

# Research Journal of Pharmaceutical, Biological and Chemical Sciences

## What Affects Short-Term Memory? – Questionnaire and Experiment Based Cross-Sectional Study On Medical Under Graduate Students.

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### ABSTRACT

Short-term memory (STM) is the part of memory process in which the memory traces from the items and sensory information initially enter the memory state temporarily. The short term memory can be affected by our lifestyle like alcohol consumption, diet, sleep, etc. This study designed to investigate the effect of dietary preferences, eating habits, sleep and exercise attitude of a student with their STM. The study involved 190 medical undergraduate students age ranging between 17-19 years. The study comprised of a questionnaire with the close-ended question about lifestyle details of students, followed by an experiment in which images of familiar objects, words, and numerical digits were projected for specified time. Students recall capacity were tested that implies their STM. Result of the study revealed higher STM for the students who take Omega 3 diet supplements, regular exercises, and adequate sleep. Students who involve in substance abuse, consume more caffeinated drinks were shown to have poor STM. It can be concluded that lifestyle of the individual is often associated with their STM. Refrain from the attitudes that affect the STM can avoid cognitive deficits and poor academic performance of the students.

**Keywords:** short term memory, academic, diet, cognitive

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## INTRODUCTION

Short-term memory (STM) or "primary" or "active memory" is the capacity for holding a small amount of information in mind in an active, readily available state for a short period. The duration of short-term memory lasts seconds to hours, processing in the hippocampus [1]. STM is achieved by the continual neural signals that travel around temporary memory trace in a circuit of reverberating neurons [2]. These memory traces are subject to trauma and drug disruption [1]. Presynaptic facilitation or inhibition of STM occur at terminal nerve fibrils just before these fibrils synapse with a subsequent neuron. The neurotransmitters liberated at these terminals can frequently cause facilitation or inhibition lasting for seconds up to several minutes [2]. There is a strong correlation between working memory and standard measures of intelligence. Conversely, the specific memory deficit in victims of Alzheimer's disease, a condition marked by severe memory losses, may be in this attention focusing component of short-term memory [3]. The process is involved in performing tasks requiring temporary storage and manipulation of information to guide appropriate actions [4].

In short term memory process, the memory traces from the items and sensory information initially enter the memory state temporarily. In this state, STM lasts for about 20-30 seconds which eventually process to enter into long-term memory (LTM) [5]. The representational basis for perception of STM and LTM are equal, as in both sequences, neural representations originally activated during the encoding of an information traces that show sustained activation during STM [6] and are the repository of long-term representations [7].

The short term memory can be affected by our lifestyle like alcohol consumption, diet, regular exercise, sleep. The present cross-sectional study was designed with the objectives to investigate the impact of food preference, exercise and sleep on STM and to analyze the influence of alcohol consumption/smoking habit on STM. We have also designed this study to evaluate the effect of different visual stimuli on STM.

## MATERIALS AND METHOD

This study involved 190 MBBS students studying in their preliminary academic curriculum. The age range of the participants was between 17 and 19 years. Among the participants, 108 of them were males and remaining 82 were females. Institutional ethical consideration was obtained before the study.

The study comprised of two parts. Part 1 was based on self –designed questionnaire containing close ended questions. These questions were about participant's lifestyle preferences like their dietary habits, activity profile, sleeping durations and substance abuse if any, etc.

The second part of the study was experimental to test the participants recall capacity. In this, a set of colored images, colorless images, familial words and random numbers of three digits were displayed. All the students were allowed to observe it for specified duration. The images selected were of familial objects. Participants were then asked to write the names of the objects, words and the numbers displayed as many as possible as they could remember. Each set had 20 items.

The compiled results were documented as a data and represented in charts and graphs for comparison purpose.

## RESULTS

### Dietary preferences and its effect on short-term memory (STM)

Result showed that there is a proportional relationship between regular omega-3 food supplement consumption with STM. Students who never consume omega-3 in their diet could score 35.3% while those have more than four servings per week were able to score up to 47.4 % (Figure 1)

