REVIEW OF LITERATURE
Webster’s dictionary (1967) defines memory as the power or process of reproducing or recalling what has been learned and retained especially through associate mechanisms. Alternately, it refers to the store of things learned and retained as evidenced by recall and recognition. From a common sense point of view, memory may refer to a complex sequence of events that commence with the presentation of information through the sensorium to the brain and its later retrieval on a given occasion. What transpires between these two points has been the subject of multitudes of investigations, inferences and relentless debates. The terminology used to refer to the scores of facets that constitute memory have been changing so frequently, even as processes they signify change their boundaries with every new insight, that the whole scenario is confusing, unless one keeps a constant track of developments. Nevertheless, an attempt has been made in the following pages, to extract relevant information from the medley of mazes of documented studies that appear to be pertinent to the components of the present investigation. Understandably, such an effort by a student investigator is bound to be fraught with inexperience, ineptness and inadequacies.

2.1. Dynamics of Memory:

Memory is regarded as a set of active processes that control the manner in which information is coded, stored, transformed and retrieved. Many of the dynamic aspects of memory (for e.g encoding and retrieval processes) overlap in function with the effortful processes of memory. The effortful or control processes of memory (i.e., effortful configuration, integration, transformation and synthesis) are those that are responsible for actively
manipulating information in primary memory. Although there are no-age related differences or small differences in span measures of memory, working memory and other effortful memory processes show a reliable decline with ageing (Salthouse, 1994).

Memory research broadly refers to the processing of information in memory. Its rate decreases beyond the age of 20. Older adults are also slower at gaining access to information stored in long term or secondary memory (Poon & Walsh-Sweeney, 1981). How long term memories are organised is the topic of current concern to cognitive researchers. Researchers proposed that there are two different memory storage systems viz., one for handling personal events (episodic memory) and the other for handling semantic materials (semantic memory). The episodic-semantic dichotomy refers not only to the types of information that are stored, but also to differences in the conditions of memory retrieval and to the degree of influence of interference (Troyer, Graves & Cullum, 1994).

Researchers in the area of cognition generally distinguish primary memory (Short-term memory) from secondary memory (Longterm memory). Primary memory is conceptualized as a limited capacity store of conscious information which is more permanent for durations longer than the span of consciousness. The information is stored in secondary memory which is unlimited and relatively permanent store (Salthouse, 1991).

Some Cognitive Psychologists made a distinction between locative processes, inferential processes and metamemory processes which are components of knowledge actualization (Maylor, 1993). Locative processes refer to relatively automatic, unconscious, and strategy free information retrieval processes. Inferential processes refer to effortful, conscious, and
deliberate control processes for constructing information. Metamemorial processes refer to a constellation of cognitive capacities concerned with the individual's self-assessment of and knowledge about his / her own memory processes and abilities (Dixon & Hultsch, 1983)

The summaries of memory researches by Poon (1985) appeared in not less than 18 reviews between 1977 and 1982. Memory has been conceptualised in various terms. A distinction in terms of sensory, primary or secondary refers to the time lapse between stimulation and response, and covers generally intervals varying from a few milliseconds, to greater than one hour. The distinction between encoding, storage and retrieval concentrates on the mechanisms underlying learning. In contrast, the distinction between semantic and episodic memory focuses on the nature of the task to be learned. Recently, interest in the awareness and intention to remember and conscious recollection has led to a distinction between implicit and explicit memory (Schacter, 1987). Baddeley (1986) convincingly argues that the notion of working memory, which demands simultaneous storage or recently learned memory and processing of additional information, can be distinguished as a critical memory system.

Some studies relevant to age differences in information processing, memory in general, age and primary memory/short term/working memory, age and secondary memory/long term/semantic memory, age and verbal memory, age and pictorial memory; age and tertiary memory, factors associated to memory and memory interventions were reviewed in this chapter. Wherever it was possible the primary sources were consulted and when these were not available information was taken from secondary sources.
2.2. Age and Information Processing:

The paradigm of information processing has been identified as a useful model of cognitive aging to direct the study of developmental differences especially in the rate and efficiency of encoding, storing and retrieving the information. The information processing (IP) model of cognitive aging model suggest that the speed of processing may be reduced, or the size or volume of cognitive capacity may be decreased which lead to slower processing rates or impose restriction in cognitive capacity with advancing age (Kausler, 1994). As per this I-P model, control or computational processes operate roughly in a similar way for young and old. But individual differences are exhibited in the efficiency and speed of these mental processes. In this subsection special focus has been made to mention studies on age differences in the speed of efficiency of the control processes, which generally construct and transform information within the human cognitive system. This includes the review of some studies bearing on adult age differences in attention in terms of selectivity and filtering, automatic vs. effortful processing, expectancy and preparation in terms of cued and non-cued in visual search tasks.

It is widely believed that memory generally declines with age, in fact, age decrements occur for most but not for all types of memory. Age differences are always found for free and cued recall but rarely found for picture recognition, implicit memory and measures of verbal ability (Park et al, 1999). Understanding the conditions under which age differences occur and when they do not occur across memory domains is a challenging task for cognitive ageing researchers.
The age decrement was slightly greater for retention of the learnt material than for the immediate recall of it (Gilbert, 1941). The age loss was greater for the recall of the new material than for the recall of the old material such as place of birth, age and current information (Shakow, Dolkart & Goldinan, 1941). Still active persons have better memory ability than those of inactive. Probably their activity might have helped to maintain their memory functions (Zoneveld, 1958).

Broadbent (1958) suggested two mechanisms viz., a simple perceptual system and a storage system. The former system deals with information as it comes in and the later system deals with information as it comes in and also deals with excess information which cannot be processed by the already occupied perceptual system. Information of the perceptual system is not stored but only "pass through".

Early researchers explained the memory in different mechanisms like encoding, registration and recall and indicated if there is any decline in memory, it is due to error in encoding or registration or deficit in retrieving the information. The first stage of memory loss has been referred to as lack of impression (Woodworth & Schlosberg, 1954) or registration (Talland, 1965). The same can be measured in controlled studies of immediate recall and recognition. The second state is retention. Talland (1965) stated that retention may be regarded as the lasting effect of registration. Registration and retention have been referred to as pre-consolidation and consolidation of the memory traces (inputs), respectively (Inglis, 1965).

Inglis (1965) suggested a model in which the perceptual system is for storage of shorter-term immediate memory while the second system is for storage of somewhat longer-term memory. Mcmulty and Caird (1966)
indicated that memory loss as a result of the aging process is due to a loss in
the ability to retrieve memories from storage. Some empirical studies
supported this view that defects in the storage system itself lead to poor
memory in old age. The aged group performed significantly poorer when
organizational factors were considered (Howard, 1966).

Anderson (1975) used a recognition memory paradigm to test two
hypotheses, one postulating storage and another postulating retrieval which
highly account for the adult age decrement seen in recall. Partial storage
was minimized by using items in the recognition list which were similar to the
to-be-remembered items. Recognition performance was unaffected by adult
age differences there by supporting the storage hypothesis, while the error
difference did not affect overall recognition performance. The results
indicate that some caution is necessary in interpreting age recognition
interactions.

Male and female subjects in their 20s and 60s with high school and doctoral
level education, when tested on a variety of memory tasks showed sizable
age decrements in word recall and recognition independent of education.
Age differences in the pattern of performance on incidental and intentional
recall and recognition tests and in semantic elaboration suggested that older
subjects suffer from associate processing production deficiencies and
inefficiencies (Perlmutter, 1978).

Thomas, Waugh and Fozard (1978) examined a memorized list of six letters
(familiar / unfamiliar organization) among healthy males in the age groups of
31 to 51 year old. Subjects of all ages took longer time to respond in the case
of the unfamiliar list. This was disproportionately true for the oldest subjects,
consistent with the idea that the age related differences in the unfamiliar condition could not be wholly accounted for by psychomotor factors.

Allegretti and Puglisi (1982) in a visual search experiment in which college students and older adults (aged 60-85 yrs) searched 650 item stimulus lists for the letters A and L. Each item consisted of a string of 4 letters forming either a word or a non-word anagram of that word. Items were printed either in uppercase, lower-case or mixed-case letters. Search items were shorter for words than for non-words. Thus, the word superiority effect was demonstrated even when the visual configuration of the words was disrupted. Results suggests that older subjects evidenced slower processing than college students in all stimulus conditions, and their processing was differentially slowed in conditions that prevented automatic processing.

McCormack (1982) in a study on automatic nature of spatial coding, found that awareness of the location requirement had no effect on performance and the two age groups were equivalent with respect to overall spatial memory accuracy. There were no reliable age differences in location performance where the young adults exhibited superior free recall.

Bowles and Poon (1982) analyzed the effect of aging on recognition memory processing in a stimulus-sampling model of recognition memory with parameters representing encoding effectiveness and stimulus overlap or interference. It was found that the distribution of recognition scores for older adults was bimodal with an upper mode which did not differ from the younger group and a lower mode representing a large decrement in performance. For those adults who showed a recognition deficit with aging, analysis in terms of the model revealed reduced encoding effectiveness. Recognition performance of the older adults was strongly related to verbal ability as measured by the WAIS vocabulary sub-test.
Patricia (1982) investigated the acquisition and retention effects of contextual interference on a coincidence-anticipation task over long retention intervals on subjects aged (53-83 years old) differing in levels of physical activity. Half of the subjects were regular participants in an exercise program for older adults. The other half did not participate in the program but indicated minimal involvement in physical activities through a self-report instrument. After 10 min, active subjects recalled the tasks better than the less active subjects but no differences were found at one week or 40 days. A significant interaction occurred between activity level and contextual interference in retention.

Macht and Herman (1983) used a secondary task methodology to investigate age differences in the amount of cognitive effort demanded by free recall on older adults (aged 58-76 yrs) and college students (aged 16-28 yrs). Both the groups performed an RT task while simultaneously retrieving a list of items in multi trial free recall learning. RTs were slower in the aged than in the younger subjects on each trail, suggesting that free recall is more demanding for older persons. Results are consistent with the cognitive effort hypotheses that postulate age differences in the demands of memory processing to be a factor underlying age-related deficits.

Spilich and Voss (1983) investigated the role of contextual information in the processing of prose within a life-span developmental frame work. Young (18-26 yrs) and aged normal (60-89 yrs) and aged subjects with memory impairment (63-99 yrs) read short passages that differed in their contextual relatedness to target sentences. It was found that large differences distinguished the performance of the young from the elderly on the free recall task, cueing aided the performance of the young and the elderly normal more than aged impaired, and no differences were found in recognition.
performance between young and aged. Age differences (young and older adults) in the speed of verbal recall under experimentally controlled processing conditions indicated no age differences in either rate of free recall or speed of cued recall (Macht & Herman, 1984). Significant age deficits were found for both recall and recognition. The failure to recognize items that are later recalled was also greater among older subjects. The age deficit in recognition is attributed to differences in the effectiveness of the retrieval process in recognition since there was no age deficit in the process of evaluating an item familiar to (Rabinowitz, 1984).

Elderly subjects were as proficient as young subjects in discriminating, planning and performance of an activity in terms of absolute frequency judgement scores (Kausler, Lichty & Freund, 1985). Craik and Rabinowitz (1985) attempted to study several lists of words at each of three presentation duration (15, 3 and 6 sec / words) on 18-29 yr old and 60-86 yr old. Under standard intentional learning instructions, the magnitude of the age-related recall deficit increased with longer presentation duration. When a semantic-orienting question was used to guide the encoding of the items of each list, an equivalent benefit of longer study times was observed for the two age groups. Results are interpreted within the context of a processing deficit framework of age differences in memory, in which age differences are due to differences in the spontaneous use of organizational strategies. The results are not well described by a cognitive slowing account of age differences in memory.

Rankin and Marcia (1985) hypothesized that elderly adults have less elaboration of information to be learned than young adults. Findings from two experiments indicate that elderly subjects showed as much benefit from the provision of relevant elaborations as young subjects but were less likely
to generate relevant elaborations. Results reflect age-related differences in elaborating stimulus words in terms of previous knowledge and in encoding specific attributes of sentence contexts.

Adult age differences in the processing of implicit sentence information by testing recognition memory for stated and implicit information (among older adults (MA-67.3 yr) and undergraduates (MA-22.3 yrs), found no age differences in memory for implied instruments suggesting that aging has little effects on the processing and storage of implicational information. Data indicate that young adults remembered more explicit information in the structured condition (Hess & Dominique 1986). Zacks et al. (1987) assessed the usefulness of a general capacity model for predicting age differences (young and old subjects) in memory for critical information in text passages that either explicitly stated or implied, in either a predictable or unpredictable manner, a fact central to understanding. No age differences were obtained in the recall of explicit central facts but the younger subjects out performed the older subjects when these facts had to be inferred. Age differences were greater when subjects were instructed to generate precise elaborations than when they were provided precise elaborations. Elderly subjects generated fewer precise elaborations than young subjects (Rankin, Collins, Drake & Desmoines, 1986).

Rubin (1986) reviewed three areas of practical memory research and suggests that spatial memory skills are influenced by familiarity and organization. Activity memory appears to be affected by automaticity, familiarity and motor cues. Recall of names and faces seems to be related to elaborative processing and over learning. He also suggests that the diverse task-specific findings require new theoretical and methodological integration.
Hess, Vandermaae, Donley and Synder (1987) examined adult age differences in the flexibility of schematic processing by measuring the degree to which a dominant structure (traditional sex-role knowledge) interfered with the operation of a non-dominant structure (non-traditional knowledge). In two experiments, young (19-34 yrs) and old (60-78 yrs) adults read statements describing a man performing actions with a prescribed sex-role in an impression formation task. Subjects in both age groups altered their processing of the action and men. Results suggest interference from the dominant schema at recall, but the lack of age differences in the degree of interference observed suggests no aging on schematic flexibility.

Pamela, Andrew and Michael (1987) administered Verbal Selective Reminding Test on 23 male and 37 female independently living, well-educated and healthy elderly (aged 65-75 yr). Results show that on selective reminding, the females did significantly better than the males on most dependent measures. Males and females showed a significant decrease from last trial recall to recall following a 15 min delay.

Hartley (1988) investigated memory for the written text on three age groups, 18-29 years, 44 - 58 years and 61 - 90 years and all the subjects were above in educational attainment with college background. Seven types of tasks were performed in the area of reading and recall, and found evidence of general slowness in the middle-aged and older-groups. This was seen as longer latency in the intercept measures from the word search, category search and memory search tasks, and also found significant differences in the speed of specific processes during the category search, memory search and word-name retrieval tasks. This study supported the hypothesis that slowness in central processing is a characteristic of old age.
Cohen (1988) stated that with advancing age, the decline of text ability to remember text information was observed. From the literature he concluded that with the use of the processing capacity hypothesis, age differences were commonly observed when processing demands were high and persisted until they relaxed. Findings indicated that age differences in text comprehension and memory are caused by an age-related reduction in processing capacity. Pellegrino, Nichelli, and Faglioni (1988) compared the performance of young subjects (15-35 yr) and elderly subjects (aged 60-85 yrs) at two memory tasks under two retrieval conditions (forced and unforced choice) to determine the choice of any incidental age-related memory deficit. Results showed a significant difference between age groups at word recognition independent of retrieval condition, while frequency judgements was found significantly impaired in elder subjects as compared with young subjects only when an unforced choice procedure was required.

Puglisi, Park, Smith, and Dudley (1988) investigated the role of limited processing resources in encoding specificity (ES) effects using twenty four older subjects (mean age 71.4 yrs) and twenty four college students (mean age 19.2 yrs). In two experiments one under full attention, and another under divided attention, subjects were presented with a cued recall task in an ES paradigm. Targets and association cues were pictures or matched words (strong and weak relationships between targets and cues). Results show strong ES effects for both groups, old and young subjects recalling more when the same cues were presented at encoding retrieval than when different cues were presented.

Loewen, Raymond, and Cao (1990) investigated the dimensions of memory viz., (1) Perceived memory capacity (2) Knowledge of memory task demand and (3) reported use of memory strategies among young and
old adults. The older participants scored significantly low on the capacity dimension and reported greater difficulty in everyday memory situations on any item in the task dimension. Both groups were equally knowledgeable about memory task demands. Responses to strategy items varied with type of strategy. Younger adults were more likely than older adults to report the use of encoding strategies, while older adults reported significantly more use of strategies which involved planning and organization.

A study on attentional capacity on elderly age groups (68-79 and 80-87) and young adults (25-35 and 35-45) indicated that older groups performed less well on the tasks and particularly poorly on the dual tasks. There were no significant gender effects (Gordon & Goldstein, 1991). Hartman and Dusek (1994) experimented the effects of interference on memory in younger and older adults in a series of three experiments, presented with a series of sentences, each having both a target to-be-remembered ending, and a non-target ending. Older adults showed equal priming of targets and non-targets on an indirect memory test (exp 1) whereas younger adults showed greater priming of the targets. In contrast, on direct memory tests (exp 2 & 3) both age groups were more accurate for targets than non-targets. This pattern of result is interpreted as evidence that age differences in interference involve selective attention mechanism but not elaborative rehearsal processes.

A study by Carol and Rabbit (1991) on cognitive changes in 50 yrs or older, reports that individuals age at markedly different rates. Firstly, when large group take simple memory tests average performance declined with age among subjects aged 50-86 yrs. Secondly, intelligence tests fall markedly with age, whereas vocabulary tests show less decline or continue until late life. Research suggests that by using complex tasks in information
processing they have to detect cognitive changes. The findings on memory for new associations show that although age-related deficits in memory for new associations are particularly pronounced on tests requiring conscious recollection, age differences are not limited to such tests. Age deficits on both direct and indirect tests are related to the precision of elaborations produced during study (Darlene, Fry & Caitlin, 1991).

The degree to which processing resources are responsible for age differences in performance on recall and recognition were explained by Wythe & Anderson (1997). It is evident that older adults relative to younger adults exhibited greater decrements in secondary task performance as the difficulty of the secondary task increased. Hierarchical regression analyses indicated that speed accounted for the largest proportion of age-related variance in the recall task while both speed and working memory contributed to much of the secondary task variance. Results confirm the hypothesis that recall requires greater processing capacity than recognition and that older adults have greater processing capacity limitation than younger adults.

