

Research Paper

A Study on Changes in the Types of Memory Functions in the Elderly

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ABSTRACT

Memory is vital for day to day functions of all the individuals. As we age, our ability to remember and recall events / things changes. This is the process of ageing. When memory deteriorates in old age, it is hard for the people to adapt to the changes and they get emotionally disturbed. Our brain is divided into four pair of lobes and one among them is Temporal lobes. Temporal lobes influences memory and emotions. When memory is disturbed, emotions also get disturbed which in turn aggravates the cognitive decline. These memory disturbances are considered to be normal in old age. Not just memory, the ability to learn also changes with the increase in age and people would complain of memory disturbances, difficulty in doing their routine due to forgetfulness, difficulty in recalling names, phone numbers, etc. So, the aim was to study the types of memory functions in elderly. 16 elderly persons of whom 10 were male and 6 were female. They were referred for Neuropsychological assessment for memory disturbance, difficulty in concentration, forgetfulness, vague fear, sleep disturbance, etc. These patients underwent a battery of neuropsychological tests to assess their cognitive functions and personality. Results reveal that 75% had above average memory, 19% had average high memory and only 6% had average low memory. All the people had no disturbance of the Percepto- motor function while 56% had difficulty in incidental recall. It was found that semantic memory was good in all the elderly people. And all of them were oriented to time, place and persons. In logical memory, 44% had difficulty in recalling the stories which were presented to them orally. Visual memory was found to be severely impaired in 13% of the elderly people. 69% of the elderly people had impairment in Verbal retentivity. Overall, 63% of the elderly people had State anxiety and 94% of them had Trait anxiety. 85% of the elders had suppression of anger while 57% of them expressed their anger inappropriately.

Keywords: *Memory, elderly, forgetfulness, logical memory, visual memory, personality, semantic memory*

Old age is considered as developmental phases where an individual faces ups and downs both physically and mentally.

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Every phase in the human life cycle has specific events that are unique to that particular age group. The aged, however, have accumulated many scars from their exposure to all the sources of human suffering.

Central to all intellectual functions and probably to all that is characteristically human in a person's behaviour is the capacity for memory and learning.

Memory is vital for day to day functions of all the individuals. As we age, our ability to remember and recall events / things changes. This is the process of ageing. When memory deteriorates in old age, it is hard for the people to adapt to the changes and they get emotionally disturbed.

Our brain is divided into four pair of lobes and one among them is Temporal lobes. Temporal lobes influences memory and emotions. When memory is disturbed, emotions also get disturbed which in turn aggravates the cognitive decline. These memory disturbances are considered to be normal in old age. Not just memory, the ability to learn also changes with the increase in age and people would complain of memory disturbances, difficulty in doing their routine due to forgetfulness, difficulty in recalling names, phone numbers, etc. Clinically, three kinds of memory are distinguishable. Two are succeeding stages of short-term storage and the third is long-term storage.

Registration holds large amounts of incoming information briefly (1 to 2 seconds at most) in sensory store (Joynt, 1975; Loftus and Loftus, 1976). It is neither strictly a memory function nor a perceptual function but rather a selecting and recording process by which perceptions enter the memory system. Registration has been called a "valve determining which memories are stored" (Nauta, 1966).

Immediate memory, the first stage of short-term memory storage, concerns the fixation of the information selected for retention by the registration process. It has been aptly called the "working memory" as well as "primary memory".

Immediate memory is of sufficient duration to enable a person to respond to ongoing events when more enduring forms of memory have been lost (Talland, 1965; Victor et al., 1971). It lasts from about 30 seconds up to several minutes unless it is sustained by rehearsal.

Rehearsal is any repetitive mental process that serves to lengthen the duration of a memory trace. With rehearsal, a memory trace may be maintained for hours. Rehearsal also increases the likelihood that a given bit of information will be permanently stored (Schachter, 1980).

Another kind of short-term memory may be distinguished from immediate memory in that it lasts from an hour or so to one or two days – longer than a reverberating circuit could be maintained by even the most conscientious rehearsal efforts, but not yet permanently fixed as learned material in long-term storage (Barondes, 1975; Rosenzweig & Leiman, 1968).

