to organize information at the time of item presentation i.e; at input. (e.g., Bjorklund, Ornstein & Haig, 1977; Langes Griffith, 1977; Moely et al, 1969). Campione and Brown, (1977) grouped children on age and sex and administered memory tasks. The children within a group could never
remember exactly the same amount of information. Indeed the differences within a group indicate that there are still differences between individuals that need to be examined, presumably, by considering additional characteristics of individuals.

Studies indicate sex differences in the overall cognitive functioning. Girls score higher than boys on tests of verbal ability while the reverse is true for tests of spatial ability (Harring, 1978; Kail and Siegal, 1973). The results from the present study support the findings for girls but the boys' performance yielded diverse results. Tyler (1956) reported the performance of girls to be superior on recall of digits and reproduction of geometric figures. Osler and Kofesky (1965) found "no concept performance" among 4, 6 and 8 year olds as a function of sex. In general, ability to utilize memory cues increases differentially, with age for males and females. It is uncertain from past results whether the ability to use memory cues exists from birth, or if boys and girls diverge at some particular age.

Over the past decade, a rich data base describing development of memory strategies during the elementary school years has been amassed (Chi, 1983; Kail and Hagen, 1977; Ornstein and Naus, 1978). The present study has shown that children become more proficient in spontaneously generating strategies for storing and retrieving information as they grow older. In
fact, memory development during middle childhood has been characterized as the achievement of the effective use of memory strategies (Brown, 1975; Ornstein and Naus, 1978). However, information directly examining deliberate memorization in younger children has been sparse. Consequently, relatively little is known about the emergence and development of memory strategies during early childhood (Ornstein and Naus, 1983).

The present study partially augments the current status of this understanding by identifying the child's early attempt at memorization and mnemonic effectiveness of these early efforts in deliberate remembering and exploring changes in spontaneous mnemonic activity during early childhood.

Memory strategies focussed on the identification of the point in development in which the child could differentiate memorization from perception. Children must learn that memorization is an active process, requiring deliberate activity before they can learn to use specific mnemonic mediators.

In a study by (Appel, Copper, Mccarrell, Ivins Knight, Yussin & Flavell, 1972), a comparison was made of the behaviours of those children who were asked to remember specified stimulus items and those children instructed simply to look at the stimuli. The results of the investigators suggested that young children do
not behave differently when asked to perceive and to remember. The results fostered the conclusion that preschoolers have not developed the concept of memorization as an active process requiring deliberate activity (Wellman, 1977). As discussed by Wellman (1977), the initial investigations in this area often equated the child's deliberate memory strategies with those adults use (e.g., rehearsal and organization). Thus, the procedures did not encompass the consideration of simple behavioural strategies through which very young children might evidence intentional remembering. Although children could express early efforts in memorization through physical manipulation of the stimuli, visual inspection of the task to be remembered, items, or unelaborated verbalizations, these behaviours might not be taken as evidence of memorization.

These behaviours might not be taken as evidence of memorization. To facilitate the consideration of behavioural strategies within the young child's repertoire that might represent deliberate mnemonic activities, experimenters used simplified task settings (e.g., Heisel & Ritter, 1982; Wellman, Ritter & Flavell, 1975). In general, the child was asked to remember about an object's location, and could meet the task demands with simple non-verbal mnemonic mediation. The use of such simple recognition paradigms demonstrated that even 3 year old can evidence deliberate planful
behaviours in the performance of memory tasks (Flavell & Wellman, 1977).

Although the use of simple task settings has contributed significantly to the understanding of a young child's capacities to prepare intentionally for a memory demand, they have not focused attention directly on the development of memory strategies. The highly specific nature of many of these tasks does not facilitate the examination of the behaviour that children often use in attempting to remember. The simple verbal and nonverbal behaviours that young children may themselves generate as mnemonic mediators are not readily encompassed in many types of memory for locating paradigms. These simple behaviours could reflect rudimentary forms of the memory strategies used by older subjects. Hence, their expression in young children may constitute a point of origin for investigations of the development of memory strategies.

Factor Structure of Memory:

In the present study 99 variables measuring various memory factors of 573 children were factor analysed to examine the underlying factor pattern and to reduce the number of variables to a meaningful number. The analysis showed that 30 factors had an eigen value of 1.00 and above totally accounting for 61% of the variance. However, except for the first factor, which accounted for 15% of the total
variance, the rest of the factors accounted for variance less than 5% each indicating that memory emerged as an unidimensional construct.