Park (1997) explored different conceptualizations of processing resources and reviewed supporting data. The hypothesis adopted is that the magnitude of age-related decrements in memory functions across different domains of memory can be accounted for by the amount of processing resource or mental effort required to encode and retrieve information. Age-related memory decrements are associated with the processing operations of a task rather than the specific stores. Empirical evidence for the processing view of remembering was reviewed by Craik (1994).

The cultural differences in information processing styles are so pervasive that they affect cognitive function at the most basic levels, including the
mechanics of cognition, neurobiological decline in cognitive function that occurs with age is a cognitive universal and can limit the strategies used in late adulthood resulting in more similarity in cognitive function in late adulthood across cultures than is observed in young adults. Park, Nisbett and Hedden (1999) emphasized the importance of developing culture invariant measures of processing resources and methodological issues associated with the cross-cultural study of cognitive aging (Park, Nisbett & Hedden, 1999).

The foregoing review covers the nature of change in information processing with age. It appears that decline in the rate of information processing can account for many of the age-related differences in cognition. As the complexity of information to be processed increases, older persons show differential rate of decrements in information processing. Also, older adults as the condition of processing load are increased age related declines have been found with regard to the process of encoding, retrieval and working memory dynamics. To investigate age differences in information processing a wide variety of material ranging from non-sense syllables, sentences and prose have been used. The above studies also provide the evidence that older adults have more difficulty than younger subjects in mobilising information from short term memory or consciousness to long term memory and also in retrieving information from long term memory.

The studies covered a wide range of cognitive performance, ranging from the most basic process i.e. from transformation of sensory input to higher order processes like problem solving. Studies related to age related deficits in attention are most evident under capacity limited conditions. Also, evident was that practice related factors can produce benefits in the attentional performance of older adults. Some pre-attentive processes such as iconic
processing they have to detect cognitive changes. The findings on memory for new associations show that although age-related deficits in memory for new associations are particularly pronounced on tests requiring conscious recollection, age differences are not limited to such tests. Age deficits on both direct and indirect tests are related to the precision of elaborations produced during study (Darlene, Fry & Caitlin, 1991).

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depend on the type of learning. It was also observed that no age difference was there in either rate of free recall or speed of cued recall. Some studies reported that a modest age deficit for encoding rehearsal-independent episodic events but no age differences were there for reality monitoring events. It was stated that elderly subjects were as proficient as young subjects in discriminability, planning and performance of an activity in terms of absolute frequency judgement scores. The cultural differences in information processing styles are evident and such differences affect the basic levels of cognitive functions.

Thus the foregoing studies suggest that both speed and working capacity are fundamental to explain age related changes in cognitive aging but the relative contributions of these constructs vary as a function of the memory task. Therefore, older adults recall requires suffers processing capacity limitation than younger adults.

2.3. Age and Primary / Short Term / Working Memory:

Many cognitive researchers refer to short term memory (STM) as of limited capacity that briefly keeps information in consciousness. There is an unintentional loss of information from STM, if it is not saved i.e. not transferred to long term memory (Perlmutter, 1986). As STM holds the information it is being processed. It includes a control system that is capable of attention, selection and manipulation (Baddeley, 1986). The system applies our learnt strategies to organise the material if needed, to make sure to record the information or encode it for future retrieval (Cavanaugh, 1994).

Usually, the capacity of STM is assessed through the Digit Span test. Simple span tests indicate that the passive capacity of working memory is
processing they have to detect cognitive changes. The findings on memory for new associations show that although age-related deficits in memory for new associations are particularly pronounced on tests requiring conscious recollection, age differences are not limited to such tests. Age deficits on both direct and indirect tests are related to the precision of elaborations produced during study (Darlene, Fry & Caitlinn, 1991).

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forward digit-span measured in a laboratory setting (Albert, Heller & Milberg, 1989, Botwinick & Storandt, 1974; Caird, 1966; Dirken, 1972; Friedman, 1974, Gilbert, 1941; Gilbert & Levee, 1971, Goldfarb, 1941; Hayslip & Kennelly, 1982, Heron & Chown, 1967; Hooper, Hooper & Colbert 1984; Inglis & Ankus, 1965; Parkinson, 1982, Potvin et al., Robertson-Tchabo & Arenberg, 1976, Salthouse & Babcock, 1991, Taub, 1973, Wiegarsma & Meertse, 1990) On a backward - digit-span task, the procedure is much like that for the forward-span task, with the exception that, here subjects are required to recall the digits in the reverse order. They were given. Although, the age related deficit is usually found to be greater than that found for the forward span, whether measured in laboratory setting (Botwinick & Storandt, 1974) or a psychometric testing setting (Berkowitz, 1953)

Some studies were carried out on how age differences in memory proficiency were simply evaluated by comparing mean idea recall scores in the paragraph for various age groups (Wechsler, 1945, Hulicka, 1966, Botwinick & Storandt, 1974) A number of other studies have also reported substantial age-related decline for the ideas contained within a paragraph (Calwell & Heller, 1978, Moenster, 1972, Schneider, Gritz & Jarvik, 1975)

The verbal material system termed the phonological loop. The phonological loop deals with words in the broadest possible sense and this not only memorizes letters and words but also numbers. In a letter-span experiment, it was found that the 5.5 and 5.4 for subjects in their 60's and 70's and there was little decline from early to late adulthood (Botwinick & Storandt, 1974; Salthouse, Kausler & Saults, 1988).

Memory theorists believe that performance on memory-span tasks is not determined exclusively by the capacity of the short term storage (STS)
(Craik, 1977; Watkins, 1977). Collectively these aging studies on memory span suggest that there is a modest decline in STS capacity from the early to late adulthood. Memory decreases with age in the free recall of pictures, reproduction of logical stories and digit span. In the reproduction of logical stories, memory of the central idea degenerated more slowly than the memory of the particulars. Degeneration in digit span performance was slower than all other memory functions except the memory of study lines. Age-related changes in the Central nervous and Cardio vascular systems were related to memory deterioration (Shulian, 1981).

Huang and Liu (1978) reported that Chinese subjects achieved 95% accuracy on a cued recall list within three trials, which is well above what is typically reported for an American sample on similar but not identical lists of words (Paivio, 1971).

The hypothesis that age differences in immediate memory are limited to the secondary or long-term component was tested with young (18-24) and old (58-89) subjects on word and digit-span tests and the vocabulary and information sub tests of the WAIS. In contrast to predictions from the selective deficit hypothesis, age differences were found in both primary memory and secondary memory as reflected by serial-position analysis and other measures of these stores. It is concluded that memory span reflects a general storage ability rather than a specific ability to retain information about the order of a sequence of events (Parkinson, Lindholm & Inman, 1982).

Hayslip and Kevin (1982) assessed the contributions of two types of short-term memory (STM) viz., passive span of apprehension and working memory, with a test battery assessing short term memory (STM), Fluid ability (GF), and Crystallized ability (GC) among subjects aged 17-26, 39-51, and
59-76 years Measures of STM and GC showed substantial and significant negative relationships with age, while the GC-age relations were significantly positive, but weak. Age declines in GF functioning appear related to working STM deficits but not to passive STM deficits (Parkinson, Lindholm & Inman, 1982).

Lorsbach and Greg (1984) compared probe-recognition task and the speed and accuracy of visual, phonemic and semantic recognition processes in 18-29 yrs old and 58-79 yrs old. Age differences were observed in the speed of access to information and these differences were greatest on tasks requiring retrieval of semantic information from the secondary memory component of short-term memory.

Coyne, Allen and Wickens (1986) in their study compared young and elderly adults (across age groups 18-32, 62-85) on the ability to search lists of words stored in Primary memory and in secondary memory. Experiment I indicated that age differences in search performance were greatest under Secondary Memory (SM) conditions. Older subjects unlike the younger ones, appeared biased toward responding, because the probe items were not numbers of the memory sets stored in their Secondary Memory (SM). As a result, older subjects committed a large number of errors on the trials in which the probe was not a number of the list. Response of older subjects to negative probe trials were more rapid than were those to positive probe trials. When pattern of responding was examined in Experiment II, it is concluded that age differences were involved in the ability to encode memory sets and transfer from Primary Memory (PM) to Secondary Memory (SM) as well as in the ability to retrieve information from SM prior to conducting a memory search.
Baddeley (1986) suggested that working memory has three aspects: 1) verbal rehearsal, which uses an articulatory loop, 2) rehearsal of visually presented information, such as a map that is recorded on a visual-spatial sketch pad, and 3) a central processing or executive unit. Light and Anderson (1986) investigated whether age-related differences in memory (in Experiments I, II and III) for discourse can be explained by age-related differences in working memory capacity by employing a digit span test, a word-span test, digit forward and backward test of WAIS and paragraph memory task (Experiment I) and by 3 alternative forced choice tests (Experiment II). Results indicate that age-related differences were observed on digit forward and sentence spans as well as on recall (exp. I) and recognition (exp. II) and retention was not predicted well by any of the span measures for either young or older subjects. Findings also suggest that there are real age differences in the span measures used.

Subjects with a specific decline in memory disproportionate for their age displayed features consistent with the description of benign senescent forgetfulness referred by Kral (Larrabee, Levin & High, 1986). Older subjects' performance declined at a more rapid rate in a extended list of letter-number combination (eg A42G") as the retention interval was increased. Gains by the younger subjects were equivalent, so that initial age differences were maintained. The presence of sensitivity differences suggests fundamental age differences in recognition memory (LeBreck & Baron, 1987).

Stine and Wingfield (1987) in their study asked younger and older adults to listen and to immediately recall the short passages of speech that varied in the rate of presentation and in the degree of linguistic and prosodic cuing. Older adults showed a differential decrease in recall performance as a
function of increasing speech rate. Age differences in recall were reduced by the presence of linguistic and prosodic cues. Differences in overall performance are accounted for in terms of age-related changes in working memory processing and strategy utilization. But age differences appear when the text is presented rapidly, primarily because older adults tend to read more slowly than the young (about 121 words per minute compared with 144 (Myer & Rice, 1989). Age differences also tend to appear when the information is disorganized or scrambled (Light, 1990).

Johanson and Berg (1989) tested robustness of terminal decline by analyzing longitudinal results from the simple digit-span memory test. Subjects participated in the Gothenberg longitudinal study were first examined at the age of 70 years. Findings support the robustness of the terminal decline phenomenon, in which subjects showed superior performance at preceding measurement occasions and a decline emerged several years prior to death. Simple span tests indicate that the passive capacity of working memory is relatively unaffected by age (Dobbs & Rule, 1989).

An investigation by Wingfield and Stine (1989) examined thirty-four community-dwelling men and women with an average age of 70 years on working memory tasks. A major finding is that elderly adults handle tasks efficiently involving memory of spoken language. However, Under the stress of especially heavy processing loads, age differences begin to appear. A diminution of processing power is associated with aging but the rate of biological aging varies widely not only from individual to individual but also from one system to another within one individual.
Stine and Arthur (1990) studied recall performance of younger and older adults by giving a series of expository passages of writing. They systematically varied the materials in terms of prepositional density and propose length. Results showed that older adults demonstrated lower levels of recall than younger adults. A correlation analysis found that age was a strong predictor of recall performance.

Some evidence suggests that age differences in working memory are not universal. For example, working memory appears to depend on the type of information being used and may even vary across different tasks (Daneman, 1987). Many researchers propose working memory as the basis for understanding language processing difficulties encountered in later life (Kemper, 1988, Stine 1990).

Maylor (1990) examined 320 families aged 52-95 yrs through telephone once a day either between two times or at an exact time. The best performance was from subjects who telephoned either in conjunction with another routine vent or engaged in some form of advanced planning of the daily schedule. The worst performance was from those who relied on internal cues, from their own memory. For subjects using internal cues, those who forgot were older than those who remembered, whereas for subjects using other cues, those who forgot were younger than those who remembered. Recognition memory of content showed no forgetting for the young subjects, but significant forgetting for the elderly subjects. Memory for temporal information was substantially greater for the young subjects than for the elderly subjects. Both the age groups showed substantial forgetting of temporal information over the 24 hr retention interval (Kausler & Judith, 1990).
Campbell and Charness (1990) in a study on young, middle-aged, and older adults, put them to learn and practice an algorithm for squaring two-digit numbers (for example, learning how to calculate $57^2$ in your head). Evidence shows that the capacity of working memory declines somewhat with increasing age (Salthouse, 1991). Many researches in the area indicate that working memory is the key mediator variable in understanding age differences in memory. Salthouse argues that the loss of some of the ability to hold items in working memory may limit older adults overall cognitive functioning. Moreover, Salthouse points out that much of the apparent differences in working memory may in truth be related to speed of processing. That is, older adults' reduced working memory capacity may be due to processing component tasks, which in turn was mediated by their overall slower rate of processing (Salthouse & Babcock, 1991).

Salthouse (1991) reviewed research on the interrelations of age, working memory and cognitive functions. Two types of assessment of the effects of aging on working memory are reviewed. In-context assessments consist of observation about working memory capacity derived while participants were performing actual cognitive tasks and out-of-context assessments are obtained from task deliberately assigned to measure the efficiency of selected aspects of working memory. Results suggest that increased age is associated with reduced effectiveness of working memory. Age related differences in cognitive functioning are due to reductions in the simultaneous storage and processing of information.

In word-span experiments, early studies reported no significant age difference in span length (Talland, 1965) but recent studies have revealed an age-related deficit in word-span scores (Kausler & Puckett, 1979; Salthouse & Babcock, 1991; Wingfield, Stine, Lahar & Aberdeen, 1988). Older adults
have increasing difficulty in performing a speeded recognition test as the number of facts to be recognized goes up (Gerard & Weisberg, 1991)

The relationship between working memory (WM) and reading Comprehension (RC) in a sample of college students and older adults (60-74 yr.) was assessed by a battery of test of WM, the Nelson-Denny Reading Test and a Syntax comprehension Test and the Syntax test with no time limitations. Results suggest that limitation affect elderly adults ability to process complex syntactic constructions, lowering comprehension in the timed test and reducing reading rates in the untimed test (Suzanne, Susan & Donna, 1992). A significant lower total recall for older subjects was attributable to a loss of details in outer configuration, which is extraneous to the main context of the complex figure. This supports the hypothesis of age-related compromise in interaction between verbal and visual codes (Mitrushina, Satz & Chervinsky, 1990).

Hasher (1993) proposed a frame work for understanding a pattern of cognitive deficits shown by older adults in a number of different domains. This frame work proposes the inhibitory mechanism that controls the access of thoughts to working memory (or consciousness) which gets impaired with aging. It was suggested that this excess information will misdirect retrieval processes, making it difficult for older adults to efficiently solve a number of everyday cognitive problems.

Research on working memory has examined memory for menus, bus schedules, and maps (Kirasic & Allen, 1994; Kirasic, Dobson, Binder & Allen, 1994) memory for discourse (Zabrucky & Moore, 1995) and free recall and concluded are that age differences in memory for discourse are
substantially reduced when processing efficiency is controlled (Zabrucky & Moore, 1994)

Andiel and Lilli (1995) reviewed the traditional concepts of STM. Changes in working memory in older adults suggest that they may experience difficulties with mediation management. They stated that evaluations of working memory would provide a better indication of older adult’s memory performance than the modal model. Cross-sectional and longitudinal evidence led to the conclusion that the 65-74 year decade was a watershed for decremental changes in immediate memory. Selected neuronal loss and slower reproduction times were considered as possible causes (eg., Giambra et al., 1995). Marko (1995) reviewed 46 articles published from 1973 -1994 on aging and verbal implicit memory performance, which include studies on perceptual implicit tests and conceptual tasks.

Kirasic, Allen, Dobson and Binder (1996) administered a battery of cognitive tasks to a cross-sectional sample of 477 adults ranging in age from 17 to 86 years. Results showed significant age-related decrements in all 3 constructs. The preferred model on empirical and conceptual grounds was one that showed (a) Working memory capability as the most important mediator of age effects in declarative learning, (b) Working memory capability as the mediator for the effects of general processing speed on declarative learning, and (c) differentiation among verbal, numeric and spatial processing speed and between verbal and spatial working memory capability.

Didier et al. (1996) reported that the impact of both education level and young adult IQ on the degree of cognitive change over the years is greater in the older age groups. Secondary memory and language functions were
found to be more resistant to decline in the high education group, while attention, implicit memory and visuo-spatial skills are found to decline irrespective of education level.

Park et al (1996) examined a total of 301 participants aged 20-90 yrs. who received a seven hour cognitive battery across three days. Key constructs hypothesized to affect LTM function were assessed, including multiple measures of working memory. The data suggest that both speed and working memory are fundamental to explaining age related changes in cognitive aging but that the relative contributions of these constructs vary as a function of the type of memory task.

Park et al (1996) used speed of processing and working memory as indicators of cognitive resources in a life-span sample of 320 adults. They demonstrated that a) all age-related variance on memory tasks operated through these two constructs and b) the strength of the relationship between working memory and long-term memory systematically increased across task difficulty, with spatial recall requiring the least processing resource, cued recall an intermediate amount, and free recall the most. Results suggest that speed and working memory can be used as variables of individual differences to estimate the amount of processing resources that different cognitive task require.

Dimeck, Roy and Hall (1998) compared older and younger adults performance in concurrent and delayed gestural limitation tasks. Older adults were less accurate than young and also took longer to inspect the modeled gesture before limitation, the recall delay did not differentially affect their performance. One explanation is that by taking more time to process task
components, the older adults were effectively able to improve the functional storage capacity of working memory to match that of the younger adults.