Long term memory, sometimes called "secondary memory" (Craik, 1977) or learning, refers to the organism's ability to store information. The process of storing information as long-term memory, consolidation, begins as soon as one-half second after information enters short-term storage and may continue as long as information remains there (Baddeley, 1976; Squire, 1975). Much of the information in the long-term storage system appears to be organized on the basis of meaning, whereas in the short term storage system it is organized

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in terms of contiguity or of sensory properties such as similar sounds, shapes, or colours (Broadbent, 1970; Craik and Lockhart, 1972).

Aim:

To study the changes in different types of memory functions in elderly.

Objectives:

To study the changes in -

- Working/ Short Term Memory (STM)
- Semantic memory
- Logical memory
- Visual memory and
- Overall memory functions in elderly

METHODOLOGY

The samples of the study consists of 16 elderly persons aged 60 years and above, of them 10 were male and 6 were female. Out of 16 elderly people, 8 were employed whose age ranged between 60 to 67 years, while 7 were retired and 1 had opted for voluntary retirement services.

The sample was collected from the referral sources of Neurologists, Neurosurgeons, Psychiatrists, and Family Physicians. These cases were referred for Neuropsychological assessment for memory disturbance, difficulty in concentration, recalling names, phone numbers, forgetfulness, vague fear, sleep disturbance, etc.

These elderly persons underwent a battery of neuropsychological tests to assess their memory and other cognitive functions and personality.

Wechsler Memory Scale (WMS) - Form I is the most commonly used Comprehensive Memory Scale devised by David Wechsler and Calvin P. Stone in 1945 consisting of seven sub tests – Personal & Current information, Orientation, Mental Control, Logical Memory, Digits Span, Visual Reproduction and Associate Learning.

- Subtest 1- Personal and current information - This subtest comprises of six simple questions relating to personal and current information such as ‘How are you?’, ‘Who is the Prime Minister?’ etc. It measures the semantic memory.
- Subtest 2- Orientation – This subtest consists of five questions related to time, place and persons. Eg., What month is this/ and What city are you in? It also measures the semantic memory.
- Subtest 3- Mental Control – This subtest has three items designed to test automatism (alphabets) and simple conceptual tracking (counting backwards from 20 to 1) and (counting in threes from one to forty).
- Subtest 4- Logical Memory - This subtest consists of two memory passages. The test is intended to measure immediate recall of logical material.
- Subtest 5- Digit span – This subtest comprises of a series of numbers to test memory span for digits forward and backward. The series of numbers employed in this test are those given in the Wechsler – Bellevue Scale for Intelligence, except that the maximum numbers of digits used in the series are limited to 8 and 7 respectively.

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- Subtest 6- Visual Reproduction – In this subtest the subject is required to draw from memory simple geometric figures exposed for a period of 10 seconds.
- Subtest 7- Associate Learning – This test consists of a list of 10 paired words, of which six are easy and four are hard words. Memory Quotient (MQ) is then derived as per the manual, which is comparable to Intelligence Quotient (IQ).

The Bender Visual Motor Gestalt Test -The Bender material is a set of nine designs originally used to demonstrate the tendency of the visual systems to organize visual stimuli into Gestalten. This visual motor Gestalt test was developed in the year 1938 by Child Neuro-psychiatrist Lauretta Bender. It can be administered on both children and adults ages three and older.

Spielberger's State Trait Anger Inventory (STAI) - The STAI was developed by Charles Spielberger to provide reliable, relatively brief, self-report scales for assessing state and trait anxiety in research and clinical practice (Spielberger, Gorsuch, & Lushene, 1970). The state instructions required respondents to report the intensity of their feelings of anxiety, "right now, at this moment". The trait instructions asked subjects to report how they generally feel by rating the frequency that the anxiety-related feelings, cognitions, and symptoms described by each item were experienced.

State Trait Anger Expression Inventory (STAXI) - This was constructed to assess the intensity of anger as an emotional state at a particular time, and to measure individual differences in anger proneness as a personality trait (Spielberger et al., 1983). The content of the AX Scale items ranged from describing strong inhibition or suppression of angry feelings (AX/In) to the extreme expression of anger directed toward other persons or objects in the environment (AX/Out).

RESULTS AND DISCUSSION

The sample of the study was 16 elderly people and their overall mean age was 64 years.