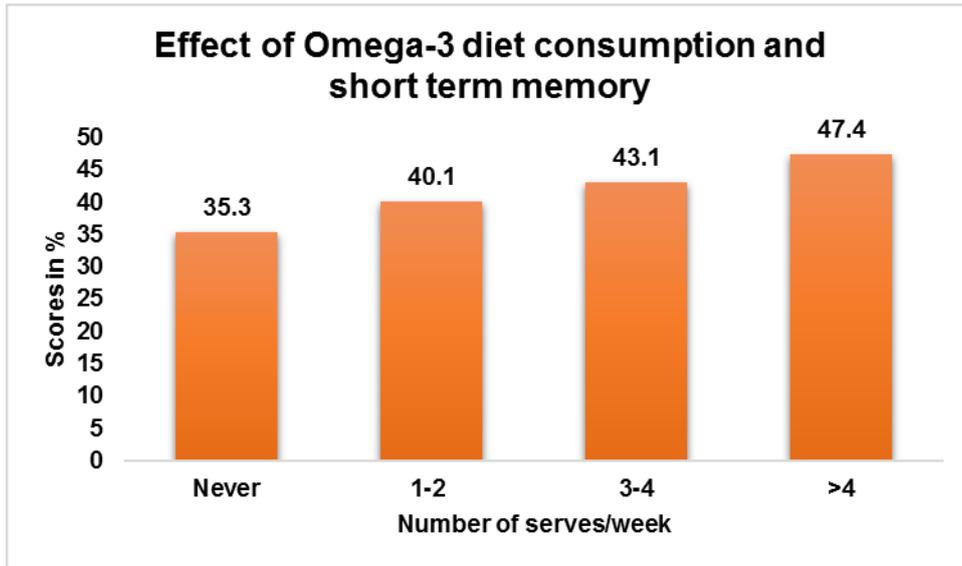


Figure 1: Showing the relationship between Omega-3 diet consumption and short term memory

**Effect of caffeinated drinks, regular breakfast, physical exercise and substance abuse attitude on STM**

Caffeine has been thought to have some benefits on STM. However, from the present study, the difference in the STM score between the students those who do not consume caffeinated drinks (37.4%) and do have it regularly every day (36.9%) is almost same.(Figure 2). However, the effect of regular breakfast on STM revealed the higher percentage of STM scores (71.2%) attributed to the students who consume breakfast regularly compared to those who never take breakfast every morning (35.3%) (Figure 2). Similarly, students who exercise regularly scored quite well (39.2%) than others who do not involve in such activities (score 36.4%) (Figure 2). The participants with the habit of substance abuse like smoking or consuming alcohol beverages, however, tend to have lower STM than the others as their STM score was 33.5%. On the other hand, those who abstained from these flared better scoring i.e., 36.7 % (Figure 2)

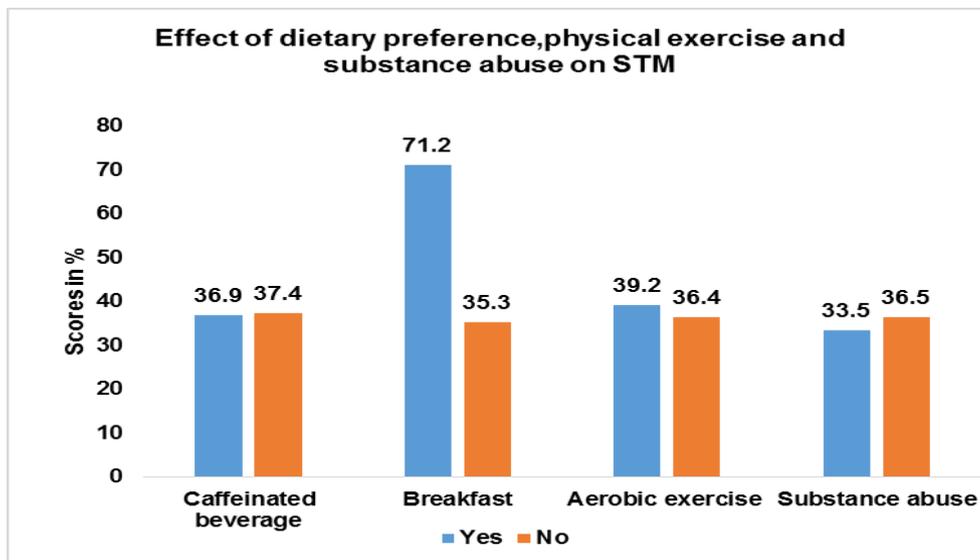


Figure 2: STM score profile of students their dietary preferences, breakfast, exercise preferences and substance abuse

**Effect of adequate sleep**

Sufficient sleep has an impact on students STM. Students who sleep for 7-8hrs per day had STM score higher (40%) than who sleep for 5-6 hours (37%) (Figure 3)

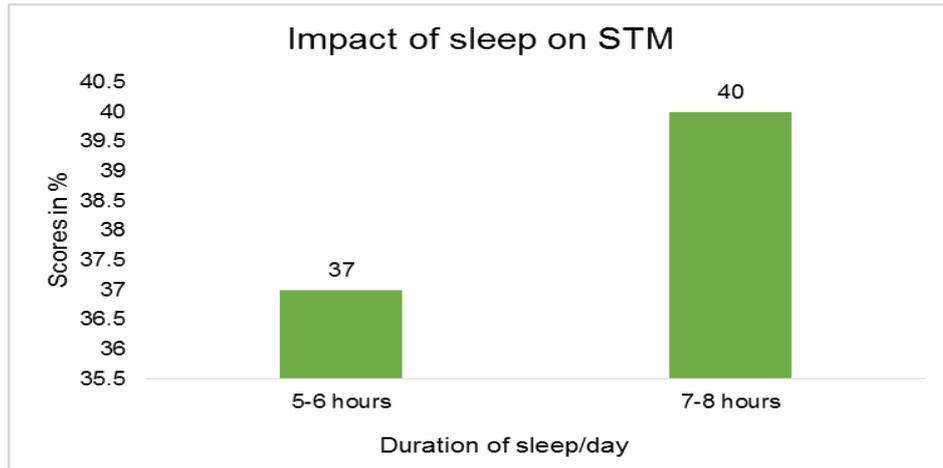


Figure 3: Impact of sleep duration on STM

**Effect of visual stimuli**

Upon analyzing the effect of visual stimuli in short-term memory, it has been noted that highest number of objects with color (40.4%) can be recalled compared to that of without color (32.8%). However, when it comes to remembering familiar words or numerical digits, almost both seem to be more or less same (words score 39.6%, and digit score 38.6%) (Figure 4).