Hedden et al (1999) from a sample of college students and older adults in Beijing and in the United States indicated the Corsi blocks task, which is an estimate of visuo-spatial working memory, may be a largely culture-free measures of resource. The backward task requires that the participants both hold the order of the blocks in memory, and manipulate the order mentally so that the blocks can be presented in backward orders and found no evidence for a main effect of culture on either the forward or backward Corsi blocks task. Young Asians and Americans performed equivalently (mean number of correct trials of 8.89 and 8.63, respectively). Older Asians and Americans performed more poorly than their younger counterparts, but their performance was equivalent (mean number of correct trials 7.82 and 7.35, respectively).

Myerson, Hale, Rhee and Jenkins (1999) administered digit and location memory span tasks with and without verbal and spatial secondary tasks on young and elderly. On the digit and location span tasks, both young and older adults showed only domain-specific interference: naming colors selectively for locations unaffected, pointing to matching colors selectively interfered with memory for locations, leaving memory for digits unimpaired. Results suggest a greater age deficit in spatial working memory than in verbal working memory, but provide no evidence of an age deficit in susceptibility to interference by secondary tasks in either domain.

Convincing evidence was reported by Baltes and Smith (1997), Baltes and Lindenberger (1997), and Park, Nisbett and Hedden (1999) to explain that neurobiological processes mediate substantial amounts of age-related
decline across all domains of cognitive functions. The data was collected in Beijing and in the United States to investigate cultural differences on a picture-fragment completion task (e.g., sun, boat, bird). Young Americans performed much better than young Chinese (means of 7.88 and 3.83 respectively). In contrast, old Americans and Old Asians performed similarly (means of 2.76 and 3.06, respectively). Findings suggest that on a resource demanding task that is culturally saturated for young adults and old adults from the two cultures have fewer resources to deploy in a flexible manner.

Older adults have difficulty binding context to target. They speculate that this binding deficit in elderly adults is the basis for poor source memory (Chalfonte & Johnson, 1996; Johnson, Hashtroudi & Lindsay, 1993, McIntyre & Craik, 1987, Schacter, Kaszniaak, Khilstrom & Valdisseri, 1991) and poor context memory (Light & Zelinski, 1983, Park, Puglisi & Sovacool, 1983, Park et al., 1990, Zelinski & Light, 1988). Chinese elderly adults maintain sensitivity to contextual information due to the automatically activated tendency to process such information.

Several reasons were quoted by Park, Nisbett and Hedden (1999) to explain the relationship of culture and cognitive mechanisms relationship to memory. Firstly, there are well-documented declines in memory that occur with age that appear to be neurobiologically based (Baltes & Smith, 1997; Baltes & Lindenberger, 1997; Lindenberger & Baltes, 1994) and that would occur across cultures. Secondly, a great deal of progress has been made in understanding the mechanisms underlying age-related variance in many types of memory performance (Park et al., 1996; Salthouse, 1994). Thirdly, there is evidence that the fundamental information-processing strategies of young Asian adults will differ from those of young Western adults on memory tasks in culturally prescribed ways, with subsequent implication for aging.
attempt to link age differences in working memory with age differences in processing speed will open up new and exciting avenues for research (Salthouse et al., 1998).

The foregoing review on changes during later years of life include studies on working memory / short term memory. Working memory has been referred to as one of the forms of short term memory. Some ageing studies on memory span suggest that there is a modest decline in short term storage capacity from the early to late adulthood. Many researchers in the areas of memory indicated that working memory is the key mediator variable in understanding age differences in memory. The loss of some of the ability to hold items in working memory may limit older adults overall cognitive functioning. Much of the apparent differences in working memory may be related to speed of processing i.e. reduced working memory capacity in the aged may be due to processing component tasks, which in turn was mediated by overall slower rate of processing. In the reproduction of logical stories, memory for the central idea decline more slowly than the memory for the particulars. Some studies report that decline in digit span performance was slower than all other memory functions. Results of some studies demonstrated age related changes in digit forward and sentence spans as well as on recall and recognition. Findings also suggest that there are real age differences in the word span and digit span measures. It was concluded in some investigations that memory span reflects a general store ability rather than a specific ability to retain information about the order of a sequence of events. Age differences were evident in the speed of access to information and these differences were greatest on tasks requiring retrieval of semantic information from the secondary memory component of short term memory.
Recent studies have revealed an age related deficit in word span scores but early studies reported no significant age difference in span length. Studies in the review indicate that increased age is associated with reduced effectiveness of working memory. The traditional concept of STM has been reviewed by some researchers. Evaluations of working memory would provide a better indication of older adults memory performance than the modal model. The cross sectional and longitudinal studies led to the conclusion that the 65-75 decade was a watershed for decremental changes in immediate memory. The possible causes for these changes could be selected neuronal loss and slower reproduction time (RT). Studies indicate that speed and working memory can be used as variables of individual differences to estimate the amount of processing resources that different cognitive tasks require. Some studies state that by taking more time to process the task components, the older adults were effectively able to improve the functional storage capacity of working memory similar to younger adults. Greater age deficit was seen in spatial than in verbal working memory. Researchers generally agreed that working memory has a relatively small capacity and quoted that this capacity limitation of working memory is like a juggler who can only keep a small number of items in the air simultaneously. Because working memory deals with information being processed right at this moment, it also acts as a kind of mental scratchpad.

Research on working memory is relatively new, a great deal more research needs to be carried out.

2.4. Age and Secondary / Long Term / Semantic Memory:

Memory researchers accept that long term memory is the system with unlimited capacity. This has been referred to as secondary memory. It is generally assumed that it is the store house of one’s past experiences,
holding the content of memory related to one’s childhood, our knowledge about the world, about how to do things, and even information about the way our thought process works. When information is coded, it is transferred to long term storage, it is held for our subsequent use. At retrieval, the information is transferred back into short term/working memory for conscious manipulation. Studies on long term memory indicate that various skills that we have learned will not be affected by age. This kind of memory is known as procedural memory - skills that are practiced and automatic. Memory about the world, is known as declarative memory. The contents of declarative memory seem to be organised in a similar way among young and old adults.

The fact that our answer to some questions for e.g., “What does the word “Science” mean?” “What is the Capital of India”? is a clear demonstration of our possession of a semantic component of the human memory system. Tulving (1972) named this as semantic memory. It refers to a store or repository of our permanent knowledge of the universe, a knowledge we share with others. Access to that knowledge is usually gained rapidly and seemingly effortlessly. Tulving (1983, 1985) later proposed that semantic memory and episodic memory exist as separate, but interacting memory systems, and he elaborated on their distinguishing characteristics.

Irrespective of age, adults have stored two major kinds of world knowledge, which are referred to as episodic memories and semantic memories. Episodic memories refer to everything that happens to us, so that each memory is linked with a time and place. Recalling events like for e.g., a childhood birthday celebration (or) the name of a person we met at a friend’s marriage retrieves an episodic memory. Semantic memories are organised factual knowledge (for e.g., dolmetsians are dogs, and dogs are mammals).
Based on the literature, it is generally believed that episodic memories are vulnerable to the effects of aging, but semantic memories are generally impaired (Craik & Simon, 1980).

The review on long term/semantic memory indicates that semantic and episodic memories accumulate throughout life. Since most elderly have larger knowledge bases than the younger adults, it is believed that where world knowledge is involved, older adults may perform well similar to younger adults. Some studies in the review reported differences in the structure and operations of the internal lexicon. Many studies used word identification and free word association tests to assess semantic memory. It seems that word identification per se seems to be unaltered by age. The amount of information needed for the spoken words was markedly reduced when the words were embedded in meaningful sentences. It is hard to accomplish this unless the information stored in the internal lexicon is organised in the same manner. A large proportion of procedural memory can't be expressed in words but can be demonstrated. Older subjects are as efficient as younger typists, and older musicians do not lose their skills, it is often unaffected by brain damage, that destroys memory about the world, which is known as Declarative Memory (Perlmutter, 1992).

Early studies on indices of age difference in words indicate structural changes in the lexicon with aging. Riegel and Birren (1965, 1966), Tresslet and Mayzner (1964), and Perlmutter (1978, 1979) reported greater "between-subject" variability for elderly than for younger subjects. Howard (1980) further confirmed the absence of age differences in word associations by employing a constrained word-association test. It was found that age differences in the content of the instances, names were negligible (Riegel & Riegel, 1964).
An age deficit in the recall of normal sentence content was also found (Gordon, 1975; Whitbourne & Slevin, 1978). More recent evidence indicates that elderly adults do make effective use of both semantic organization and prosodic organization in their comprehension memory of auditorily presented word strings (Wingfield, Wayland & Stine, 1992; Spilich & Voss, 1982).

How the normative word-frequency was manipulated in a lexical decision task with older and younger adults was studied by Bowles and Poon (1981). Three methods of comparing processing time across age groups were evaluated. The additive factor method appeared to be a viable alternative to these two analyses. Within this framework, the lack of interaction between the two variables, age and word frequency indicates that the factors affected different stages of processing. Since word-frequency has been shown to affect the lexical access stage, the present result was taken to suggest that aging does not affect speed of lexical access.

Young (17-19 yrs) and old (64-83 yrs) females learned 1 of 2 equivalent lists of 18 unrelated nouns on the WAIS vocabulary sub test. Although a significant interaction of age and list was obtained in total recall, significant age differences in recall from long-term memory were associated with quality of rehearsal. No significant effect of age emerged in subjective organization or frequency of item rehearsal. Results provide direct evidence that the elderly may suffer from a decrement in organizational processing in long-term memory with unstructured material possibly stemming more from acquisition than retrieval-related mechanisms (Jackson & Schneider, 1982).

In a letter recognition test (7 letter strings for a brief period) young adults were able to identify 3 letters at a rate of 27 m. sec per letter, a value which
is typical of other reports. Any additional letters were identified at a much slower rate whereas older adults were able to identify only two letters, at a rate of 35 m sec per letter. Older men thus showed a decline in both the amount of and rate at which information was encoded from the icon within a fixation period (Cerella, Poon & Fozard, 1982).

Petros, David and Chabot (1983) in a sample of low and highly educated young and older subjects, employed a series of cognitive decision tasks (word pairs) to investigate adult age differences in the speed and accuracy of encoding physical features of a word (word encoding), accessing the name of a word (lexical access), and accessing categorical information about a word (semantic memory access). Results show that older subjects were slower than younger ones at feature extraction, lexical access and accessing category information. The age deficit was proportionally greater when retrieval of category information was required.

Bowles, Williams and Poon (1983) reported cohort differences for word associations especially for words that do not have strong primary associations (Lovelace and Cooley, 1982), and Bruce and Peters (1986) concluded that aging has little effect on the associative structure of internal lexicons.

Fullerton (1983) used a syllogistic reasoning task to assess the ability of two groups of subjects (young adults aged 20-39, and older adults aged 60-80 years) to use imagery. Answers to memory and interference test questions depended on explicitly provided information, but answers to integration test question required the use of information drawn from semantic memory. Older subjects obtained significantly lower scores than younger subjects. Imagery instructions also facilitated integration administrative scores in both
paragraph and sentence presentation for younger subjects but facilitated only the integration score in the paragraph condition for older subjects. Results suggest that older adults can use imagery as a control process but are less likely than younger adults to use imagery as a strategy in abstract situations.

In a well controlled studies by Lovelace and Cooley (1982), Bowles, Williams and Poon (1983), Burke and Peters (1986) and Scialfa and Margolis (1986) demonstrated that age differences were negligible in word associations (e.g., for 45 of the stimulus words the primary association was the same word for the young and old groups). The same comparisons, along with several additional ones, were made by Burke and Peters (1986) for over 100 stimulus words. Scialfa and Margolis (1986) found no age difference either in the commonality or the variability of associates to either high frequency or low-frequency words.

Age differences in absolute decision time were greater for the synonyms than for the other word pairs, but the proportional slowing of decision time exhibited by the older subjects was constant across word-pair type. A generalized age-related slowing in the speed of information processing is suggested to account for age differences in the retrieval of letter identity and semantic information from long-term memory (Madden, 1985).

A likely reason for difference in results on the age differences was identified by both Lovelace and Cooley (1982) and Burke and Peters (1986). In their study, correlations between vocabulary test scores and various word-association scores were found to be moderately high. In fact, vocabulary test score proved to be a much better predictor than age for such subject's scores as the percentage of associations that were paradigmatic. In the later
studies the age groups were roughly comparable in verbal ability as assessed by a vocabulary test. The elderly subjects in the earlier word-association studies were probably less verbally proficient than the young subjects.

Andrew, Philip and Delos (1986) compared young and elderly adults on the ability to search lists of words stored in primary memory (PM) and in secondary memory (SM). The results (Exp I) indicated that age differences in search performance were greatest under SM conditions. This pattern of responding in Exp II examined and concluded that age differences were involved in the ability to encode memory set and transfer from PM to SM as well as in the ability to retrieve information from short term memory (SM) to conduct a memory search. It is concluded that age differences occurred because elderly adults have more difficulty in utilizing encoding strategies than young adults (Patricia & Herman, 1986).

The proportion of paradigmatic responses varied with the grammatical class of the stimulus word and with the vocabulary level of the subject, but not with age. Within-subject variability was also comparable across age, as on a retest young and older subjects (62-87 yrs) gave the same proportion of responses that were identical to those on the original test (Deborah & Laura, 1986).

Howard (1988) stated that older persons often experience difficulties in understanding and remembering spoken and written language. Differentiating age-sensitive from age-constant components of cognition provides a more accurate theoretical account of cognitive ageing. No age differences in the effortful components of semantic priming was found; yet...
there were age differences in the rate of what appears to be automatic semantic activation

Stine (1986) found negligible age differences in descriptive associations to common objects. But Mantyla (1993), Mantyla and Backman (1990) did find one interesting difference in descriptive associations given by young and elderly adults. Elderly subjects tend to give more schematic and typical associations (e.g., fruit to apple) than did young subjects, whereas young adults gave more idiosyncratic or distinctive associations (e.g., computer to apple) which shows that atypical associations serve to enhance the distinctiveness of a memory trace thereby giving young adults a memory advantage over elderly adults. The review concludes that aging has little effect on the associative structure in internal lexicon (Lovelace & Cooley, 1982) and cohort differences are present for word association, especially for words that do not have strong primary association (Bowles, Williams & Poon, 1983). Puglisi, Park and Smith (1987) concluded that the age differences in the word association response to the pictures of common objects as stimulus elements tend to be fairly negligible.

Fleischmann (1989) evaluated longitudinal changes in memory functioning across ages by using a set of memory tasks inter-correlated, and proposed structural model of memory functioning. Three separate cognitive dimensions i.e., primary memory, secondary memory and attention speed were studied. Results indicated no changes in the number of age-dependent factor correlations especially between the factors of primary memory and attention speed in the cross-sectional analyses. Highly individual change patterns were outlined for the factor of secondary memory in the longitudinal study. It is concluded that memory is a central parameter in assessing changes in cognitive functioning in old age. Younger adults perform better.
than older adults in the majority of standard laboratory memory tasks because of superior ability in various types of recording operations. Data indicate that older adults benefit greatly in memory performance when the tasks, the materials, or the experimenter guides the learner (Backman, 1989).

Vriezen and Moscovitch (1990) compared the performance of Parkinson's patients (MA-68.45 yrs) with that of matched normal controls on memory for temporal order and conditional associative-learning (CAL) tasks. Memory for temporal order involved reconstructing the presentation order of each of a series of drawings, words, and designs. Parkinson's patients exhibited poor memory for the relative temporal relations between stimuli. Results suggest that the strategic retrieval processes were involved in both memory for temporal order and learning. Conditional associations by trial and error depend on the integrity of the fronto-striatal system which is affected in Parkinson's patients.

The information processing speed, working memory capability and declarative learning in a cross-sectional sample of adults ranging in age from 17 to 86 yrs showed significant age-related decrements in all three constructs (Kathleen, Gary, Dubson & Katherine, 1991).

Erber and Sharon (1991) examined young and elderly women read vignettes describing short-term, long-term and very long-term memory failures. Each vignette was accompanied by a photograph of an attractive or unattractive young (or) elderly women. Subjects judged each vignette for possible reasons for the target person's failure (capability, lack of effort, task difficulty, luck of attention). They also rated whether the failure was a sign of mental difficulty and whether medical and psychological evaluation was indicated.
Failures of young targets were attributed to lack of effort and lack of attention, whereas failures of attractive targets were attributed to task difficulty and lack of attention. Elderly and unattractive targets were judged as having greater mental difficulty and need for evaluation than young and attractive targets. Subjects particularly the young, considered very long-term failures. Subjects with better functioning at baseline tended to have stable performance over this period (Johansson, Zarit & Berg, 1992).

In an attempt to understand memory in old age and to deal with the practical problems experienced by many old people who have no discernible pathology found that the aging process too often occurs in a social situation detrimental to intellectual functioning. The age decrements interpreted as precursors of dementia may be due to the aging process itself than to deleterious element and of that social situation (Eena, 1992). Results demonstrate that learning or acquisition performance declines uniformly with increasing age but is not related to education. Delayed recall or forgetting, however, was stable across age (Peterson et al., 1992). Individual differences in three year performance on a slit and prose memory indicated that performance had been pertaining to individual change. It could be predicted by age or reasoning (Elizabeth, Michael & Warner, 1993). Forgetting was predicted by age, even after a composite measure of general ability was included in the regression. Recovery was related to general ability alone (Maylor, 1993).

Giovanni, Lucia, Antonello and Claro (1993) administered two tasks viz., long term verbal and long term visuo-spatial to Alzheimer Diseased (AD) and fifteen Multi Infarct Demented (MID), and control subjects following neuropsychological examination. Results challenge the validity of the construct of nonverbal memory as distinct from that of verbal memory, especially in older.
normal adult population (Glenn James & Robert, 1992) The results showed that AD patients demonstrated a larger proportional rate of forgetting than MID and control subjects. Healthy elderly controls showed significant effects of priming for word pairs whereas demented patients showed effects of priming for associatively related words but not for word pairs that are related only by shared semantic features. The results suggest that independent networks of relationships among words and among concepts in semantic memory may be differentially disrupted with various forms of brain damage (Guila & Rhouda, 1991).