Table 1 shows the sample distribution (N=16)

Age in years	Male	Female
60 - 64	5	3
65 - 69	3	0
70 - 74	1	2
75 - 79	1	0
80 - 84	0	1
Total	10	6

Since these elderly people had complaints of forgetfulness, difficulty in concentration, vague fear, and sleep disturbances, Wechsler Memory Scale was administered in order to assess their memory functions and also to see the impairment in various memory functions such as short term memory/ working memory, semantic memory, verbal automatism, logical memory, orientation, visual memory and verbal retentivity.

It was found that 75% had above average memory, 19% had average high memory and only 6% had average low memory.

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In the tests of Incidental Memory, people see/hear some information and are then asked to recall (or recognize) the information despite the lack of prior effort made to memorize the information. These tests are often used to examine the Levels-of-processing effect. In this study the Bender Visual Motor Gestalt Test was used to test the Incidental memory. Bender Gestalt Test results showed that all the people have no disturbance of the percepto- motor function while 56% had difficulty in incidental recall.

Subtest 5 of WMS, i.e., Digits Span Test was administered to assess the attention and concentration / short term memory/ working memory.

The average score in Digits forward is 6 and Digits backward is 4 and the difference between Digits forward and backward should be 2. More or less than 2 digits difference indicates difficulty in short term memory. Attention and concentration is also been tested by Digits Span Test. Impairment in short term memory has a bearing on attention and concentration which is another cognitive function.

Table 2 shows the scores of Digits forward and backward of the elderly sample (N=16)

Initial	Age in Yrs	Digits forward	Digits backward	Inter pretation	State Anxiety	Trait Anxiety	Anger		
							Overall A.	Expr.	A. In
GR	67	5	6	Impaired	29	56	51	17	34
RP	63	5	4	Impaired	42	54	46	24	15
ZA	65	5	3	Impaired	37	36	ND	ND	ND
MB	72	6	5	Normal	32	52	ND	ND	ND
VS	64	8	4	Impaired	24	48	47	16	15
BS	61	6	3	Impaired	35	37	41	15	10
HB	81	7	4	Impaired	42	40	43	21	15
RR	74	6	6	Impaired	49	50	51	15	16
AM	61	8	7	Normal	45	55	50	19	18
KE	60	8	4	Impaired	44	54	48	27	21
AR	61	8	6	Normal	41	47	44	26	18
JM	60	8	7	Normal	29	37	41	22	19
SN	76	7	6	Normal	25	36	54	19	15
AG	70	6	4	Normal	49	49	ND	ND	ND
KR	66	5	5	Impaired	31	57	36	25	14
KR	60	7	6	Normal	24	35	62	21	24

Note: ND = Test not done

56% had impairment in attention and concentration. From the above **Table 2** it is evident that two individuals aged 74 and 66 who had complaints of forgetfulness, sleep disturbance, had high anxiety and inappropriate expression of anger. Because of the emotional disturbance they seemed to have impairment in attention and concentration which seemed to be functional memory loss.

Semantic memory stores more general information about the world such as rules, concepts and facts. This was assessed on the first two subtests - personal and current information, orientation. It was found that semantic memory was good in all the elderly people. And all of them were oriented to time, place and persons.

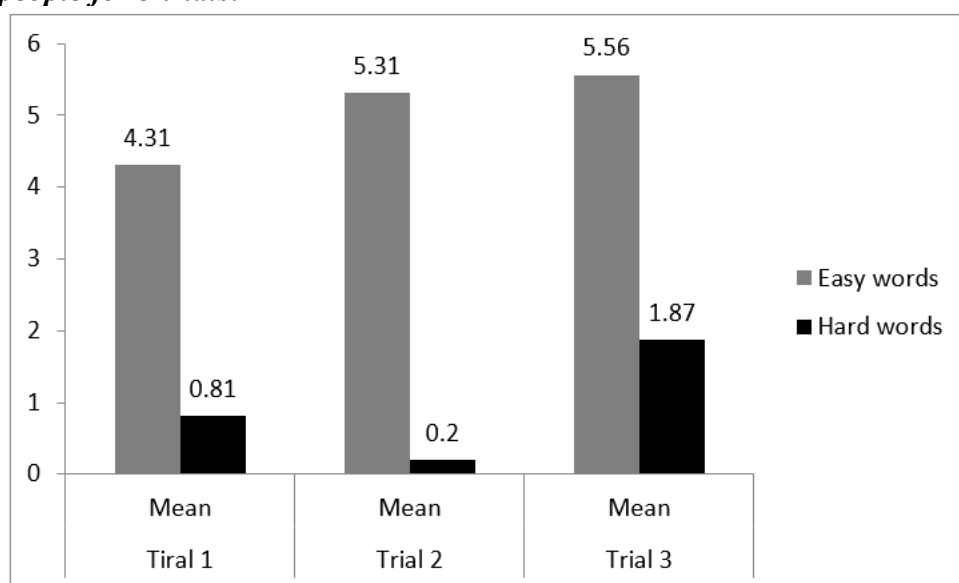
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Patterned material learned by rote early childhood and frequently used throughout life is normally recalled so unthinkingly, effortlessly and accurately that the response is known as automatism. Automatisms are among the least perishable of the learned verbal habits. This verbal automatism was assessed by using the third subtest of WMS - Mental control. Mental control consists of three sub items - Counting backwards from 20 to 1, saying the alphabet A to Z and counting numbers by threes from 1 to 40. All the elderly people were able to say numbers in backward from 20 to 1 and alphabet A to Z correctly. Three people had difficulty in performing the number series in threes, other elderly people did the verbal automatism tasks within the time limit.

