

Enhancement of Memory – Does gender influence?

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Abstract

Background: Learning is acquisition of information and memory is retention and storage of information. The process of learning is most essential to become academically more effective. **Aim:** The present study is aimed to establish that different memory improvement techniques can help to enhance and retain a particular memory for longer time and also to see the influence on gender. **Materials and Methods:** Two hundred young healthy medical students' males and females of age group 18-25 years were randomly selected for this study (100 males and 100 females). Short term memory status by visual tasks before and after application of memory improvement methods by using words and objects were analyzed. Student's paired 't' test was used to analyze the memory status before and application of memory improvement methods. 'Z' test was used to compare the memory status between the various tests. **Results:** There was statistically significant decrease in short term memory status in higher trials of test. Short term memory status for object test was significantly greater than word test. Females showed a significantly better object memory due to better attention, involvement in task and concentration. There was statistically significant improvement in memory status after application of memory improvement methods in all subjects and more so in females. **Conclusion:** Our study revealed an improvement in memory status after application of memory improvement methods in all subjects and this improvement was more significant in the females.

Keywords: learning, memory, object test, short term memory, visual task, word test

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Introduction

The human brain has been called the most complex object in the known universe and in many ways it's the final frontier of science. A hundred billion neurons, close to a quadrillion connections between them, and we don't even understand a single cell.¹ Memory function is generally divided into three categories; immediate, recent and remote. Much can be learned about memory as the patient tells his or her story during the interview. Specific memory

functions are tested only when one has reasons to suspect memory deficit on the basis of patient's history and clinical condition.²

Met memory, a type of met cognition, is both introspective knowledge of one's own memory, capabilities and strategies that can aid memory and process involved in memory self monitoring. This self-awareness of memory has important implications on how people learn and use memories.³ Overall, the mechanisms for memory are not well understood. Brain areas such as the hippocampus, the amygdala or the mamillary bodies are thought to

be involved in certain kinds of memory for e.g. the hippocampus is believed to be involved in spatial learning and declarative learning. Scientists who have investigated the nature of memory, Johan Carew Eccles, Weilder Penfield and, biologist Rupert Sheldrake, have suggested that memories are a field phenomenon and are not stored in the brain at all, but rather accessed through neurological structures. A final possibility of explaining short term memory is synaptic potentiation, which can enhance synaptic conduction.^{4, 5}

A number of imaging studies have demonstrated that the brains of males and females show different patterns of activity on various tasks. as regards spatial cognition, while males typically outperform females on tasks dealing with mental rotation and spatial navigation, females tend to outperform males on tasks dealing with object location, relational object location memory, and spatial memory.⁶ While the two sexes score the same on broad measures of mathematical ability, girls tend to do better at arithmetic, while boys do better at spatial tests that involve mental rotation. This study aims at unraveling the mystery by visuo-spatial tasks for short term memory.

Materials and Methods

The present study was conducted in department of Physiology Chengalpattu Medical College. Two hundred young healthy males and females in the age group of 18- 25 years were volunteers for this study. After obtaining IEC approval, a written and informed consent, a detailed personal family and past history was recorded and the subjects were also clinically examined to rule out any neuropsychiatric disorders, mental disorders, head injury, drug history of any anti psychotics, anti-depressants, hypnotics and any other disorders which would affect short term memory by visual task. The following tests were administered:

1. **Words test:** Subjects were given 30 seconds to look at a list of 15 words which were used commonly in daily life, like eggs, apple, chair etc. Then the subjects were asked to recall all the words or whatever they remembered and were asked to write on a paper immediately. Results were expressed in percentage.
2. **Object test:** A tray containing 15 commonly used objects, like lock & key, flower, pen, pencil etc. were

shown to the subjects for 30 seconds. The tray was covered with cloth and then the subjects were asked to write the names of the objects on a paper. Results were expressed in percentage. The subjects were given a rest of 15 minutes, and then the same short term memory tests were repeated with different sets of words and objects after asking them to apply some standard methods for improvement of short term memory.

The improvement methods used in this study were:

1. **Grouping method:** This method was used for improvement of words test. Here the subjects were asked to make a group of words (2 or 3) like a group of eatable products for example, eggs, banana, apple etc, group of parts of our body like brain, heart etc.
2. **Association method:** It is also called as linking method used for improvement of object test. Here the Subjects were asked to link the objects with each other and try to remember, for example the following are the objects-Soap, pot, school bag, tooth brush, table, chair, apple, tiffin carrier, school bus etc how to link each other? Early morning a child wakes up, brushes his teeth, has bath with soap and takes water from a pot in to bucket, later sits on a chair and has an apple on the table, picks up the tiffin carrier & school bag goes to school by school bus .

Results

This study was conducted to determine the effect of different memory improvement techniques on enhancing and retaining a particular memory for longer time and also to determine the influence on gender. The mean age of the males in our study was 18.95 ± 2.08 years while the mean age of the females was 18.85 ± 1.15 years.

Words Test

Memory status before application of memory improvement methods

1. **In all the subjects:** The mean $\pm$ SD of memory status in all the subjects was $68.41 \pm 14.47\%$.
2. **In males:** The mean $\pm$ SD of memory status was found to be $67.29 \pm 14.57\%$. In all the subjects, the memory status of word test was found to be less than object tests; however this decreased memory status of words test was not significant statistically when compared to objects test ($p > 0.05$).
3. **In females:** The mean $\pm$ SD of memory status was found to be $69.52 \pm 14.18\%$. The results were same

like in males, the memory status for word test was found to be less than object tests; however this decreased memory status of words test was not significant statistically when compared to objects test ($p > 0.05$).

Male vs female: The mean of memory status before application of memory improvement method was found to be numerically more in females than males which was not significant statistically ($p > 0.05$).