Parkin (1993) stated that recent research has examined how different factors influence implicit memory performances. Of these factors, age, is perhaps the most interesting, as well as providing insight into the mechanisms of implicit memory. Studies of aging allow the concept of implicit memory to be examined from a broader developmental perspective. Younger subjects had better incidental memory, but older subjects had better aided prospective memory. The older subjects displayed better prospective memory over younger subjects by better recall of the task and from greater motivation to complete the task (Patton and Machael, 1993).

Several conclusions were drawn from the results of hundreds of studies on secondary memory. Over all older adults perform worse than younger adults on tests of secondary memory (Poon, 1985). These age differences are large. More than 80% of sample of adults in their 20's did better than the adults in their 70's (Verhaeghan, Marcoen & Goossens, 1992). These differences are not reliably lowered either by providing slower presentation or by giving cues or reminders during recall.
Murray (1995) examined seventy two subjects, who were divided into 3 groups rotated (ROT), upright (UR) and imagined (IG). Subjects in the ROT group named drawings shown at each of 6 orientations (0-300 degrees). Subjects in the UR group named drawings shown at zero degrees only. For the IG group, a key press following the fixation cross resulted in the display of a drawing of an upright object. Subjects were instructed to name the experiences previous at six orientations. Results showed that the orientation effects for old objects were reduced compared to those for new ones.

Event related desynchronization (ERD) in young (18-21 yrs) and older subjects (aged 56-71 yrs) were studied during verbal and visuo-spatial recognition tasks. Task difficulty varied according to the difficulty of distinguishing between target and distracter. The effect of task complexity was also influenced by the kind of material to be remembered. More differences between the two levels of difficulty were observed during the verbal tasks. Significant influences of task and time variable on ERD patterns were observed (Dujardin, Bourrée & Guieu, 1995). The magnitude of the age-related deficit was unaffected by various conditions. A significant age-related deficit in recall was found for a short-list of six activities as well as for the longer list of 12 activities (Kausler & Judith, 1990). The age differences in speech discrimination would reduce enhancing the distinctiveness of the speech processing event in terms of both the context of encoding and the response outcome. Younger and older adults performed an auditory lexical decision task in which the degree of semantic constraint and type of feedback were manipulated. The older adults generally showed lower discriminability (D) and greater bias (B) toward reporting signals to words (Brent, Lisa, Miller & Nevin, 1999).
McGuire (1996) examined the remembering medical information over time is important for patient's health and well being on younger and older adults respective memories. Information from a videotaped medical feedback session about osteo-arthritis were examined as a function of information organization. Retention was assessed immediately, after one week, and after one month delay by the use of a free recall task. Younger and older adults in general remembered equivalent amounts of medical information after the one week and one month delays.

Rybash (1996) reviewed the literature on age-related deficits in implicit memory as measured by performance on various repetition priming tasks. Results show that the process associated with normal aging are likely to impair performance on tasks of conceptual item priming and conceptual associative priming, but do not have a negative effect on tasks of perceptual item priming, perceptual associative priming and perceptual-motor priming. This pattern of selective preservation and impairments also found in patients with Alzheimer's disease but not amnesia or Huntington's disease. Findings are interpreted from the perspective of a model of human memory that builds on recent advances within the domain of cognitive neuropsychology. Schacter et al. (1994) provided experimental evidence by demonstrating age-related source memory deficits with one-to-one mapping between facts and sources. The data also indicate that source memory deficits were observed across encoding tasks that manipulate the allocation of attention to the source or the fact.

Multhaup, Balota and Cowan (1996) examined the relationship between contribution of long-term memory to memory span performance and contribution of rehearsal rated 24 younger (MA 21-92 yrs) and older adults.
results show that older subjects had slower speech rates and smaller spans than the younger ones.

Cherry and Pierre (1998) examined the effects of perceptual and conceptual encoding processes on younger (MA 20.8 yrs) and older (MA 69.9 yrs) adults implicit and explicit memory for pictures during acquisition. Subjects studied simple line drawings under varying encoding task conditions. Half of the subjects judged the orientation of the central object (a perceptual encoding task) and the other half indicated the taxonomic category to which the object belonged (a conceptual encoding task). Implicit memory measures were priming in picture-fragment and word fragment completion. Explicit memory measures were free recall and recognition. Results showed that the magnitude of age differences in primed picture completion varied across encoding task conditions. Age deficits occurred on both explicit tasks.

Mathew (1998) proposed a model that links the processing, difference to normal age-related generalized cognitive slowing and to the appearance of specific age-related differences in memory performance. Evidence for these suggestions is present from work in four areas: mental rotation, spatial memory, paired associates learning, and free recall. Cognitive performance in young and older respondents is shown to vary predictably with systematic variation of visuo-spatial and semantic stimulus factors consistent with these hypotheses. A further test of these ideas derives from the development of a clinically useful mnemonic system for older adults that is based on these principles. Taken together, it indicates that much of the deficit observed in the memory performance of older adults may derive not from memory problems per se, but rather from the action of generalized cognitive slowing, which contributes to diminished abilities to represent and process visual images.
A number of studies in the above section on age differences in word associations reported that structural changes appeared in the lexicon with age. Semantic memory has been viewed as the repository of facts, ideas, and concepts that are stored without reference to the temporal and spatial context present at the time of this storage. A generalised age related slowing in the speed of information processing was suggested to account for age differences in the retrieval of identity and semantic information from the long term memory. Age differences in search performance were greatest under secondary memory conditions. In word associations age differences were negligible. Elderly subjects tend to give more schematic and typical associations than did younger subjects, whereas young adults gave more idiosyncratic associations which shows that atypical associations serve to enhance the distinctiveness of a memory trace, thereby, giving young adults a memory advantage over elderly adults.

Researches are still needed on the issue of how much age differences could be attributable to diminished access to information in the lexicon with increasing age, rather than the result of true structural changes. More errors in older adults probably results from diminished connection between separate non verbal and verbal cognitive systems. The age related changes in the organisational structure of lexicon was studied through free word association test with an assumption that the distance between stimulus word and response word representations in the net is greater as the frequency of the response decreases.

Some studies concluded that ageing has little effect on associative structure in internal lexicon, and cohort differences are present for word association, especially for words that do not have primary association. No age differences in the effort components of semantic priming was found. Yet, there were age
differences in the rate of what appears to be automatic semantic activation
in memory of word association, strategic retrieval processes are involved.
There are studies indicating the independent networks of relationships
among words and among concepts in semantic memory.

2.5. Age and Verbal Memory:

Historically speaking, the psychology of verbal learning had its research
origin in serial learning. The originator was Hermann Ebbinghaus (1885) and
perhaps the first formal study of adult age differences in serial learning with
verbal elements was that of Bromley (1958). He found that the serial position
effect is just as characteristic of elderly subjects as it is of young adult
subjects. The total number of errors at each serial position is simply greater
for the elderly subjects. Eis dorfer et al. (1963) and other researchers have
also reported the age equivalence in overall serial position effects.

Kausler and Trap (1960) identified Type I incidental learning in laboratory
testing. Also, there is another form of incidental learning called Type II
incidental learning. In this the material that is learned intentionally is
accompanied by additional material that must be acquired incidentally if at
all. As noted earlier, learning R-S associations along with S-R associations
may be viewed as being incidental learning. It was reported that older
subjects are somewhat less proficient incidental learners than younger
subjects.

The item presentation while using paired associates may also cause
ambiguity in age differences (Kausler & Lair, 1965, 1966). Kausler (1964)
reported that given lists of high and low associative strengths, we would
clearly expect that subjects to acquire the high strength list in fewer trials
than the low-strength list. More important, we would also expect that the
difference in trials to learn between young and elderly subjects to be less for a high-strength list than for a low strength list. In fact, there is a strong reason to support this view that age differences would all but disappear with pairs of high pre-experimental associative strength.

Hulicka and Grossman (1967) studied the role of mediators in the practices on a paired associate’s list. They found that only 36% of their elderly subjects reported using mediator during practice on a paired associates list, compared to 68% of their younger subjects. Moreover, young and elderly subjects also differ in the kinds of mediators employ. Young adults are more likely to use imaginal mediators (i.e., constructing phrases or sentences containing S and R elements), whereas elderly adults show the opposite pattern. Another important factor contributing to age-related deficits in paired associate learning. In general, imaginal mediators are more effective than verbal mediators in promoting paired-associate learning (Paivio, 1971). Marshall et al. (1978) studied the complexity of mediators and reported that once mediators elicited, they do not seem to differ greatly between young and elderly adults.

Age differences in the practice of paired associates has been reported in several studies (Canestrari, 1968, Crossley & Hiscock, 1992, Kausler & Lair, 1966, Ross, 1968; Zaretsky & Halbertstam, 1968). Zaretsky and Halberstam (1968) studied both young (20 to 45 years) and elderly (60 to 80 years) hospital patients who received lists containing pairs of either high, medium, or low pre-experimental associative strengths (five pairs in each list). The age differences were not existed in trials to learn the list with high-strength pairs although it took a surprisingly large number of trials for both age groups to learn the list. Modest with medium identical results were obtained with separate groups of brain-damaged young and elderly subjects.
Reese (1976) in a study on learning proficiency reported that the improvement in performance for instructed elderly subjects clearly indicates that part of the age-related deficit in paired associate learning proficiency is the consequence of a production deficit that can be at least partially overcome by training and practice. Laboratory studies of age differences in paired associate learning proficiency have ignored the fact that much of everyday learning of verbal materials occur incidentally rather than intentionally.

Elderly adults may be experiencing only a production deficiency or performance decrement, brought about, most likely, by the lack of practice in mediator once they have left formal educational settings. If only a production deficiency is involved, the age related deficit in paired associate learning should be largely overcome through the effective use of instructions and training. The elderly people do begin to use imaginal mediators spontaneously after practice on a number of paired associate lists (Treat, Poon, Fozard, & Popkin, 1978).

Pershad (1979), investigated whether younger subjects aged 20-40 yrs old and elderly subjects aged 41-70 yrs old differed with regard to acquisition, retention recall (forgetting), and learning dissimilar pairs of words. Both retention and retentive recall were poor in elderly subjects, and both groups differed significantly with regard to initial learning on a paired-associate tasks, but gains from trial to trial were not significantly different.

Poon and Fozard (1980) presented a long sequence of words to males representing groups with medium ages of 20, 52 and 63 years. High and low frequency words and separations of 0 to 64 words between the two presentations of a given word were employed. Analysis of errors, confidence
judgements and decision times revealed minimal or no age difference when the number of words intervening between successive presentations did not exceed the span of immediate memory. Older subjects' performance declined more rapidly than younger subjects from 3 to 12 sec. retention intervals, but declined at about the same rate from 12 to 192 sec. retention intervals. Low frequency words were better remembered by all age groups and there was no interaction between the effects of age and word frequency in any dependent measure.

Poon and Walsh (1981) examined the effects of bizarre and interacting imagery in the acquisition and retrieval of two paired associates on thirty young and elderly who successfully learned the paired associates to criterion. Interacting imagery facilitated acquisition, especially for the elderly, but did not benefit in retrieval of information. There was no evidence that bizarre imageries were superior than logical once in facilitating acquisition or retrieval. Furthermore, the elderly tended to resist using bizarre imagery and both young and elderly subjects tended to use imagery that was more congruent with non-bizarre life experiences and events.

Siegler, McCarty and Logue (1982) reported from longitudinal test performance on three Wechsler memory scale sub tests (logical memory, paired associate learning and visual reproduction) of the Duke first longitudinal study. Results indicate that hard associates and visual reproduction were found to decline in later life. The issue of selective attrition and distance from death are evaluated on the basis of results.

Patricia and Meggison (1984) in their study on young adults (MA=20.16 yrs) and retirees (MA=67.03 yrs), sorted 48 unrelated words into 2, 4, 6 or 8 categories prior to recall. High and low frequency lists were tested, a
manipulation that only affected the young subjects. Findings showed that initial recall was equally high for both age groups, but the effect of increasing numbers of categories on recall differed dramatically for young and old subjects. Subsequent assessment of long-term recall showed greater memory loss for the older subjects. Long-term forgetting was not associated with a decay of the initial.

Santo and Goldfarb (1985) analyzed the responses of older persons (60-96 yr) to a word association test. Findings show that subjects with Senile Dementia evidenced a characteristic pattern of responses that included marked reduction of paradigmatic responses, no decrease in syntagmatic responses and a marked increase in unclassifiable and multi-word responses not previously reported in the literature.

Monika (1995) presented results of a series of previously published and original studies on older adults memory of action they have performed. The aim of these studies was to determine whether the age-related decline in memory is a global characteristic of the aging memory system or whether the decline is specific to verbal memory. Results demonstrate that deficits in remembering self-performed action are similar to deficits in remembering verbal materials. Thus, the age effect in memory is not limited to verbal materials.

Lovelace and Marsh (1985) measured the memories of twenty undergraduates and twenty older graduates (aged 60-75 yrs) for 60 unrelated paired associates using an associative matching task. Each pair was rated at the time of study for likelihood that the subjects would recall it (prediction measure) and on the matching task each response pairing was judged as to its correctness. Findings reveal that undergraduates were
correct on 50% of the associative matches, while older subjects were correct on only 30% and both were able to predict relative memorability. Marked effects of practice and of age, but no interaction between those two variables were observed when a set of paired associates given to adults in 30's and 60's. Older subjects performance did not decline proportionately after a two week retention interval. After extensive practice, younger subjects took almost the same amount of time to name a word associate as to name word itself while older subjects took markedly longer time to name the word associate than to read the word aloud. This difference in latencies is attributed to less efficient retrieval from memory by the older subjects rather than impairment in response selection (Nancy, 1985).

Marked patterns of intraindividual change was observed in text recall performance for different participants. The decline in performance was characterized by deteriorating physical health. Texts having female protagonist yielded superior recall performance which may indicate that weekly fluctuations in psychological states of the participants influenced their memory performance (Hertzog & Dixon, 1986).

Rabinowitz (1986) studied the related and unrelated word pairs and also gave both cued recall and recognition to young (18-32 yrs) and elderly (60-86 yrs) adults. The recognition test requires speed responses to single words. Priming was measured as the difference in reaction time. Significant age differences were found in both recall and recognition. Both groups showed equal amounts of priming. There were significant main effects of relatedness on all 3 dependent measures but only in cued recall was there a larger age deficit for unrelated words. The results are inconsistent with an age related deficit for integrating pairs of words at encoding and suggest instead an impairment of effortful retrieval processes.
Recent research on cognitive aging indicates the importance of experience and practice in skill maintenance for a particular activity (Salthouse, 1987). Perhaps not surprisingly such expertise is relatively domain-specific and does not extend to other tasks (Hoyer, 1985). Zacks et al. (1987) reported a general capacity model for predicting age differences in memory for critical information in text passages that either explicitly stated or implied, in either a predictable or unpredictable manner among older (60-78 yr.) and younger (16-35 yrs) subjects. No age differences were obtained in the recall of explicit central facts but the younger subjects outperformed the older subjects when these facts had to be inferred.

Cockburn and Smith (1991) aimed to investigate the relationship between everyday memory, cognitive abilities, participation in social, domestic and health status among community-dwelling people (aged 70-93 yr) by using a short term memory test that provides analogs of everyday activities. While fluid intelligence was a significant predictor of performance on most memory items, age was also a significant predictor of performance on verbal memory items. They concluded that cognitive decline in aging involved more than a simple decline in fluid intelligence.

Crossley and Hiscock (1992) administered both "easy" pairs (associatively related words, such as baby-cries) as well as "difficult" pairs (associatively unrelated words, such as obey-inch) from the Wechsler Memory Scale to a sample of young adult, middle-aged elderly and subjects (Wechsler, 1945, 1987). A significant age difference was observed only for the difficult pairs in the number of responses recalled to stimulus elements. However, in their meta-analysis of paired associate learning, Verhaeghen, Marcoen and Goossens (1993) concluded that age deficits are as prominent for highly related words as for lowly related words.
Verhaeghen, Marcoen and Goosens (1993) also concluded that significant age related deficit for low strength pairs was due to qualitative and quantitative changes in rehearsal activity from early to late adulthood. The differential age differences for high and low-strength pairs is unlikely to be the consequences of poorer response learning by elderly subjects for the low strength than for the high strength pairs. The response elements in the low-strength list were essentially equivalent to those in the high-strength list in terms of familiarity and meaningfulness.

Younger and older adults in a study on recognition schematized stories indicate that both age groups produced robust false recognition effects; however, older adults were not more susceptible to these effects. The findings suggest that there are limits to the range of circumstances that yield age differences in illusory memories (Lavoie & Mahustran, 1998).

For name recall, the young and elderly subjects on an average recalled 12.67 and 7.38 names correctly when tested across the young and late adult years. The decline from early to adulthood appear to be greater for the incidental material than for the intentionally learned material. Surprisingly, however, Crook et al. (1993) concluded just the opposite i.e., the age related decline was greater for intentional learning than for incidental learning.

From the foregoing review, it is evident that there has been very few studies on adult age differences in paired-associate learning during the past 20 years. However, in recent years the interest has reappeared towards the use of paired associates in memory interventions. The age difference in trials to learn the list was virtually non-existent with high frequency pairs, moderate with medium strength pairs and age differences are quite evident with low-strength pairs. Many studies concluded that age related deficits are as
significant for high related words than for low related words. The decrements were attributable to the slowness of responding by elderly subjects rather than the decrements in learning ability per se and due to errors of omission rather than errors of commission.

In verbal learning instructions at recall influenced responding. Steady decline in memory performance was reported in some areas, such as recognition and text recall. Results on other studies demonstrated that deficits in remembering self-performed action were similar to deficits in remembering verbal material.

The use of medication during practice on paired associates may lead to differences between young and old. It was reported that use of imaginal mediators are more effective than verbal mediators for both younger and older adults. Older subjects are somewhat less proficient incidental learners than younger subjects.