In Logical memory subtest, 44% had difficulty in recalling the stories which showed impairment in immediate recall. 56% of them had difficulty in recalling the stories after 45 minutes of delayed recall which indicates difficulty in verbal retentivity in logical memory. Visual memory which was assessed using the subtest 6 – Visual reproduction and the visual memory was severely impaired in 13% of the elderly.

69% of the elderly people had impairment in Verbal retentivity which was assessed using the subtest 7- Paired Associate Learning. The significant factor was that all the 16 elderly people had learning as they moved from 1st trial to 3rd trial which is shown in **Figure 1**. 13% of them had impairment in 45 minutes of delayed recall in easy words, while 19% had impairment in delayed recall of hard words.

Figure 1 shows the mean score of the subtest – Paired Associate Learning of the elderly people for 3 trials:



Overall 63% of the elderly people had State anxiety and 94% of them had Trait anxiety.

When the subtests of memory were compared with the state anxiety, personal and current information (Semantic memory) and the logical memory were found to have significant association i.e., when the person was anxious at the moment, his ability to recall general information and logical memory was found to be impaired (Level of significance $P < 0.05$). This was confirmed using Mann-Whitney Test.

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Also Attention and Concentration / Short term memory was seemed to correlate with the Trait anxiety. When people are anxious, their attention, and concentration is found to be impaired, which was also confirmed using Mann-Whitney Test ($P < 0.01$).

85% of the elders had suppression of anger and 57% expressed their anger inappropriately.

Impairment in memory functions in elderly in this sample seemed to be due to emotional disturbance among these people as analyzed above. Hence, the memory disturbance among elderly seemed to be functional impairment. Appropriate psychological intervention for anxiety reduction, anger management, stress coping may be helpful to overcome their memory disturbances.

CONCLUSIONS

Memory disturbances are commonly reported in elderly with a deterioration or impairment in some of the cognitive functions. The study revealed that 75% had above average memory, 19% had average high memory and only 6% had average low memory. Bender Gestalt Test results showed that all the people have no disturbance of the percepto- motor function while 56% had difficulty in incidental recall. 56% had impairment in attention and concentration / Short term memory. It was found that semantic memory was good in all the elderly people. And all of them were oriented to time, place and persons. In Verbal automatism test, three people had difficulty in performing the number series in 3s', others did the verbal automatism tasks within the time limit. In logical memory subtest 44% had difficulty in recalling the stories which were presented to them orally. This shows that their immediate recall was impaired. 56% of them had difficulty in verbal retentivity in logical memory. Visual memory was found to be severely impaired in 13% of the elderly people. 69% of the elderly people had impairment in verbal retentivity. Overall, 63% of the elderly people had state anxiety and 94% of them had trait anxiety. 85% of the elders had suppression of anger and 57% had inappropriate expression of anger.

The association of personality factors namely anxiety and anger expression with memory disturbances seemed to be functional impairment in memory functions. Appropriate psychological management to cope up with the anxiety, anger, and stress and upheavals in their life situations may be helpful to overcome the memory disturbance to lead a healthy life among the elderly.

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Conflict of Interest

The author(s) declared no conflict of interest.

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