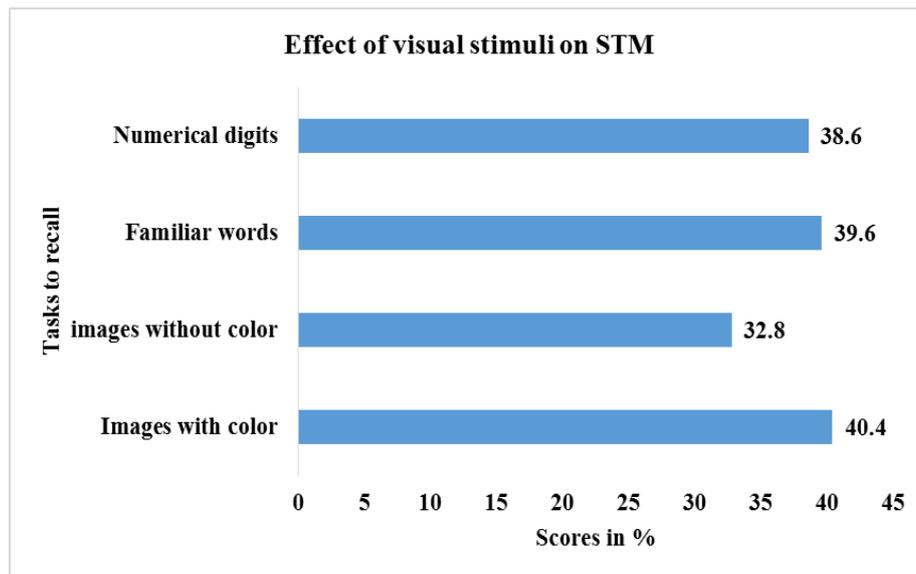


Figure 4: Effect of visual stimuli on short term memory of the student

**DISCUSSION**

Several factors influence the STM of students. Some of it include their diet preferences, physical exercise, habit of consuming excess caffeinated drinks or alcohols, smoking habits, and sleeping durations. Omega-3 fatty acids are dietary supplements which are commonly found in salmon, flaxseeds, walnuts, soybeans and tofu. They have health benefits and are considered essential fatty acids. Linus Pauling Institute upholds the role of Omega-3-fatty acids in short-term memory. They acknowledged the research report by Fedorova et al., stating that impairment of learning and memory results from the deficiency of Omega-3-fatty acid derivatives [8, 9].

Physical exercise; a vital ritual of individual’s routine, has been proved to increase cognitive abilities, besides keeping the body fit and healthy. Our study result also witnessed that those who exercise regularly had

scored better in the STM test conducted. Exercise increases the flow of blood to the brain. The blood delivers oxygen and glucose, which the brain needs for heightened alertness and mental focus. Exercise also stimulates nerve growth factors [10].

Sufficient sleep allows the STM to be transferred into long – term memory. Students should not be misled by the values of industrial society, that people can “train” their body to sleep less, hoping to expand the number of “working hours” of the day. Though there are different opinions on the minimum duration of sleep required, as per the majority opinions, minimum 6-hours of sleep is necessary especially for the students. Our study result supports this assumption as the students who sleep for 7-8hrs/day tend to score higher STM score than the others.

Various substance abuse such as consumption of tobacco (in the form of cigarette smoking) and alcohols may also have an adverse effect on STM. The exact mechanism however debatable. Different visual stimuli may provide different impact on STM among the individuals. Color has been scientifically proven to stimulate the brain on short term memory. Moreover, STM is even better with visual stimuli along with pictures and colors compared to those with words and numbers. Images and words together were better remembered than words alone, but pictures and words together were not significantly better than pictures alone [11].

The type of distraction tasks and length of retention interval, as studied among 48 Indian university students revealed the images can be better remembered than words. However, sound disturbance produces poorer recall for both stimulus types. Both recall for pictures and words was found better with shorter retention interval. But, more delay effect was noticed for words than for pictures [12].

### CONCLUSION

From the results of the study, it can be inferred that students' lifestyle do affect their Short Term Memory. While certain nutritional supplements like Omega 3 diets, regular physical exercise, breakfast and adequate sleep did show an enhanced effect on STM, factors like smoking and alcohol consumption are found to set back the STM. Impaired STM, in turn, affects students' learning and academic achievements as a whole.

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