2.6. Age and Pictorial Memory:

A picture is worth a thousand words. Pictures of day-to-day objects or complex real-world scenes are a potential source of stimuli for memory research. Certain features of a picture are specific to some cultures. Several studies have revealed the startling ability of young adults to recognize with great accuracy of pictures of scenes even though hundreds and even thousands of pictures were presented for a single study trial (Shepard, 1967). The advantage that pictures have over words in recognition is known as the picture superiority effect. This effect is consistent with an important theory that postulates the existence of separate but interacting, picture memory and word memory systems (Paivio, 1969, 1971). Research found only small age difference in picture recognition.
It is difficult to state that memory of pictures is simple and common objects diminish from early to late adulthood. This was probably because, the age-related deficit stems from the greater likelihood of young adults, relative to elderly adults, to name the depicted objects verbally to themselves as they are presented. Thus, from Paivio’s (1969, 1971) perspective, they are more likely to have the benefit of a dual coding. In support of this position, Rissenberg and Glanzer (1986) discovered that their elderly subjects displayed the picture superiority effects only when they have to name overtly the objects in the pictures as they were presented. On the other hand, young subjects displayed the picture superiority effect whether or not they were required to name the objects.

A number of experimental aging studies have supported the notion that neural traces to visual stimuli persist longer for elderly adults than for young adults (Sperling, 1960, Erikson & Collins, 1967). It is concluded that any changes with aging in either the capacity or the duration of iconic memory are likely to be slight, if they exist at all.

There seems to be no reason to believe that there are major age changes in echoic memory. The equivalent of iconic or echoic memory for each of the other senses has received relatively little attention. Available evidence indicate that iconic memory stems from persisting activity of both rods (Sakitt, 1975) and cones (Adelson, 1978). On the other hand, there is also evidence to indicate that post sensory factors are at least partially responsible for the existence of iconic memory (Holding, 1975; Merikle, 1980, Sakitt & Appelman, 1978).

Bolye, Aparicio, Kaye and Acker (1975) tested short term auditory and visual memory of subjects aged 44-77 yrs as part of a longer series of memory and
cognitive function tests. The tests included the Wechsler memory scale, visual reproduction and associative learning sub-tests. All test scores for visual memory, including facial photograph recognition when a sequence requirement was adhered to, showed a significant decline in a comparison of subjects aged 44-54 yrs and subjects aged 55-64 yrs. This decline was not observed with the two sets of auditory memory. Thus, the data indicate that short term visual memory may be more susceptible to aging than auditory memory.

Charman (1979) investigated iconic memory, attention and aging in four groups of 10 subjects each (mean age 58.1, 58.9, 20.9, 20.2 yr.) for the purpose of understanding the role of pre-senile dementia. It was hypothesized that 1. Attention and iconic memory are independent variables and 2. Attentional demands are independent of age whereas iconic memory is inversely related with age. Findings support the hypothesis that younger subjects possessed a non-subjective iconic memory that had not deteriorated through aging.

Memory for the lateral orientation of seeing pictures in two experiments with 12 young (MA =19 yrs) and 109 elderly (MA =67-72 yrs) adults were examined (Bartlett et al., 1983) to investigate whether such orientation in memory is susceptible to age related differences or not. In experiment I, an input list of pictures was followed by a test demanding discrimination between targets vs reversed copies of input items, or targets vs new pictures that verbally resembled input items. Results show that age related difference was reliably larger in the former task than in the latter. In experiment II incidental vs intentional acquisition of orientation was compared under conditions of short (1 sec) and long (5 sec) presentation of pictures at input. Results show that with short presentation, intentional
instructions reliably impaired orientation memory. Findings suggest an age-related deficit in truly non-intentional encoding of orientation and pose a challenge for capacity theories. All memory interference in young adults could be attributed to retrieval difficulty, but a residual proactive deficit occurred in older subjects (Schofield, Heather & Jones, 1983).

Park, Puglisi and Sovacool (1984) studied the contextual detail in a stimulus set by reproducing cartoon pictures intact or with much of the background obliterated on college students and 65-69 yr olds. They were presented cartoon slides both with and without contextual detail During recognition, presence or absence of background was crossed factorially with its presence or absence during encoding and subjects indicated whether they recognized the cartoon. Old and young subjects evidenced encoding specificity effects of comparable magnitude. Young subjects recognized pictures with contextual detail better than pictures without detail, whereas reverse appeared to be true for older subjects. No age differences were found in either accuracy or response latency. Younger subjects were superior in word retrieval as measured by both number of successful retrievals and response latency (Nancy & Poon, 1985).

Jerker (1986) reviewed research during the 1970-1985 period on auditory and visual attention, short term memory and long term memory, learning and memory dysfunction and reading, problem solving and decision making from the perspective of memory and learning. Specific processes addressed include coding processes, serial position phenomenon, discourse processing and amnesia. Five hundred and thirteen papers were reviewed of which 360 are of Scandinavian origin. Three trends were projected as follows: Cognitive task analysis, cognitive neuro-psychology, and an of qualitative data analyses. It refers to people's memory for location. Results indicate that
performance peaks by midlife and decreases steadily thereafter. The spatial memory can be tested by presenting them with an array of objects, remove the objects and ask the subjects to reconstruct the array (Atting, 1983; Pezdek, 1983, Waddell & Rogoff, 1981). Older adults do not perform well than young adults regardless of whether the objects are household items/building locations on a map.

Adult age differences in memory for pictures of common objects per se were reported by many researchers (i.e., without contrasting it with memory for words). Trakan, Larrabee and Levin (1986) tested age differences, in picture recognition memory (line drawings of objects) with the continuous recognition procedure, in a sample of subjects (aged 10-89 years). The older adults in their sample were far less proficient on this task than were the younger adults (e.g., mean $d'=3.10$ and 2.25 for the age range of 18-29 yr and 66-77 yr, respectively).

Bartlett and Leslie (1986) evaluated differences in the ability of young women (MA= 18 yr) and thirty three elderly females (MA=74.2 yr) to recognize faces under two conditions. In a standard single-view condition in which each input face was shown as one photograph, prior findings were confirmed that young adults perform better than the elderly at distinguishing photographs seen before from photographs of new faces. The elderly had more trouble in distinguishing photographs seen before from photographs of (1) old faces changed in facial expression and (2) old faces changed in expression and pose. In the multiple condition no age differences were found. Data support age differences in remembering facial expressions but not in remembering faces per se.
Rybarczyk, Hart and Harkins (1987) assessed the rate of forgetting in terms of standardized line drawings of common objects on young (MA=22yrs) and older (MA= 70.5 yr) subjects. The two groups forgot equal quantities of pictorial stimuli over successive intervals of 10 min, 2 hr, and 48 hr, after being matched for original learning. In contrast, the older subjects showed the expected age decrement in reproduction of geometric designs from memory. These findings indicate that aging does not affect retention of pictures when differences in learning and retrieval abilities are controlled.

Park, Royal, Dudley and Morrell (1988) presented the pictures for study on young and older adults. Their recognition of the information was tested at five retention intervals, immediately and after 48 hr, one week, two weeks, and four weeks later. The main finding of interest was that picture recognition did not show an age-related decline until the first week retention interval.

Park, Smith, Morrell, Puglisi and Dudley (1990) employed a cued recall procure in their study. In the control condition of their study, line drawings of to-be-remembered common objects (e.g., spider) were presented along with an unrelated cue juxtaposition with the target (e.g., a drawing of a cherry). On the recall of test, the unrelated cues were reinstated, and the subjects attempted to recall the target items paired with them. Of the 32 target items, the young adult subjects recalled an average of 16.18 and the elderly subjects an average of only 5.79.

Park et al. (1990) also demonstrated that the memorability of targets and the cues exposed along with them. In one condition the two pictures in each pair were shown as interacting with each other (e.g., the spider eating the cherry). Here the young on an average recalled 14.53 targets and elderly subjects
recalled 9.66 targets. In another condition, each target was exposed in juxtaposition with a semantically related picture (e.g., an ant next to the spider). In this condition the young averaged 23.78 and 16.59 targets and elderly subjects averaged 14.53 and 9.66 targets recall, respectively. It is interesting to note that the increase in recall promoted by adding either an interacting or a semantic relationship between the targets and its context (i.e., the picture) was greater for the elderly subjects than for the young subjects. This age differential was viewed as evidence for the advantage of providing environmental support to the memory for the older people (Park et al., 1990).

Age difference in memory for pictures of faces presented under laboratory conditions have been found to be better pronounced (Crook & Larrabee, 1992, Ferris, Crook, Clark, McCarthy & Rae, 1980). Researchers have found little age difference in hit rates for correctly recognizing old faces but a large age difference in false alarm rates for incorrectly recognizing new faces as old (Bartlett & Fulton, 1991, Bartlett, Strater & Fulton, 1991, Fulton & Bartlett, 1991) Elderly adults have been found to be no more accurate in the recognition of old faces serving as target items than the recognition of young faces (Backman, 1991; Fulton & Bartlett, 1991).

Denney, Miller, Dew, and Levav (1991) stated that only moderate age related deficits for memory of scenes whether they were either the targeted-to-be-remembered items or the background for words as the targeted items. Frieske and Park (1993) reported age-related deficit in the scene memory to be accounted for in part by an age related deficit in working memory capacity.
Levels and rates of forgetting of name-face association and grocery list items were assessed in a sample of 1,921 normal participants that was divided into five age groups (i.e., 17-39 yrs, 40-59 yrs, 50-59 yrs, 60-69 yrs and 70-92 yrs). Retrieval was assessed via the consistent long-term retrieval score from the Grocery List Selective Reminding Test. Substantial linear age-associated declines in level of acquisition were noted for both name-face associations and grocery list items. There was a significant age-related drop in rate of acquisition of name-face associations. Very little forgetting occurred over a 40-min delay at any age on either measure. There was a significant linear age-related decline in retrieval efficiency for grocery list items when variance due to both level of acquisition and retention was removed (Youngjohn & Crook, 1993).

This subsection reviewed studies on memory performance for pictorial stimuli. It is evident from the literature that older adults did not appear to employ strategies, possibly due to limits of the meta memory demands. Younger subjects possessed a non-subjective iconic memory that had not deteriorated through aging.

Studies on memory for pictures show that pictures with contextual details was better than pictures without detail, whereas reverse appeared to be true for older subjects. Some studies observed age differences in remembering facial expressions but not in remembering faces per se. Texts having female photographs yielded superior recall performance peaking by midlife and decreasing steadily thereafter. No age differences were obtained in the recall of explicit central facts but the younger subjects' performance was superior than the older subjects.
2.7. Age and Remote Memory:

Many reviews have summarised the age-associated changes in different types of memory, across different information processing stages. The distinction between primary and secondary memory indicates most pronounced deficits in secondary memory. Episodic tasks typically showed age-related decline, in contrast to preserved semantic tasks. Remote memories that are not practiced often are very difficult to examine systematically. There are very few studies in which remote memories have been examined longitudinally (by acting themselves as subjects) (Botwinick, 1967). Episodic events experienced early in life are remarkably preserved as one gets older. Very long term memories were sometimes referred to as either remote memory or tertiary memory (Poon, 1985). In this, studies referred to another type of memory, i.e., autobiographical memory. Assessment of autobiographical memory naturally have a number of methodological problems. These autobiographical memories refer to personally experienced events that are unique to an individual. Episodic memory as stated in the earlier subsection refers to memory that linked with a time and a place.

The standard procedure to measure autobiographical memory is the one introduced years ago by Galton (1911). Subjects are presented with a series of words (e.g., book, machine, sorry, surprised) and are asked to associate freely to each word with a personal memory. After the last memory is recalled, they are then asked to date when the remembered event occurred.

In autobiographical memory, it is found that reminiscences have been recalled many times before over a person's life span and with each
retelling, details alter to improve the flow of the narrative (Bartlett, 1932).

Forgetting among adults was investigated on adults, ages from 20's to their 70's. They were simply asked to recall the names of all their grade school and high school teachers. By the time the subjects had reached their 20s, they had already forgotten one third of the names of their teachers. Beyond that age, forgetting began to slow down considerably (Schonfield, 1969). Nevertheless, for people age 70 and beyond, more than half of the names had been forgotten. Similar results were found by Bahrick, Bahrick, and Wittlinger (1975) for names of high school classmates and by Bahrick (1979) for names of streets in the city housing in the college attended by the subjects by Bartlett and Snelus (1980) for titles of songs.

Warrington and Silberstein (1970) employed somewhat different strategy for studying age differences in remote memory. This one has been employed in a number of later studies (Erber, 1987). Instead of testing for the retention of episodic events shared with relatively few individuals, such as teachers' names, they tested the retention of newsworthy event, that is events shared by virtually all of us. Their procedure has the advantage of studying the effect on retention of the age of an event, the effect of the age of an event and the effect of the age of the individuals being tested for retention (both at acquisition and at the time of testing). At the same time, the procedure is loaded with methodological problems that confound possible age changes in retention with changes linked to other potentially causative factors.

Elizabeth and Helen (1971) devised a questionnaire relating to past events and a well known faces recognition test, to provide an objective and quantitative assessment of recent and remote memories. 304 old normal
Elizabeth and Helen (1971) devised a questionnaire relating to past events and a well known faces recognition test, to provide an objective and quantitative assessment of recent and remote memories. 304 old normal subjects in the age groups of 40-89 yrs were tested on recall and recognition versions of each test. It was found that performance declined with increasing age for all time periods sampled. No evidence obtained to support of the widely held belief that memory is inversely related to the remoteness of event in older subjects.

In a more comprehensive study by Warrington and Sanders (1971), subjects (age ranging from 40 to 80 yrs) were tested for the retention of events occurring during a two year period, beginning with 1967 – 1968 and ending with 1930-1931. The popular notion mentioned earlier, predicts that the oldest members of the total groups should excel for retention of the most remote events (those of 1930 – 1931), whereas the youngest members should excel for retention of the most recent events (1967-1968, the study was conducted around 1970). Contrary to this notion, that is, their oldest subjects retained less of early events as well as more recent events. These results were subsequently referred to even so-called “flash bulb” memories.

Botwinick and Storandt (1974; 1980) found no overall age differences for events occurring from the 1890s to the 1960s, and other have found small or unsystematic age differences over a long historical time period (Howes & Katz, 1988; Storandt, Grant & Gordon, 1978). Perlmutter (1978) found significantly superior overall retention (i.e., combining all the time period being tested) by her older subjects.

Remote memory is usually tested by giving a subject a list of names and descriptions of events which have been ‘in the news’ over the past 50 or so
years and asking them to indicate which they can remember. To assess the depth of a person's remote memory, the names on the Famous Name Test (FNT) can be divided into categories, namely those famous in the 1970's; 1960's, 1950's, 1940's, 1930's This phenomenon has been observed by many other researchers (e.g., Craik, 1977, Perlmutter, 1978) Poon et al (1979) contradicts the once popular Ribot's hypothesis (1882) According to Ribot's hypothesis, fresh memory inputs are more likely to displace recent than distant memories He found no age differences for the retention of relatively recent events and superior retention by elderly adults for more recent events Poon et al. (1979) studied the age related differences in memory for recently and remotely dated events through questionnaire assessment among healthy males aged 26 - 69 years Results showed that the elderly exhibited no impairment of the ability to remember recent colloquial events and the elderly's surprisingly accurate recall of remote events was not a product of selective and frequent rehearsal.

McCormack (1979) in his first experiment on a sample of 44 females with a mean age of 79.6 yrs were required to respond to each of twenty common nouns with an episode from their lives They were also asked to time tag each episode when it was elicited and again approximately a week later. In experiment II, 41 males and 17 females with mean ages of 72.5 and 83.2 yr respectively served as subjects in a single session. Results were found to be significant of age and gender

Researchers who have examined adults' performance on tests of knowledge about historical events, find little difference in performance across age groups (Lachman & Lachman, 1980; Perlmutter, Metzger, Miller & Nezworski, 1980). In general, studies using Galton's method (Galton, 1911) have indicated that more recent memories are recalled more frequently than
are more remote memories, regardless of a subject's age (e.g., Hyland & Ackerman, 1988), although a U-shaped function has also been reported (McKinnon & Squire, 1989, McCormack, 1979). That is, both remote and recent events are recalled more frequently than temporally intermediate events.

Fitzgerald and Lawrence (1984) examined the processes of autobiographical memory through a procedure in which young (11-14 yr old college students), (35-55 yr young adults) and elderly (60-75 yr olds) were asked to provide memories of specific events in response to single-word prompts. Analyses of response time and age of memories indicated response time remained stable during adulthood, whereas average event age increased. Analyses of retention function indicated little difference in the retrieval of memories from recent intervals. Imagery values and meaningfulness correlated with response time for all age groups but only correlated with age of memories for college students. Data suggest similarity of memory systems across age for the level of functioning associated with the encoding of daily events.

Many studies reported that forgetting is quite rapid for the first few years after acquisition. After 4 to 6 yrs it levels off, and retention remains rather stable for the rest of one's lifetime. Somewhere between 20 to 40% of the original material is seemingly retained in what Bahrick (1984) calls a permastore. The information in permastore is probably adult age differences in real-life forgetting. That portion of the original material that was highly "overlearned" at the time of acquisition. It was observed that forgetting was rapid for the first few years following acquisition of the to-be-remembered information, followed by a general leveling off for the amount retained.
Bahrick (1984) tested the recognition memory of faces in Professors' introductory course classes (about 40 students per class) at several retention intervals extending over 8 yrs. Recognition memory scores were moderately high (about 65%, each student's picture was tested with four foils); 11 days after the end of the 10 week term, they were close to chance (about 25%) and after 8 years the degree of original acquisition, of course, was undoubtedly much less than that occurring for students acquisition of their classmates names or their teachers names. These results emphasize further that a high degree of overlearning is surely required before information enters a permastore (store of original material). Generalizing from these studies, the notion that remote or tertiary memories of long ago events are remarkably immune to forgetting does not appear to be true. Age of the memory (40 yr and 10 yr for 60, and 30-year-old individuals) is obviously confounded with the actual ages of those individuals.