In the literature, factor analysis has essentially been applied to Wechsler Memory Scale and 3 factors were found to have emerged (Bachrach and Mintz, 1974 and Kear-Colwell, 1973). Factor-I consisted of Orientation, Mental Control; Factor-II consisted of Digit Span; Factor-III consisted of Logical Memory, Paired Associate Learning and Visual Reproduction.

A repetition of the study with larger samples would throw light on the vexed question of memory. The results of the present investigation are sufficiently definite to state that the practice of testing memory by the usual clinical tests is unsatisfactory, and that these measure intelligence rather than memory. In addition, it is also possible that a slight memory factor may have escaped through the none too fine sieve of our probable errors; and its contribution to the total score on any of the memory tests examined would not be large enough in any individual case to outweigh the much more considerable contribution of the general cognitive factor.

Factor analysis of one of the most commonly used memory scales, the Wechsler Memory Scale (Wechsler, 1945), has generally failed to find distinct verbal and nonverbal
factors (Prigatano, 1978, Skilbeck & Woods, 1980). The most commonly found factors include: A) general memory/learning factor composed of Logical Memory, Visual Reproduction, and Associate learning subtests; B) Attention/Concentration factor composed of Mental Control, Digit Forward and Digit Backward subtests; and C) Personal Information/Orientation factor composed of the Personal and Current Information and the Orientation subtests. Support for the WMS subtests of Logical Memory and Paired Associate learning as measures of verbal learning and of memory has been reported by Larrabee, Kane, & Schuch, 1983, Larrabee, Kane & Schuch, 1983; Larrabee, Kane, Schuch & Frances, 1985). In the Russell's (1975) revised version of the WMS, when a verbal Recall, and Delayed condition was factor analysed, the results indicated an increased loading on a general visual Memory Factor. Larrabee et al. (1985) concluded that Delayed Recall of the Verbal Recall subtest may be a better measure of visual memory than Verbal Recall and Immediate Recall. Therefore, the WMS subtests of Logical Memory (Immediate and Delayed Recall), Associate learning and Delayed Verbal Recall may be useful in devising a battery of verbal and non-verbal memory scales.

Heilbrunner, Buck and Adams (1989) factor analyzed a set of verbal and nonverbal neuropsychological memory measures. They arrived at a factor solution composed of a visuo constructive/visuo cognitive factor (made up of Verbal
Recall, Tactual Performance Test Memory, Tactual Performance test, location category, and the WAIS/WAIS-R Block design and Object Assembly subtests) a verbal learning factor (made up of Logical Memory, Associative Learning and Luria Memory words immediate and delayed recall), a general verbal factor (made up of logical Memory, and WAIS/WAIS-R) information and vocabulary, and attention/concentration factor (made up of the WMS mental control and Digit span). The researchers concluded that Associate Learning may be a better measure of verbal learning and memory than Logical Memory as suggested by Larrabee et al. (1985) that logical Memory in immediate and delayed conditions may be a useful measure of verbal learning and memory, that logical Memory delayed may be a purer verbal memory than Logical Memory Immediate, and Tactual Performance Test Memory and Tactual Performance Test location may be useful measures of nonverbal/Visual Spatial Memory.

Russell (1982) factor analyzed the WMS and tests from the Halstead Reitan Battery. He interpreted the results as indicating that five kinds of memory were represented in the factorial solution. Most notably, for the present purposes the factors were verbal memory immediate and delayed and non-verbal incidental learning (TPTM and TPTL). The verbal Recall subtest loaded on a factor that included the WAIS - R Block Design subtest and the category Test of the Halstead Reitan Neuropsychological Battery.
The existence of memory as a multidimensional construct linking together all the tests involving learning retention and recall or recognition is more questionable than it appeared at first.