Memory status after application of memory improvement methods:

1. **In all the subjects:** The mean $\pm$ SD of memory status in all the subjects was $77.99 \pm 14.47\%$.

The memory status found to be increased and was statistically highly significant when compared to the memory status before application of memory improvement methods ($p < 0.001$).

2. **In males:** The mean $\pm$ SD of memory status was $75.86 \pm 15.64\%$. The memory status found to be increased and was statistically highly significant when compared to the memory status before application of memory improvement methods ($p < 0.001$).

3. **In females:** The mean $\pm$ SD of memory status was $80.09 \pm 12.88\%$. The memory status, like in males, was found to increase significantly ($p < 0.001$) when compared to memory status before application of memory improvement methods.

Male vs female: A statistically significant ($p < 0.001$) improvement in memory status was observed in females than males.

Object Test

Memory status before application of memory improvement methods:

1. **In all the subjects:** The mean $\pm$ SD of memory status in all the subjects was $82.12 \pm 12.28\%$ when compared to words test, memory status was found to be more and was significant statistically ($p < 0.001$).

2. **In males:** The mean $\pm$ SD of memory status was found to be $79.41 \pm 12.60\%$ when compared to words test, memory status was found to be more and was significant statistically ($p < 0.001$).

3. **In females:** The mean $\pm$ SD of memory status was found to be $84.79 \pm 11.35\%$ when compared to words test memory status was found to be more and was significant statistically ($p < 0.001$).

Male vs female: The mean of memory status before application of memory improvement method was found to be more in females than males which was significant statistically ($p < 0.05$).

Memory status after application of memory improvement methods:

1. **In all the subjects:** The mean $\pm$ SD of memory status in all the subjects was $88.47 \pm 12.0\%$. The memory status found to be increased and was statistically highly significant when compared to the memory status before application of memory improvement methods ($p < 0.001$).

2. **In males:** The mean $\pm$ SD of memory status was $86.12 \pm 12.24\%$. The memory status found to be increased and was statistically highly significant when compared to the memory status before application of memory improvement methods ($p < 0.001$).

3. **In females:** The mean $\pm$ SD of memory status was $90.79 \pm 11.18\%$ status in females was found to be numerically better than males compared to memory status before application of memory improvement methods. Table 3

Male vs female: A statistically significant ($p < 0.001$) improvement in memory status was observed in females than males

The comparison of word and object test in males and females before and after application of memory improvement methods are shown in Figure 1 and Figure 2 respectively.

Table 1: Comparison of word and object test in males and females before application of memory improvement method

Test	Males (Mean $\pm$ SD)	Females (Mean $\pm$ SD)	Significance
Word test	67.29 ± 14.57	69.52 ± 14.18	$Z=10.7$, $p < 0.001$
Object test	79.41 ± 12.28	84.79 ± 11.35	$Z=8.54$, $p < 0.001$

Table 2: Comparison of word and object test in males and females after application of memory improvement method

Test	Males (Mean $\pm$ SD)	Females (Mean $\pm$ SD)	Significance
Word test	75.86 ± 15.64	80.09 ± 12.88	$Z=2.17$, $p > 0.05$
Object test	86.12 ± 12.34	90.79 ± 11.18	$Z=2.84$, $p < 0.05$

Discussion

The present study has highlighted the memory status of young individuals. Further response to changes in short term memory after applying standard memory improvement methods and gender influence on short term memory enhancement techniques were analyzed.

Performance on trials in which two sets of stimuli were presented and both were cued for retention could be compared either to trials in which only one set was presented, or it could be compared to trials in which both sets were presented but the cue later indicated that only one set had to be retained. The part of working memory preceding the cue showed modality-specific dual-task effects: encoding a stimulus set of one type was more by encoding another set if both sets were in the same modality.⁷ However, the retention of information following the cue showed dual-task effects that were not modality-specific.

In a study entitled "Working memory in mild Alzheimer's disease and early Parkinson's disease" by Elizabeth A. *et al*, compared the performance of 22 patients with mild Alzheimer's disease, 22 patients with early Parkinson's disease without dementia and 112 control participants on tests of short term memory (digit span and word span), tests of working memory. The working memory deficits seen in patients with Alzheimer's disease may be secondary to deficit in other cognitive capacities, including semantic memory.⁸

Saher Ansari *et al*. showed that progressive decrease in memory status in higher trials of alphabetical test is due to increase in number of bits /items more than 7 as an individual can hold 7+2 bits of information.⁹ Due to effectiveness of memory improvement methods there is significant improvement in memory status in all subjects, more so in females visual memory and working memory.¹⁰

This study showed that

- There was statistically significant progressive decrease in short term memory in higher trials, which may be due to increased number of bits more than seven, as an individual can hold 7+2 bits of information in short term memory
- Short term memory status for objects was better than words and this may be due to

good sight, one's relation with the object around.

- Females showed better short term memory when compared to males which may be due to their better attention, involvement in task, intention, concentration and effort.
- There was statistically significant improvement in memory status after application of memory improvement methods both in males and females
- Application of such tools, based on the clinical cases could be applied for a better outcome.

Limitations of the study: Limitations include the fact that a more standard battery of tests could have been employed and analyzed statistically in detail. Further studies using standard battery of tests for memory and more detailed statistical analysis in a large sample are planned to overcome the limitations of this study.

Conclusion: Our study revealed a significant decrease in short term memory status in higher trials of test. Short term memory status for object test was significantly greater than word test. There was statistically significant improvement in memory status after application of memory improvement methods in all subjects and more so in females. Further studies using other standard tests for memory and more detailed statistical analysis in a larger sample are planned.

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Conflicts of interests: Nil

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