Memory for personally experienced events, which are unique to an individual refer to autobiographical memory. Accuracy of the time the related to remembered event i.e., when it was occurred especially is questionable. Despite these problems, there have been a number of studies that have examined age differences in autobiographical memory (e.g., Cohen & Faulkner, 1988, Crovitz & Quina-Holland, 1976, Crovitz & Schiffman, 1974, Fitzgerald & Lawrence, 1984, Franklin & Holding, 1977, Fromholt & Larsen, 1979, Holland & Ackerman, 1988, M. c-Kinnon & Squire, 1989, McCormack, 1979; Rubin, 1982; Sagar, 1990, Sperback, Whitbourne & Hoyer, 1986).

Allen and Brendam (1987) reported age differences in prospective memory and the relations among metamemory, use of memory aids and actual performance on prospective memory tasks. Subjects were 83 males and 145 females aged 30-99 yrs who have completed a metamemory
questionnaire and two prospective memory tests. Findings of the metamemory tasks show an age-related increase in reported memory problems. The pattern of correlations revealed that metamemory scores and prospective remembering performance were often negatively correlated.

Backman, Herlitz and Karlsson (1987) examined the free recall of verbal materials varying in datedness on younger adults (aged 18-25 yrs) and elderly, aged 73 yrs and 82 yrs. Data suggest that activation of pre-experimental knowledge structures appears to improve episodic recall in both young and old adults. Byrd (1987) examined twenty younger (18-24 yrs) and twenty older adults (63-73 yrs) to retain textual information on how the semantic memory store of previously acquired knowledge affects the ability. Subjects were presented with a series of biographical passages and were told they concerned either a famous historical character or a fictitious character. In an immediate recognition test, both young and old subjects were able to discriminate between test and distractor sentences. However, in the delayed recognition condition, older subjects had considerable difficulty in differentiating between target and distractor sentences, particularly in the famous character story condition.

Fitzgerald (1988) explored the over representation of memories from the adolescents and early adult years in the autobiographical memories of older adults. In study I, older subjects asked to report on autobiographical memories and the quality of memories were examined in study II. Results indicate that reminiscence effects reflected the availability of a pool of vivid memories from this era. Forgetting in very long-term memory can be gradual and continuous for many years after learning (Larry, 1989). Research on people's ability to combine pieces of information in tertiary memory to answer
inference questions indicate no age differences in tertiary memory and may be an evidence for improvement (Camp, 1989).

Howes and Katz (1988), used a skillfully crafted assessment procedure with demonstrated sound psychometric properties. Their results indicated that middle aged subjects remembered more than elderly subjects about historical events. All of the subjects had lived through, both remote and recent. Given the potential presence of causative factors other than age level at the time of retention is assessed, it is interestingly that some investigators have found age difference in retention favoring elderly subjects (Poon et al., 1979), whereas other investigators have found age differences favoring younger subjects (e.g., Howes & Katz, 1988, Warrington & Sanders, 1971).

Johnson, Foley and Suengas (1988) conducted two studies to explore potential bases for reality monitoring of naturally occurring autobiographical events. In their first study, subjects rated phenomenal characteristics of recent and childhood memories. Compared with imagined events, perceived events were given higher rating on several characteristics including perceptual information, contextual information and supporting memories. In their second study, subjects described how they knew autobiographical events happened for perceived events. Subjects were likely to engage in reasoning based on prior knowledge. Results are consistent with the idea that really monitoring draws on differences in qualitative characteristics of memories for perceived and imagined events.

Older people's prospective memory is well preserved or even better than younger people's when tested under laboratory conditions (Cockburn & Smith, 1988, West, 1989). Perceived memories refer to the recall of things
that actually occurred in the past, while generative memories refer to things that were thought about or imagined. Ability to discriminate these memories affects several factors. The reliability of eyewitness testimony, autobiographical memories, and efficiency in everyday tasks and ability to comply with advice instructions were important (Cohen & Faulkner, 1989). Thus, prospective memory refers to remembering to remember (Harris, 1984; Meacham, 1982) on the basis of two distinctions: event-based and time-based.

Events do not always have to be personally traumatic to be highly memorable. Some historical events that have considerable personal relevance, very unusual or novel events, and other events that are highly emotional are also remembered very well. Such memories are called flash bulb memories because they are so vivid that it seems as if we have photographed the event (Brown & Kulik, 1977; Rubin & Kozin, 1984). Research indicates that flash bulb memories are affected by aging. Studies on older adults' ability to remember the source of information consistently shows that they have more difficulty compared with young adults in remembering where, when, or from whom they learned information (Schachter, Harbluk & McLachlan, 1987) as well as the context surrounding the event (Cohen, 1993). As a result, older adults experience fewer flash bulb memories than young adults (Cohen et al., 1994).

Holland and Rabbitt (1990) examined different explanations of age-related impairment in recall of details from text and autobiographical events. Subjects in their 60's and 70's show that difficulty with details was predicted independently by chronological age and by measures of fluid intelligence and the more crystallized verbal ability. Decreased specificity was not a result of faster decay of memory for details. The resource deficit appears to
affect retrieval and appropriate implementation of detail. Subjects’ verbal
ability, which does not decline with age, still has an important part to play

Event based action is to be performed when a certain external event
happened e.g., giving message to a person. Time based action is to perform
an action after a fixed amount of time, e.g., pressing a key for every eight
minutes (Einstein & McDaniel, 1990). Older adults showed age differences
in time-based prospective memory than event-based

Method of recall in prospective memory can be divided into two classes,
Internal strategy (simply remembering to add another on to the end of a
familiar sequence) or an external strategy (the right of the coffee cup acts as
an aide memory). Earlier findings show that older people tend to use more
external cues (Jackson et al., 1982, Moscovitch, 1982). An age effect was
also found. Internal cue users who made errors were significantly older and
external cue users who made errors were significantly younger (Maylor,
Fromholt and Larsen (1991) studied the autobiographical memory of old
people (71-89 yrs) by a method of free narratives. The sample consists of
normal subjects and subjects of SDAT at three stages of development.
The chronological distribution of memories across the life span in both
groups showed a peak in adolescence and early adulthood, decrease in mid-
life and increase in recent years. The distribution in the demented group was
more flat, which contradicts theories of selective preservation of early
memories. The article argues for an approach to autobiographical memory
that takes into account socio-cultural and developmental determinants of
memorability and internal mechanisms of the cognitive system.
Mackavey, Malley and Janet (1991) analysed the autobiographies of 49 eminent psychologists by content analysis in terms of autobiographically consequential experiences. Most memories for age were not single episodes. They share many characteristics of "flash bulb" and vivid memories elicited using traditional procedures. Memories were concentrated during the college and early adult years. Thus, as in other autobiographical memory studies that have used older subjects, there was a pronounced reminiscence effect. Results were interpreted in light of Erikson's theory of adult personality development.

Maylor (1991) in his study on 50+ aged subjects asked them to listen to theme tunes of remote, recent and frequent television programs. First they were asked for the name of the program as possible. The Multiple Regression Analysis shows that age was a better predictor of performance than measures of current cognitive ability. When compared this result with recognition and naming of famous faces, the information processing rate decreases with age. Thomas and Dorothy (1992) examined the extent to which the memory performance of different aged adults was dependent upon the conceptual relationship between the to-be-remembered information and the perspective adopted at retrieval. In both studies, young and old adults read a story from one of two perspectives. It was found that memory performance in both age groups was related to the relevance of the story formation to the recall perspective.

Another serious methodological flaw concerns how the memories are elicited. Asking subjects for their most vivid memories produces a glut of reminiscences from the early part of their lives. So does giving subjects a cue word, and asking them to produce a reminiscence associated with it (Cohen, 1989). Amazingly adults in their 70's could still recognize 70% of
their classmates' names 48 years after graduation (Bahrick, Bahrick & Wittlinger, 1975). Verification is crucial in testing people's recollection of personally experienced events. In fact, half of the memories elicited at age 50 were more accurate than the memories for the same information elicited 10 years earlier at age 40 (Cohen, Casey & Dwyer, 1991).

The review of age differences or changes in episodic memory proficiency focused on research investigated by information processing models and analyses of the human memory system (Craik, 1977; Craik & Jennings, 1992, Hultsch & Dixon, 1990, Kausler, 1985, 1991a, 1992; Perlmutter et al., 1987, Poon, 1985, Walsh, 1975). The extent to which age-related differences in executive functioning account for age-related differences in recall from episodic memory on a group of healthy older adults (60-91 yrs) was examined by Troyer, Graves and Cullum (1994) by administering general cognitive abilities, episodic memory and executive functioning. Results indicated that when considered alone, age was not a significant predictor of recall when the effect of executive functioning was partialled out of the equation ($p = .37$). A significant portion of age-related differences in episodic memory recall, therefore may be due to age-related differences in the executive skills required for optimal performance on such tests.

Cockburn and Smith (1994) studied the distribution and constituents of incorrect responses in elderly subjects (aged 7-93 yrs) to understand the relationship between age and perspective memory. Responses to the appointment item of the Rivermead Behavioral Memory Test (RBMT) were examined for frequency of occurrence of different types of error and their relationship to anxiety, age and current intelligence. The results suggest a complex relationship in which there is an inverse relationship between...
anxiety and intelligence and where error types are differentially related to low and high anxiety and to age. Several studies found that adults performed best on prospective memory tasks in the early mornings (Leirer, Tanke & Morrow, 1994)

Hess and Follett (1994) were specifically interested in examining performance of age differences in the availability of episodic information. It was found to be minimal. No age effects were observed in judgement tasks where responses were biased toward exclusive reliance on one or the other type of information. However, in a situation where both types of information could be used, the responses of older adults were less likely than those of younger adults to be influenced by available episodic information. Word-cued autobiographical memories in older adults from the ages 10 to 30 were examined by Rubin and Schlikind (1997). All age groups recalled memories from childhood than from other years and a power retention function for memories from the most recent 10 yrs. There were no consistent differences in reaction times and rating scale responses across decades. The five most important memories given by 20 and 35 yr old participants were distributed similarly to their word cued memories but those given by 70 yr old participants memories come mostly from the single 20 to 30 decade.

The autobiographical specificity decreased with increasing levels of cognitive impairment. Subjects were more likely to produce over generic memories (omissions or generic memories) than extended or specific memories. There was little relation between severity of depression and specificity in autobiographical memory consistent with previous suggestions that over generality in depression is a long-term cognitive style unaffected by state of depression (Phillips & Williams, 1997).
Cohen (1998) reviewed research on age-related changes of function (both interpersonal and knowledge-based) and in memory quality for self-selected and experimental designated memories. This shows that elderly people preserve a selected sample of memories in their original vividness and detail. These are memories of events that are personally important and are often thought about talked about other memories. Other memories that have less personal significance are not often recalled, recounted or mentally rehearsed and these memories lose specificity and detail, become vague and general. He relates these changes to the age-related changes in the function of autobiographical memory, including the problem-solving function and interpersonal functions.

Johansson et al. (1999) using the relative importance of genetic and environmental influences on episodic memory in very late life studied identical (N=125) and same sex fraternal (N=157) twin pairs, aged 80 and old (MA=83, SD=31), without a diagnosis of dementia were tested with seven memory measures: 1-2 Digit span forward and backward; 3. Prose recall; 4 Thurstone’s picture memory test; 5 Free recall; 6 Recognition and 7 Relocation. The results demonstrate genetic influences on memory in the oldest-old but suggest that the magnitude of these effects differs across memory measures.

Brent et al. (1999) examined longitudinal changes in quantitative and qualitative measures of episodic memory. The sample selected from the Victoria Longitudinal study consisted of younger adults (55-70 yrs) and old-old adults (71-86 yrs) who were tested three times over six years. Average word and text recall as well as five indicators of qualitative aspects of word recall and one indicator of structure of text recall were used. Results for all text-recall showed significant performance increments for the you
group, whereas the old-old group exhibited slight declines in overall performance.

From the review of studies on remote memory among the aged the following observations were made. The studies on remote memory indicate that forgetting in real life events started by the time the subjects had reached their 20's, beyond that age forgetting began to slow down considerably. It can only show that forgetting is quite rapid for the first few years after acquisition, after 4 or 6 yrs it levels off, and retention remains rather stable for the rest of one's life time. Twenty to forty percent of stable informations are stored in permanent store. Some studies on this indicates that over learning is a requisite if it needs to be kept in the permanent stores. Age of the memory is obviously confounded with the actual ages of those individuals. The studies that appeared in 1970's indicated no age differences. Oldest subjects retained less of early events as well as more recent events. Subsequent researchers reported highly conflicting results. They reported that no overall age differences for historical events and some studies found small and unsystematic or no age differences. Thus a potentially critical factor is the age of an individual at the time a significant event occurs.

Number of studies were reported on age differences in autobiographical memory. Several studies reported that remote and recent events are recalled more frequently than are midlife events. Some studies reported significant age and gender differences in episodic memory. Data on episodic memory indicate that similarity of memory systems across age for the level of functioning associated with the encoding of daily events. It is clear that reminiscence effects reflected the availability of poor vivid memories from that particular stage of life. Subjects were likely to engage in reasoning.
based on prior knowledge to monitor naturally occurring autobiographical events. Some studies stated that age alone was not a significant predictor of recall. Time-based prospective memory deficits in older adults are due to a fundamental deficit in time monitoring rather than to prospective memory. The resource deficit appears to affect retrieval and appropriate implementation of detail. For an approach to autobiographical memory, socio-cultural and developmental determinants of memorability and internal mechanisms of the cognitive system are important. Some studies reported that laboratory studies may overestimate the magnitude of age-related deficits in episodic memory and serve effectively to identify reasons why deficits occur in everyday episodic memory experiences. The studies on flash bulb memories stated that some events which are highly traumatic with personal relevance, highly emotional are remembered frequently.

2.8. Memory and Interventions:

It is very common that both old and young people often complain of a poor memory. Some find it very difficult to remember names or numbers and quickly forget them again. Others find that they cannot recall old familiar names of people, things or places. Nevertheless, people also grow apprehensive about their poor memory, observing an increasing decline in mental powers or inability to keep pace with demands of their daily life. Further, it is observed that if memory is systematically trained, its previous performance can largely be regained.

The method for efficient remembering has been well-known for more than 60 years. Woodrow (1927), a Psychologist suggested seven strategies through which the memory can be improved. These are: 1) learn by wholes rather than in parts, 2) use active testing of what you have learned and
remembered, 3) use rhythms, rhymes and groupings for the items you are memorizing, 4) pay attention to meaning and picture the items in your head which you are going to memorize, 5) be mentally alert and concentrate; i.e., pay close attention to what you are learning, 6) use secondary association, linking what you are learning to things that you have learned before, and 7) have confidence in your ability to memorize (Das, 1998)

Experimental evidence shows that paired-associate and list learning can be improved when an appropriate mnemonic technique is provided for elderly persons. Memory can be improved through acquiring skills and practicing them (Yates, 1966). Leech and Witte (1971) attempted to enhance performance on a paired-associate-learning task in a group of older volunteers. The intervention consisted of reducing the number of omission errors by administering a small monetary reward for commission errors. The authors reasoned that older adults may know correct responses yet be reluctant to provide them. The intervention decreased omission errors and increased the rate of responding as a result of intervention and performance on paired-comparison was unaffected.

Labouvie-Vief and Judith (1976) conceptualized the reduced intellectual performance in the elderly as an experimental deficit that can be reversed by training relevant component skills. Sixty females aged 63-95 yrs old participated in three phases of the experiment, training, immediate post test and delayed post test. Training was geared at strengthening covert self monitoring strategies in complex reasoning problems and training effects were evaluated both on the training and on a transfer task. Results show raised performance in the complex reasoning problems.
Researchers suggested two points should be emphasized about intentional remembering. Firstly, it takes effort to systematically organize the to-be remembered information. Secondly, different individuals may prefer different mnemonics (Higbee, 1977, Lorayne & Lucas, 1974). In intentional remembering a couple of points need to be emphasized: (1) it takes effort to systematically organize the to-be-remembered information; and (2) different individuals may prefer different mnemonics (Poon, 1984, Higbee, 1977, Lorayne & Lucas, 1974).

Evidence suggests that though pharmacologic-cognitive intervention models are appearing, their success in cognitive facilitation has been found to be limited (Hines, & Fozard, 1980; Marsh, 1980).

Harris (1980) and Cavanaugh, Grady and Perlmutter (1983) suggested that most useful classification of the organized memory strategies that are commonly used to support memory in everyday situations were external memory aids - that rely on environmental resources, such as note books (or) calendar diaries, address books, notepads, micro computers, and other devices.

Another approach to memory training is based on viewing memory as mental muscle. Exercising memory is one type of task strengthening and setting the stage for better memory in a variety of other tasks (Harris & Sunderland, 1981). Research has suggested that older adults are less efficient in using categorization strategies than younger adults (Sanders, Murphy, Schmitt & Walsh, 1980). Older adults found to respond to instructions to use category rehearsal techniques (Schmitt, Murphy & Sanders, 1981) and also suggested that the timing of the incentive will invoke different recall processes.
Harris and Sunderland (1981) also suggested that some benefit may accrue if memory practice is begun at the first sign of loss. Four popular mnemonic systems were discussed in memory training studies by Harris and Sunderland (1981). They were Link system, Loci system, Reward system and Phonetic system.

Treat, Poon and Fozard (1981) investigated the elderly and college aged subjects on a series of age differences in the use of mnemonic imagery as a strategy in verbal learning. Subjects were tested on three occasions at two-week intervals. Two ten-pair lists of concrete noun paired associates were learned at each session. Standard self-generated and experimental-provided imagery instructions were used. Results indicated that imagery instruction are quite beneficial for elders in the short-run. Elders tended not to use the strategy effectively after a two-week interval unless reminded to do so. Results also indicated that elders were capable of generating useful learning strategies on their own when given sufficient experience with the task. Older people, who think memory inevitably declines may also believe that strategy training is useless to try (Cavanaugh & Mortan, 1988) and remember something that does not come to mind immediately (Chaffin & Hermann, 1983; Zarit, 1982). In contrast, remembering errands, appointments, and places appears to remain unchanged with age (Cavanaugh, Grady & Perlmutter, 1983).