Memory Deficits in clinical conditions

Children with epilepsy have poorer concentration and mental processing and are less alert than non-matched controls. The relationship between cognitive functioning and epilepsy is complex; with widely differing degrees of intellectual impairment, ranging from minimal to severe, and progressive cognitive impairment related to diverse types of epileptic seizures, syndromes and other aetiological factors. Prolonged and frequently repeated seizures are typically associated with more severe effects on cognitive functioning, particularly in epilepsy secondary to a demonstrable brain lesion (Trimble, 1990). A combination of such factors may contribute to the mental deterioration seen in children suffering from severe epilepsy. The findings from the present research revealed that there was no significant difference noticed on subtests Word Recall Meaningful and Cattell's Retentivity test. There was significant impairment on Personal Information, Mental Control, Logical Memory, Digit Forward, Digit Backward, Delayed Response learning, Picture Recall, Benton Visual Retention test, Story Recall Delayed, Non Meaningful Word Recall, Paired Associate
learning and Total Memory Score. This would have negative implications for progress in school and possibly account for some of the educational difficulties of epileptic children (Holdsworth and Whitmore, 1974; Stores and Hart, 1976; Stores et al, 1978; Stores and Bannett Levy, 1993). It has become apparent that memory difficulties in epilepsy are multifactorial in origin. The findings from these studies are difficult to interpret (Nellson, 1980). However, variables such as aetiology, type of epilepsy, seizure type, hemisphere side, site of focus, seizure frequency, age of onset and duration of disorder may influence memory test performance (Loiseau, Strube & Signoret, 1983; Thompson, 1991). Furthermore, antiepileptic drugs, appear to influence memory and concentration. (Butlin Danta and Cook, 1990; Duncan, Shorran and Trimble, 1989; Galassi, Morris, Lorusso Procaccianti Lugasreti and Barazzi, 1988; Thompson and Trimble, 1992). However, the clinical evidence implies that factors other than the neurological condition and treatment are also at work. For example, some patients whose histories would suggest that they are "low risk" on cases often report no difficulty, and cases with comparable histories may differ only in their level of memory complaint. Gourlay (1990) supports the view point that learning problems of students with epilepsy are certainly common enough to be of major concern, taking many and varied forms. Academically, deficiencies are said to be the greatest in certain areas:
arithmetic, spelling, reading, and word recognition. Such deficiencies probably reflect impairment of specific learning processes. Thus, reading problems that obviously interfere with the whole educational process may result from impaired verbal abilities. Poor motor ability may result in difficulties with hand writing and generally show slow performance on mental processing problems, both visual and auditory, and can cause difficulties in all these areas. Problem solving ability may be impaired, especially with frontal lobe lesions, and forgetfulness is very common among students with epilepsy. A wide variety of cognitive deficiencies has been observed in these children. Stores (1981) reported impaired memory functioning and reduced attention capacity, whereas Knight and Tymchuk (1968) found difficulties with abstract reasoning. Reduced information processing efficiency has been observed. In a direct comparison of cognitive functioning in children with epilepsy Seidenberg et al (1988) showed that a group of underachieving children were distinctly impaired on measures of auditory, perceptual and language processing abilities and on measures of attention and concentration.

Psychological Approaches to the Management of Memory Impairment

Memory Impairment is a handicap to those who suffer from it and a number of ways have been devised to try to help
those afflicted. Effective psychological approaches are likely to be based on methods designed either to make the most efficient use of remaining memory capacity, or to alter the environment so as to reduce the demands placed on memory.

One method to enhance memory is through repetition, drills or practice. There is no good evidence that this is an effective method as reported by O'connar & Cermak, (1987). Sohlbery & Matter, (1989). These skills have to be consciously learned and used, often requiring considerable effort by the epileptic children.

One factor known to have a powerful effect on normal memory is imagery, this finding is corroborated by other researchers like Paivio, (1971) and Jones (1974). This is one of the familiar, natural memory strategies, that could be taught to epileptic children as part of normal memory skills.

There are other approaches like the internal and external strategies. The internal strategies involve such things as the use of imagery that requires the child to carry-out some form of internal mental manipulation. In contrast, external strategies rely on something outside the person such as making a shopping list to remember, what to buy at the market, making note on a piece of paper and leaving it somewhere, where it is likely to be seen, put an object in a prominent place, keeping a diary, making a list,
and so on all used at sometime by most children. On the other hand, internal strategies, such as the use of mnemonics, were rarely employed. Certainly many students use mnemonics, particularly of the first letter and rhyme varieties. Epileptic children also use these mnemonics although much less often than they use many external aids. They do not wish to be seen using external aids, because it might mark them out as handicapped.

Normal children rely on external strategies and it has been argued that internal strategies have limitations. Those with impaired memories may find the systematic use of external strategies helpful. Some of the preliminary work along these lines has been reported by McKinley & Hickox (1988).