Data available from memory training programs indicate that memory complaints can be reduced after training, but in a non-specific way (Perlmutter et al. 1980; Schaffer & Poon, 1982; Yesavage, 1981; Zarit, 1982). It is important that participants be distributed equally on these across the experimental and control groups in order to obtain a clear picture of training effectiveness (Schaffer & Poon, 1982).
Zarit, Zart and Karen (1982) tested the use of visual imagery for overcoming memory loss in a sample of community living older people with evidence of senile dementia. These people were randomly assigned into one of three training conditions didactic, in which imagery techniques were taught, problem-solving which presented practical solutions for everyday difficulties, and a wait list Caregivers of the dementia patients were also included in the groups. Although recall performance was somewhat improved for subjects in the didactic group, those gains seemed to have little practical value for caregivers.

Poon (1984) discussed the wide scope for future research especially the collaboration of biomedical and cognitive researchers through a defined set of diagnostic and evaluative tools that examines the efficacy of treatment effects and to evaluate the effects of cognitive and pharmacological intervention that improves memory and cognitive function in older adult. Ericsson (1985) argues that acquired memory skills best account for individual differences in memory performance. Chase and Erickson's (1982) theory specifies three principles that characterize the structure of memory skills i.e. (1) information rapidly stored in long term memory is encoded in terms of knowledge structures in semantic memory, (2) during storage in long-term memory, special retrieval cues are explicitly associated with the memory encoding of the presented information, (3) encoding and retrieval operations using long term memory can dramatically speed up by practice, making the rate of information storage in long term memory comparable to that of short term memory. It is contended that strong evidence for these principles has also been found for normal subjects when they are given more than a couple of hours of practice or training on memory tasks. It is concluded that expert memory skill is related to normal subjects superior memory for meaningful information.
Greenberg and Powers (1987) reported that an extensive body of research that exists and examines the effects of interventions aimed at maintaining or improving memory functioning among older adults. Research that resulted in improved memory performance is described including slowing the pace of learning, encouragement to organise learning materials, training in the use of imagery, loci mnemonics and face name mnemonics, and information about normal age-related memory changes. Findings of memory intervention research is reviewed and the ways in which findings of laboratory research can be incorporated into educational activities among older adults are explicated.

The techniques that enhance long-term memory, were divided into those that rely on imagery, verbal elaboration, organisation or retrieval practice was examined by West and Tomer (1989). Selection of an effective strategy should be guided by several factors, including (1) potential application of the strategy to a wide range of practical memory tasks, (2) the motivation of participants to master specific kinds of memory tasks, (3) expectations about the existing strategy skill level of participants; and (4) the amount of time available to devote complex training methods. Researchers found that the most effective memory training packages are those in which investigators have provided extensive training of at least one hour on the very difficult, narrowly defined memory task.

Sixtytwo normal elderly subjects averaging 71 years of age were taught a common mnemonic device for recall of lists using a computer aided instruction (CAI) package. Improvement in list learning after CAI training was not statistically different from a separate group of 218 elderly subjects, who received instruction from a trainer in a normal classroom situation. Improvement in the CAI group was significantly related to higher scores on
the openness of experience subscale of the NEO-personality inventory. CAI devices for memory training in the elderly may find a place in training select elders in specific areas of memory loss (Finkel & Yesavage, 1989)

Memory and its improvement following memory training were investigated by Dorfman and Ager (1989). The methodology considered variables such as age, number of years since formal education, number of classes taken over the last 15 years, subjects perception of health as it related to attention and memory and subjects perceptions of relevance of course material to their every day lives and careers. Subjects ranging in age from 52 to 84 years were recruited from local senior centers and senior housing development. To qualify they had to be (1) able to live independently in the community, (2) not have a specific condition that might cause memory loss and (3) not be taking medications that might interfere with memory. A personal information survey was completed as well as a pre-test that assessed memory of names and faces, word lists and addresses and phone numbers. Four memory training classes followed then a post-test, similar to the pre-test was given. Data indicated statistical significance in the relationships of memory with age, number of years, since formal education, and number of classes taken in the last 15 years. No statistical significance between variables was elicited in improvement in memory following memory training.

Two related questions (1) What memory skills would elders like to improve? (2) Is there a common set of these memory skills? were probed by Leirer (1990). Subjects completed a three-part questionnaire that included participant demographics, ranking of the main three and listing all other memory skills they would most like to improve, and ranking the importance of ten specific memory skills. The results indicate that elders share a common set of memory skills they wish to improve. They are (1) people's names, (2)
important dates, (3) location of household objects, (4) recent and past events, (5) meetings and appointment, (6) information and facts, (7) general improvement and (8) medication.

Studies on memory training focuses mainly on the use of internal strategies that supply meaning and help to organize incoming information (Bellezza, 1987). Research has shown that training on most internal strategies improves memory significantly. In most memory improvement courses, people are trained to become proficient at using internal strategies and certain personality traits may be associated with success in training (Yesavage, 1983). People who scored high on openness to experience performed better with imagery than other people (Gratzinger, Sheikh, Friedman & Yesavage, 1990). Older adults have been successfully trained to use the method of loci as a way to help them to remember items to be purchased at the grocery store (Camp, Markley & Kramer, 1983) and follow-up study was done after 3 years to see the degree of improvement after the course end and how long this improvements lasts (Anschutz et al., 1987).

Explicit - external interventions are the most frequently used, probably because they are easy to use and widely available (Cavanaugh et al., 1983). But the excess dependency on external aids can be a problem for many others. Research shows that the type of pillbox is the easiest to load and results in the fewest errors (Park, Morrell, Frieske, Blackburn & Birchmore, 1991). These external cues are more effective, if properly used. Many studies have demonstrated that younger subjects performed better than older subjects across a wide variety of memory tasks (Hultsch & Dixon, 1990, Kausler, 1991). One among several offered explanations for the poor performance of older adults on episodic memory tasks is their tendency not
to use effective encoding strategies spontaneously (Light, 1991; Salthouse, 1991).

The effectiveness of a story mnemonic for free recall learning was assessed in seventy one community dwelling elderly adults. Participants received one of three memory training programmes—\( a \) narrative story, \( b \) method of loci and \( c \) placebo training. The stimuli consisted of 26 nouns chosen for being highly imagible and concrete. Recall was examined immediately following study of the words, after one hour and after three days. At each testing interval, both mnemonic condition groups outperformed the placebo group. The results suggest that a story mnemonic aid can enhance word retention on a free recall task.

Zhenyun, Cahnghua, Zhiping and Shulian (1991) investigated age-related differences in cognitive plasticity in adolescents, young adults and older adults. Participants were trained in nine-sessions on mnemonic skill based on the method of loci to remember lists of 30 concrete nouns in a serial order. All groups improved their performance in the serial recognition tasks. Training related change was larger for young adults and adolescents than for older adults for serial word recognition. Regression analyses were used to predict post-test mnemonic skill with pre-training cognitive abilities. Digit symbol substitution was shown to predict memory skill in old but not in young adults and adolescents.

It is evident from the earlier studies that visual imagery skills are important for the effective use of the method of loci and the interactive imagery technique (Lindenberger, 1990; Lindenberger, Klugl & Baltes, 1992). A number of studies have shown that imagery instructions have little effect on recall of low imagery words (Paivio & Yuille, 1967; Richardson, 1985) which
suggests that recall of abstract words may not benefit from mnemonic usage to the same extent as the other transfer tasks that involve concrete materials. Kliegl, Smith and Baltes (1990) showed that subjects with high scores on digit symbol substitution, a marker of fluid intelligence, improved much from training than subjects with low scores on this test. It is evident that young-old adults gain more from memory training compared with old-old adults (Yesavage, Sheikh, Friedman & Tanke, 1990). In general, the results from these studies suggest that more able older individuals may show greater improvement from memory training than less able persons. Also under utilization of experimenter-provided strategies has been a problem in much memory training research (Anschutz, Camp, Markley & Kramer, 1987, Hill & Vandervoort, 1992, Scojen & Bienenstock, 1988).

There is essentially no evidence that direct retraining approaches, involving repetitive drills, memory "exercises" and note practice, may result in functional memory improvement (Glisky & Schacter, 1986, Schacter & Glisky, 1986). Approaches of these types are based on a restoration of functional model derived from physical rehabilitation techniques, approximate the remediation of memory impairments to mental muscle building. Despite this lack of efficacy, these techniques are among the most widely used in cognitive rehabilitation (Wilson, 1989) and are the basis of nearly all commercial computer programs intended for memory retraining.

One organizational strategy, the PQRST technique, i.e., Preview, Question, Read, State, Test does appear to have considerable utility with some generalization to natural setting (Glasgow et al., 1977, Grafman, 1984). The most applicable and effective approaches to the remediation of memory which are generally referred to are compensatory techniques, based on the functional adaptation model. Training in the use of external memory aids
including notebooks, checklists, computer calendars, alarm watches, dimes, calculators, labels, and posted reminders are practical and may be efficiently generalized to different situations. Of course, the effective use of such external devices by patients with memory impairments necessitates extensive and detailed instruction and practice.

Sohlberg and Mateer (1989) described a structured and systematic training sequence for implementation of a memory notebook, progressing through stages of acquisition, application, and adaptation. In addition, the acquisition and utilization of a compensatory memory notebook, they reported effective carry-over to activities of daily living (ADL) and working with a patient with severe memory impairment. Finally, two functionally oriented approaches that have considerable potential for memory rehabilitation, based on findings from experimental work with amnesic patients, include the acquisition of domain-specific knowledge (Schacter & Glisky, 1986) and prospective memory training (Sohlberg, White, Evans & Mateer, 1992).

The results from different studies have typically shown efficacy of training in old people (Kotler et al., 1990, Verhaeghen, Marcoen & Goossens, 1992). Common to this research is that training in internal strategies is combined with other potentially memory relevant factors, such as attention and relaxation (Stigsdotter & Backman, 1989, Stigsdotter, Neely & Backman, 1993a, 1993b), visual imagery (Yesavage, 1983), verbal judgement (Yesavage, Lapp & Sheikh, 1983), relaxation and attention (Hill, Sheikh & Yesavage, 1988; Yesavage & Rose, 1983; Yesavage, Lapp & Sheikh, 1989), self-efficacy (Lachman et al., 1992), and social support (Flynn & Storandt, 1990). Although several composite programs have routinely resulted in training related gains, it is not clear whether the size of
improvement due to training in several memory related skills exceeds that observed following traditional strategy training (Stigsdotter & Backman, 1993, 1993b)

Camp et al (1993) describes a heuristic classification scheme for memory interventions as a 2 X 2 matrix. One dimension of the matrix addresses the use of internal vs external mnemonics and the other dimension addresses the use of explicit vs. implicit learning. Results suggest that memory intervention in normal older populations, even when "successful" usually produce results that are limited in their generalization and are usually not maintained over time.

Use of external aids in memory rehabilitation is becoming increasingly popular especially when these aids are recommended while working with the Alzheimer's patients (Zgola, 1987). Earlier researchers using the multi-factorial memory training programme with encoding operations (interactive imagery & the method of loci), attentional functions and relaxations have indicated training related gains in older people for word recall that are maintained 3-5 years after training (Stigsdotter & Backman, 1989; Camp et al., 1993, Stigsdotter & Backman, 1993a, 1993b). If memory and learning becomes the integral role in nearly all aspects of everyday functioning, memory impairment, particularly when combined with attention dysfunction, represents one of the most debilitating manifestations of brain injury. Furthermore, given the inherent role of learning in most therapeutic interventions and the rehabilitation process in general, memory and learning difficulties further limit the potential for significant gains in other functional domains (Hanlon, 1996).
Rockstroh, Dietrich and Pokorny (1995) investigated the effects of training on two memory and two attention tasks in twenty four healthy elderly subjects (aged 60-70 yrs) and twenty four young subjects in four sessions. They were performed on these tests and the effects of training were assessed during two test sessions with a gap of one week. Significant age-related effects at the pre-training test session were found for reaction times to a simple usual stimulus, retrieval time of information from long-term storage, and the speed of focussing attention. In both age groups, performance of the first two tasks was significantly improved by training, the age-related effect remained significant after training. Significant age differences could be decreased only if the test performance of young subjects did not improve. Books that help readers through tips on how to improve one’s own memory have also been available since a very long time (Grey, 1756)

Training people how to remember information more effectively can be aimed not only at people with identifiable disorders, but also at people whose memory performance has declined as a result of normal, age related changes. In many studies, the most frequently reported memory strategies are (1) memory performance paying attention to the incoming information, (2) rely on already stored information to facilitate making new connections with the new material and (3) those that provide the basis for future retrieval cues. The very best memory strategies are the ones that practically guarantee that the appropriate cue will be available to access the stored information when it must be retrieved (West, 1995). Major chunk of memory training studies have addressed transfer across tasks, that is, the ability to use a mnemonic device as a task not encountered during training, have revealed small or nonexistent transfer effects (Rebok & Balcerak, 1989; Roberts & Wilson, 1986; Scogin & Bienias, 1988; Scogin et al., 1985;
Stigsdotter & Backman, 1989; Stigsdotter & Backman, 1993a, 1993b, Weaver, 1995) However, two exceptions to this pattern have been reported. Yesavage and Rose (1983) trained subjects to use the method of loci in verbal free recall, and found transfer to a paired-associate learning task. Anschutz et al (1985) also trained subjects in the method loci and examined transfer from verbal free recall task to a more ecological task, a grocery list, as well as, transfer from a lab setting to a real-life setting and found transfer under both conditions. Research shows that near-transfer as opposed to far-transfer effects, indicating fairly narrow limits of generalization (Baltes, Dittmann & Kliegl, 1986, Blieszner, Willis & Baltes, 1981)

Caprio and Fry (1996) assessed 158 adults aged (65-76 yr old) for purposes of developing a multi-factonal memory enhancement program for community-dwelling older adults. It is aimed at encouraging positive beliefs and behaviours about memory function and abilities in later life. The authors evaluated the effectiveness for cognitive restructuring techniques (56 subjects) as compared to traditional memory training techniques (61 subjects) for purposes were conducted after ten weeks of memory training. Follow-up was done nine weeks later to assess maintenance of memory performance and memory beliefs. Assessment measures included the Guild Memory Test, Geriatric Depression and Meta Memory in adulthood Instrument. Results suggest that cognitive restructuring techniques may help community-dwelling older adults to gain and or control over their beliefs about memory and thereby enhance their memory performance

Andrews, Kinsella and Murphy (1997) evaluated the effectiveness of training handbook training in remediating everyday memory difficulties reported by forty non-demented subjects of 60-70 year old. Twenty subjects were assigned to a Memory Hand Book (MHB) group and were
individually trained on two of the handbooks sections. Twenty subjects were assigned to a placebo group and were given instructional pamphlet with a description of 3 list learning mnemonics. The MHB group significantly improved their performance on a face-naming test and a strategies knowledge questionnaire, but not on the prospective memory measures. The MHB group showed a significant advantage on an every day memory diary that was filled out by all subjects following the intervention. After the study, the placebo group was also given the memory handbook and both groups were assessed at a four month follow-up. At this time the MHB group appeared to maintain most of its original gains, while the placebo group made some improvement.

Floyd and Scogin (1997) examined the effectiveness of memory training on the subjective memory functioning and mental health of older adults in meta-analysis. Effect sizes indicated that memory training led to improved subjective memory functioning ($d_{+}+=19$), but the magnitude of the improvement was less than that obtained on objective memory measured ($d_{+}+=66$) in the meta-analysis of Verhaeghen, Marcoen and Gossens (1992). No difference in effectiveness were found among mnemonic training, expectancy modification, or placebo procedures such as unstructured practice. Improvement of subjective memory functioning was enhanced by including pre-training in skills such as the use of imagery and by including interventions to improve participants attitudes toward the effects of aging on memory functioning.

The aforementioned review of studies on interventions, highlighted some of the methods used in memory training. Several efficient methods were mentioned for remembering. Studies show that paired-associates and list learning can be improved when an appropriate mnemonic technique is
provided for elderly persons, especially by reducing number of omission errors. Research has suggested that older adults are less efficient in using categorization strategies than younger adults. Some researchers emphasize the use of certain organised memory strategies as external memory aids in managing memory problems. It is beneficial if memory practice is begun at the first sign of loss. Many studies aimed at maintaining or improving memory among older adults post and pre test intervention studies demonstrated the efficacy of interventions in memory improvement. Older people have been successfully trained to use method of loci as a way to help them to remember day-to-day functioning.

2.9. Memory and Associated Factors:

A study by Scogin (1985) examined whether the correspondence of memory complaints and performance differ as a function of an individuals affective state and degree of concern about memory functioning. Fifty nine elders (60-82 yrs) seeking memory training and twenty five (60-75 yrs old) volunteers completed questionnaire and 3 recall tasks. Results suggest that elders with high levels of concern about their memory functioning may hold special expectations or beliefs about their cognitive abilities. Depressed subjects and those seeking memory training showed lower levels of correlation between self-reported memory complaints and memory training.

Arbuckle, Gold and Andres (1986) examined the subjective ratings of memory adequacy in the context of twelve social, personality, adjustment and life style measures on men and women aged 65 to 93 of middle and working class backgrounds. Multivariate and Univariate analyses revealed that a large proportion of the age differences and virtually all of the social-class differences of memory measure. Self-rate memory adequacy was not
correlated with performance and although the expected finding of lower ratings by older participants was obtained with the working class group, the opposite was true for the middle-class group.

Sex, age, educational attainment, health status, perceived changes in health status, number of functional limitations and vision and hearing impairments were analysed to identify significant predictors of self-reported memory problems (Cutler & Grams, 1988).

Cohen and Faulkner (1989) tested the hypothesis that elderly people have more difficulty than younger people in distinguishing among (1) what they actually did (performed actions), (2) what they watched someone else do (watched actions) and (3) what they only thought about doing (imagined actions). The weight of the evidence from experimental testing, self-assessment and formal observations supports the conclusion that perceived memory changes in the ability to discriminate between memories of imagined and perceived events affect several factors including (1) the reliability of eyewitness testimony and autobiographical memories, (2) the efficiency with which an individual can perform everyday tasks and (3) ability to comply with advice and instructions.

Cavanaugh (1989) advances the idea that memory awareness is composed of three fundamentally different categories (1) systematic awareness, that is awareness of the memory system and how it works, (2) epistemic awareness, or the ability to know about the extent of one's general knowledge base and (3) on-line awareness, the knowledge of the process of remembering as it occurs. Researchers may find it fruitful to focus more attention on what the typical adult thinks why it is happening to him or her than to attend exclusively to more objective assessments. Future research
trying to map out the developmental course of memory should consider the major roles that personality and related factors play in this respect. It is possible that the most important question is what individuals think is true.

Derovesne et al (1989) studied the interrelationship between severity of memory complaints and performance in memory tests and affective status in French aged 57-80 yr olds who had no amnesia and has not been treated for psychiatric disease of organic cerebral disorder. Subjects participated in an interview, completed self- report questionnaires, and were assessed for memory performance in a memory clinic No relationship was found between severity of memory complaints and age, sex, educational level, marital status, living alone or in family, or memory test performance. More severe complaints were reported in people with poor social network, negative stereotypes on aging and poor affective status. A strong correlation was found between severity of memory complaints and scores on a self-reporting depression questionnaire even in people with low depression scores Cavanaugh and Elizabeth (1990) stated that retrieval of personal attributes provides a way of integrating self theory implicit theories and personal control with self efficiency Recollection of these past success and failures provides the data for making self-efficacy judgement. Memories that are consistent with one's belief or implicit theories are more accessible and have greater influence on the judgement

Hertzog et al. (1990) assessed the patterns of change and variability in text recall performance of elderly women (67-83 yrs ) by testing them weekly for upto 2 years. Results showed markedly different patterns of intra-individual change in text recall performance for different participants The two women whose performance declined were characterized by deteriorating physical health. Texts having female protagonist yielded superior recall performance
which may indicate that weekly fluctuations in psychological states of the participants influenced their memory performance.

Agrawal and Kumar (1992) in a 3 phase study with 50 (20-80yr old) males and 40 females (20-65yr) studied gender differences in everyday memory problems, the effect of age, sex, task complexity and sensory modality on the speed of information processing and the explicit role of factors as causes of cognitive changes with increasing age. Analyses showed that significant changes occurred with age in everyday memory capacity. Older and aged males showed a decrease in memory problems and females showed an increment in memory problems.

Bazargan and Babre (1992) used to ascertain how an older person's memory is influenced by subjective evaluation of rational deficit on a sample of 240 black elderly (62 yr and older) residents of subsidized urban high-rise apartments. 81% of the subjects were women and 19% were men. 52% reported poor memory and forgetfulness to be a very (15.4%) or somewhat (36.6%) serious problem for them. Women and less educated reported more problems with their memory. Regression analysis revealed that those subjects who had chronic illness, used a high number of psychotropic drugs, were older and expressed a higher number of loneliness were more likely to complain about their memory. A significant positive relationship was found between mood and memorabilia, a lack of cherished object was associated with significantly lower mood scores. Significant associations were also found among objects, reminiscence and mood variables by age and gender (Sherman, 1991).

Joan, Szuchman and Ruthberg (1992) investigated the relationship between several aspects of memory self report, objective memory, attitude towards
intellectual aging, self rated health and self rated depression scale, and then rated their discomfort with eight categories of everyday forgetting and their attitudes towards intellectual aging. Attitude toward intellectual aging was correlated with frequency of and discomfort with forgetting in the older group.

Arbuckle and Gold (1993) examined whether or not off-target verbosity (extended speech that is lacking in focus or coherence) is mediated by an age-related decline in the ability to inhibit task-irrelevant thoughts. A sample of community dwelling elderly volunteers (aged 61-90 yrs) completed cognitive, psychosocial, and verbosity measures. Performance on four tasks that measured the ability to suppress or remove irrelevant information stored in working memory accounted for a significant proportion of the variance in verbosity, whereas performance on other cognitive measures was unrelated to it. Shared effects between the measures of the ability to inhibit task-irrelevant information and age suggest that age declines in this particular ability may underly age-related increases in verbosity. In contrast, the contribution of psychosocial factors to explained variance in verbosity scores was relatively independent of that of inhibition-related measures and age.

Foisy (1994) estimated the meta-analysis on the average effect of aging on intentional memory for spatial location in small scale space. Findings from twenty two studies on 1,598 young and elderly subjects were compared using and proportion of classified subjects. Results suggest that the effect of aging is large. Review findings must be treated with caution because only a minority of studies controlled for visual acuity and duration of test phase. Gender was maintained constant across age groups in 15 studies, level of education was controlled in 12 studies, general intelligence in 12 studies, and general health in 13.
A longitudinal study on 1,192 persons from community based population for Linear Structural Relations modeling techniques (LISREL) aimed at testing the ability of on a priori model to predict cognitive change over a 2.0 to 2.5 year period in older adults aged 70-79 at the initial evaluation. The model includes 22 demographic physical and psychosocial variables as predictors of cognitive function. Structural equation modeling analyses identified four endogenous model variables (education, strenuous activity, peak pulmonary expiratory, flow rate and self-efficacy) as direct predictors of cognitive change over the study period (Abert et al. 1995).

The risk of ADL dependence is high but varies considerably depending on how well and how quickly one can perform simple tasks of everyday function (Gill, Richardson & Tinetti, 1995).

To determine whether the age-related decline of cognitive abilities is related to educational level among 307 normal subjects aged 40-85 yrs in a cross-sectional neuropsychological study, the test battery consisted of five tests. Results show a linear decline with age. Of three patterns of interaction between education and age-related decline (protection, parallelism and confluence) some tests showed a parallelism (verbal fluency, spatial memory and RPM) and others showed protection (visual attention and verbal memory). Confluence was never observed (Capitan, Barbarotto & Laiacoma, 1996).

From Australian Longitudinal Study of Aging (ALSA), Luszcz (1996) examined aging adult’s general or global perceptions of control over health and memory, the latter two domains being of particular concern to this cohort. Findings show inter-cohort differences and health measures suggesting that older adults continue to take responsibility as agents for
outcomes that they experience. Another finding is that ones global sense of control is internally oriented, this is likely to be accompanied by a higher level of morale and more positive self-esteem.

Nyberg, Backman, Erngrund, Olofsson and Nilsson (1996) examined age differences in episodic memory, semantic memory, and priming using a random sample of 1000 men and women from ten age groups (35, 40, 45, 50, 55, 60, 65, 70, 75, 80 yr). The main purpose was to determine whether the age effect existed after differences on various demographic, intellectual and biological factors had been controlled for. The simple correlations of age with episodic and semantic memory performance were found to be significant, whereas no relationship was found between age and levels of priming.

Ryan, Lopez and Paob (1996) studied base rates for digit span forward (DF) backward (DB) and DF-DB among normal elderly (N=130) individuals of 75 years of age, and means on DF, DB and DF-DB were 5.79 (SD=1.21), 4.18 (SD=1.20) and 1.62 (SD=1.20), respectively. Education was related to DF, and educational and pre-retirement occupation were associated with DB. With less than 11 years of education, normal achievement was 4 for DF, with 12 years of schooling normal DF was 5. Persons with less than 11 years of education, who were previously labourers/operatives or craftsmen/home-makers repeated 3 digits on DB, those with more than 12 years of education and professional/managerial backgrounds repeated 4 digits on DB. A DF-DB greater than 4 was atypical.

In a five year longitudinal study, 69 elderly eminent academics (aged 70 yrs old & older) were compared with 30 elderly blue collar workers on tests of intelligence and memory. Both blue collar workers and academics deteriorated on a test of verbal reasoning. The cross-sectional analysis of the
performance of the academics was compared with that of 30 young Ph D students and two conclusions were drawn. (1) high ability is not associated with slower rates of decline and (2) cognitive deterioration is universal on tests of non-verbal intelligence (Christensen, Henderson, Griffiths & Levings, 1997)

**Physical Health and Memory:**

The studies are few in number. Very few physiological measurements were made in each study when physiological functioning was broadly defined in terms of health levels, even mild vascular disease seemed to make for poorer memory Physical health has long been assumed to decline with age owing to inactivity, illness and the aging process. Health and physical status is probably an important concern and has a significant impact on intellectual functioning. Physical health is predictive of the maintenance of cognitive function (Schaie and Hertzog, 1986). Health is the variable implicated in ability loss in Horn’s fluid - crystallized intelligence theory (Horn & Donaldson, 1976). It was noticed that super-health group performed well in performance tests than normal health group (Botwinick, 1984).

Hart and Kwentum (1987) found that non-demented Parkinson’s sufferers had longer response latencies as a function of memory - set size on the Sternberg - short -term memory scanning procedure. It is important to note that poor performance by an elderly subject on a measure might not reflect true cognitive decline but merely result form a physical disability.

Plenty of evidence is available on how one's physical conditioning increases the attention span of the elderly and improves their performance on simple cognitive tasks (Ohlsson, 1976). The ability to grasp complex relationships
in non-verbal material also increases after physical training (Elsayed, Ismail & Young, 1980)

Studies have shown that exercise improves memory in middle age and old age, and that aerobic exercise improves performance on digit-span test (Perlmutter et al., 1987). Clarkson-Smith and Hartley (1989) emphasized the physical fitness may have important effect on memory. The middle age and older adults who are on a regular, vigorous exercise program react faster, have more efficient short-term memories, and reason more accurately than sedentary adults of the same age. In adults ranging in age 20 to 89 years, there was little correlation between age and digit-span memory, but there was a clear connection between health and memory span among the older adults (Perlmutter & Nyquist, 1990)

**Psychological Health and Memory:**

Mental Health may have an equally powerful effect on learning and memory because anxiety leads people to worry and to focus on themselves instead of on the task, it can pull their attention away from the task at hand, lowering their scores. Clinical models of depression emphasize its effects on cognition in everyday life (Beck, 1967, 1976, Garber & Seligman, 1980). In general, seriously depressed individuals develop negative expectations, decreased concentration and attentional deficits that result in poorer memory. Severely depressed people show a decreased ability to learn and recall new information (Cohen, Weingartner, Smallberg, Pickar & Murphy, 1982), a tendency to leave out important information (McAllister, 1981); a decreased ability to organize (Breslow, Kocsis & Belkin, 1981); less effective memory strategies (Weingartner, Cohen & Bunney, 1982) and decreased attention and reaction time (Breslow et al., 1981; Cohen et al., 1982)
The connection between depression and memory may operate indirectly. Among older adults, those who are depressed are more concerned about memory lapses and complain more bitterly about them than do those who show no signs of depression (O'Hara et al., 1986). It is evident that, after steps are taken to reduce anxiety in older adults, age differences on memory tasks narrow and also among older adults who suffer from depression, researchers have found improvements in memory following treatment (Perlmutter et al., 1987). Thus, serious depression impairs memory (Watts, 1995).

Internal–External Locus of Control and Memory:

Rotter (1966) explained the characteristics of internally controlled individuals as more striving, more self confident and less anxious and apathetic than externals. Kuper (1971) in his study on older people indicated that internals cope better and are less defensive than externals. Brim (1974) found a decrease in internality scores in older age cohorts. Wolk and Kurtz (1975) also found internality to be related to higher adjustment, satisfaction, and involvement scores in a sample of noninstitutionalised elderly. Contrary to expectations, the elderly sample was found to be much more internal than current younger samples. As Phares and Lamiell (1977) have commented, "Clearly, older groups ought to be more external, but perhaps these older groups were raised in a more internal era. Such a finding is intriguing and offers fertile ground for further investigations of the social and cultural antecedents of Internal-External beliefs and also its relationship with cognition among the elderly.

In a study of young-old (aged 60-69) and old-old (ages 70-79) females, (Kabat, 1980) a significant relationship was found between locus of control...
and life satisfaction levels, but a nonsignificant relation between internal/external scores and general health status and morale scores (Kabat, 1980). Correlation patterns were similar in both of the elderly sub samples. Although the general tendency for individuals to become more internally oriented with increasing age, at least through the middle adult years, has been the usual observation (Dupont, 1980), the patterns of internal/external control biases observed during the aging years have been more ambiguous.

Locus of control has frequently been presented as an important construct in adult development and aging (Baltes & Baltes, 1986). Perceived locus of control has been mentioned as a significant contributor to successful aging (Palmore & Luikart, 1972; Ramamurti, 1988, Schulz & Decker, 1985) and is very much needed to cope up with the deleterious changes of aging.

**Self - Esteem and Memory:**

Self esteem or self-image measures tend to show consistency, continuity, and stability following their formation during the early adolescent years (Carlson, 1965, Engel, 1959). Situational factors also appear to influence self-esteem estimates. Thus, elderly institutional residents score lower than matched individuals living independently (Pollack, Karp, Kahn & Goldfarb 1962, Shrut, 1958), and persons about to enter old age homes score low on self-esteem measures (Leiberman, Prock & Tobin, 1968, Rose & Peterson, 1965).

Jaquish and Ripple (1981) found that self-esteem scores based on Coopersmith's 54-item inventory significantly predicted divergent thinking scores for a sample of subjects ranging in age from 18 to 84 years. Self-esteem was a better predictor of divergent thinking than chronological age. Self-esteem scores were observed to increase from young adulthood to the
middle years, with a significant decline during the advanced years of age (61-84 years). Nonetheless, the highest self-esteem / divergent thinking correlations were observed for this elderly sub sample.

These differences tend to diminish, as the later years of adulthood are reached (Turner, 1982). In the Lowenthal et al. (1975) study, self-criticism differences, which were notably male-biased at the 18- to 20-year range, became minimal by the time of the pre-retirement phase. It would seem that since many stereotypically feminine traits are rated as socially undesirable by both men and women, it follows that as traditional feminine traits decline in importance during the later years gender distinctions in self-esteem should also diminish (Turner, 1982).

Bandura (1989) indicates that our judgement of our own competence in a particular situation, which is called as self-efficacy, has a powerful effect on how well we learn and remember in various situations. Older adults anticipate the outcomes of their actions and set goals for themselves based on the way they appraise their capabilities. The stronger their self-efficacy, the higher the goals they set, and the more firmly they are committed to them. Even though older adults may have extensive knowledge about the working of memory, their belief that their own ability to remember in a particular situation is poor may lead them to perform below their capacity (Hertzog, Hultsch & Dixon, 1989). Older adults performance was improved after receiving training in the use of a new memory strategy, but their confidence in their ability to remember did not (Rebok & Balcerak, 1989).

The review of studies reported in this subsection deals with some factors associated with memory performance like physical health, psychological health, subjective rating of psychological health, certain personality factors
like self esteem and locus of control. Some studies supported the importance of self rating or subjective rating of one’s memory as an important correlate, but some studies reported no relationship. Health, educational, functional limitations were identified as significant predictors of self-reported memory problems. More memory complaints were reported in people with poor social networks, negative stereotypes on ageing and poor affective states. No relationship was reported between severity of memory complaints and age, sex, education, marital status, living by himself or with family. A strong correlation was found between severity of memory complaints and self-reporting depression. Subjects who had chronic illness, who have feelings of loneliness complain memory problems. Women who were less educated had more problems with their memory. Physical health has been recognised as a significant correlate of memory function. The relationship between personality variables like self esteem and I-E locus of control is not fully established.

SUM UP:

It is rather difficult to sum up available research in an area such as memory and ageing, the field being so vast and varied. What has been done in the foregoing pages is to report representative studies of more recent times that are directly relevant to the facets of memory and related variables under study.

An overall observation with regard to ageing changes in any domain would be to expect a decline in functions which in this case would be memory functions. If the dimensions and facets of memory were to be unitary and age effects in the population were uniform, generalisations would be easy. But in memory we have multiple dimensions and a multitude of facets with
varied and complex underlying processes and to cap it all with significant individual differences it would perhaps be a futile exercise to comprehend at one go these age changes. To some extent a semblance of an effort has been put up to very briefly sum up the studies in the respective sectional reviews.

The studies reported over the years in the various facets of memory do not give scope for a single conclusion. The results of studies are often different and some times are even contradictory. This is probably because of differences in the sample, testing objectives, procedures and conditions.

The observations on the studies of short term/working memory indicate decline with age, that varies from small amounts to modest amounts of decline in normal aged subjects. This also applies to assessments of logical memory digit span (forward-backward) and letter span (non sense syllables) Some studies have reported a slowing in reproduction time in the older adults. Few, if any, studies showed large amounts of age decrements in normal subjects.

Studies on long term memory under which head semantic memory has been reviewed shows no significant changes in old age. With regard to remote memory small amounts of decline was reported with age. However, it is stated that in so far as the memory refers to the later years of life they are not remembered as well. In these cases the fading of memory is reported to be gradual after an initial spurt of decline. Pictorial memory shows that older adults were less proficient than young adults.

Researches on the relationship of psychosocial variables with different facets of memory has not been extensive but sparse. Also the studies do not
indicate any clear cut trend. Nevertheless, the studies have suggested the relevance of these factors and indicated a need for further investigation.

In view of the foregoing discussion certain observations seem to be relevant. Despite the large number of studies available in the literature, the findings are not clear-cut, indicating the need for further investigation. Examination of differences among the sub groups of older people (the young-old, old-old etc) are not many. Therefore, sub group differences need to be further probed. Differences in performance across biographical variables like gender, locality, educational background etc, have not been fully examined. This apart while several researchers have stressed the role of certain psychological and social factors on memory performance, there are not enough studies to enable us to comprehend their role meaningfully. It would not be an over emphasis to state that the influence of these variables on memory performance needs to be assessed further.

Almost all the studies reviewed in this chapter were carried out in western cultures. There were hardly any studies carried out on these facets of memory on Indian subjects. This is particularly so with regard to the study of memory change in old age.

With hardly any studies reported across the length and breadth of the populous country of India, carrying seventy million elderly, any effort directed towards the understanding of the memory function in these elderly and relating them to biographical, social and psychological variables would not only be not redundant but become a useful contribution to the field of Geropsychology in India.