Based on earlier studies, a clearer understanding of ADD-H children, gearing remediation programming to the developmental level of the child is a necessary requirement. The younger ADD-H children seem to benefit more from explicit practice in strategy selection, implementation and generalization under low effort conditions. Older ADD-H children also need training in cognitive skills, but the present study results suggests adequate implementation under less effortful conditions; so repeated practice with application of specific skills under gradually more effortful conditions may be more productive for them. As noted by
Ackerman et al. (1986), the repetition necessary for mastery is particularly difficult for those children due to their core symptoms, so judicious use of frequent rewards is needed to maximize attention and motivation.

Learning disabled reader's poor memory may be due to fewer or weaker interconnections of the verbal and visual coding systems. There is some indirect evidence to suggest that learning disabled readers do not use verbal codes or integrate those codes for effective storage and retrieval of visual information (e.g., Ceci, 1982; Ceci, Lea & Ringstrom, 1980; Perfetti, Finger & Hogo Boam, 1978; Shankwaler, Liberman, Mark Fowler & Fischer, 1979; Swanson, 1983; Vellutino, Steger, De setto & Phillips, 1975). For example, Swanson (1983) found that verbal codes improve episodic memory of visual information for skilled readers, while memory of learning disabled readers seems unrelated to the integration of nonverbal and semantic representations. The nature of learning disabled readers' poor integration of visual and verbal codes is uncertain. One hypothesis is that skilled readers' episodic memory has interdependent visual and verbal coding systems, but in learning disabled children words fail to establish interconnections with visual codes and such a failure impairs memory of visual information. The existence of an interdependent coding system in skilled readers assumes that a word applied to a visual form activates a network of both verbal and non verbal
associations and hence produce multiple coding of input. Such multiple processing might be expected to facilitate storage, because with multiple codes, even if some codes have dissipated the subject may be able to recover information from remaining codes. Skilled readers may possess a better implicit interconnection between coding system than learning disabled readers.

Psychologists and educators have long known that retarded children remember less well than nonretarded children. Perhaps retarded children are less likely to use mnemonic strategies. Memory traces decay more rapidly in retarded than in non retarded persons.

Memory deficits were found in the subjects failure to use strategies appropriately (Belmont and Butterfield, 1971; Brown, 1974). Recall of items from the beginning of the test was uniformly low, suggesting absence of rehearsal.

In many ways retarded and non retarded individuals differ in their memory skills. From the results of a study by Campione Brown and Murphy (1974), with the three criteria, durability, generalization and minimization of retarded and non retarded differences it is clear that the goal of durability can be achieved. Differences in speed of memory search have been found between retarded and non retarded children - an important issue confronting researchers who are
interested in fostering the intellectual development of retarded children. The retarded child is mnemonically similar to the young school age child, the retarded child does not use strategies spontaneously, but he can be trained to do so and such instruction may produce lasting change in the trained behaviours.

Over the elementary school years, children become increasingly adept at planning and executing appropriate memory strategies and also become more aware of their own memory processes. We know little about factors in the child's environment that contribute to these developmental changes. Brown, Bransford, Ferrara & Campione (1973), Kail & Hagen (1973) and Moely (1977) advocate differential effects of training on strategy maintenance and generalizations as a function of the child's development.

In the present study the battery of tests of memory for children was devised to meet the need for an economical yet effective screening procedure. It also attempted to provide normative data for children. It provides a comprehensive coverage of the various aspects of memory disabilities and throws light on various clinical conditions with associated memory problems.
IMPLICATIONS OF THE STUDY:

Developmental memory research certainly flourished following the adoption and developmental adaptation of the general information processing model. During the grade school (i.e., 5 to 11 years of age), speed of information processing increases. A number of memory strategies emerge and develop, with the development of rehearsal and organizational strategies for list learning documented in some detail. Factual knowledge about memory increases during this period, and monitoring improves. The knowledge base continues to develop and greatly facilitates learning of content that is related to knowledge already possessed by children.

The subtests measure different aspects of memory and employ different methods of recall. Hence the scale can be used effectively to assess variations of memory among children.

The Battery of memory tests can be used to evaluate memory deficits in various clinical conditions at an early stage in order that attainable goals and the support to achieve them can be offered without delay.

Children with varied academic abilities can be taught covert verbalization or inner speech which is important for both short and long term memory.
LIMITATIONS OF THE STUDY

1. The present investigation has focused only on an urban population and hence lacks information about the rural population.

2. The cross-sectional paradigm used can only provide information about developmental differences. It is difficult to account for developmental changes.

3. The need to validate these tests with concurrent and other clinical conditions to provide more defined information about the child's deficits.

4. It will be important to prepare equivalent forms, to establish alternative form to allow monitoring of change over time.