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Effectiveness of mnemonics based teaching in medical education-A prospective study in learning physiology by first year medical (MBBS) students

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***Abstract*---**Background: Classical teaching methods by faculty lectures and text-based materials are thought to be less interactive and research aimed to compare the effectiveness based on mnemonics is the need of the hour.Methods: All study enrolled students underwent a pre-test on six physiology topics. The pretest retention capacity of knowledge of all the students was assessed by multiple choice questions (MCQs). Later students were randomly assigned to the intervention-based mnemonic text-reading group which served as Group A or non-intervention group (control) which served as Group 2. Group A was subdivided in to group A1, group A2, group A3, group A4 and group A5 consisting 10 students in each with mnemonics-based teaching on six topics randomly assigned among them and educated. Similarly, group B was also subdivided into group B1, group B2, group B3, group B4 and group B5 consisting 10 students in each and were taught same six topics without the aid of mnemonics. The mean score difference and percentage between intervention and non-intervention group was compared and compared between pretest and posttest.Results: The data were analyzed by ANOVA followed by Dunnett's multiple comparison test. Unpaired T rest with Two paired 'p' value. Observations are Mean ± SEM and p value < 0.05 - considered statistically significant. Mean score and percentages of intervention group was 8.4 ± 0.24 with p value of < 0.0001. Mean score and percentages of non-intervention group was 4.8 ± 0.37 with p value of > 0.5.Conclusions: Mnemonic intervention-based text-reading

method is more effective than the ordinary methods of teaching the physiological concepts in promoting memory retention among medical students.

***Keywords*---**effectiveness, mnemonics, medical education.

Introduction

Historical data reveals strategy that dates back to ancient Greece and has been used from many centuries. Greek lyric poet (circa 566-468 BCE) used the ancient "method of loci", by using tool of mnemonic for remembering and managing information. Mnemonics was used by placing mental images in to imagined places in one's mind like a theoretical backdrop for recalling and remembering. Mental snapshot is a process of remembering the things that enables students to remember the learned topics based on new information reflecting mental picture of the past. Architectonics is a structured mental organization as designated by classical orators, cognitive psychologist and philosophers that helps to retain learned knowledge[1].

Mnemonics helps to create in minds of the student and label these images in strong natural storage system and this process of learning science is an active and complex interface of recalling terminologies and construct concepts[2]. More recently, mnemonics has proven to be a useful tool to provide assistance to regular and special education students in the process of committing ideas and vocabulary to memory[2,3]. Due to its effectiveness in transforming non meaningful, nonsensical crazy things to concrete meaningful information, mnemonics are used as effective tool which has even proven in terms of school going student[4]. The best knowledge can be achieved by use of mnemonics which helps to encode memory and aid in retaining the learned things[5].

Due to huge syllabus in medical subjects, medical students are often termed as "strategic learners" as they become slow and superficial learners[6]. One of the most worrisome aspects of medical students is that students often forget the learned subjects once their examination gets over. This pose a major challenge to medical teachers to encourage students to attain in depth knowledge based on their syllabus and hence multiple-choice question with mnemonics is found to be helpful in quick assessment of the students of knowledge[7,8]. In terms of teaching medicine, use of mnemonics has shown its versatility and reliability for many students. Most of the medical students are given many assignments to access their learning ability especially task related to essay writing and project work[9].

One more special type of learning includes song-based mnemonics and has been used a very potential in learning concepts in the field of medicine and using the same for all the concept may be difficult. Mnemonics are used as main tool by students themselves to learn complex tasks as most of the medical books don't give mnemonics and hence some faculty form their own mnemonics to teach students[10].

Material and Methods

Study design

A single-centered, single-blinded and controlled study

Study setting

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Sampling technique

Systematically randomly sampled technique

Methods

Institutional ethics committee approval was obtained before conducting the study with IRB approval Ref. No. 10.2021/PIMS dated 07 / 09 / 2021. All the students were informed regarding the objective and students who voluntarily showed interest were selected and involved in this research after obtaining informed consent. Inclusion criteria was based on students who scored >40% mark in internal assessment (High achievers) and <40% mark in internal assessment (Low achievers) of first year MBBS. All students underwent a pre-test on six physiology topics. The retention capacity of knowledge of all the students was assessed by mcq or tests initially to record base line response. Later students were randomly assigned to the intervention-based mnemonic text-reading which served as group A or non-intervention group (control). Students of group A was subdivided in to groupA1, group A2, group A3, group A4 and group A5 with mnemonics-based teaching on six topics randomly assigned among them and educated. Similarly, group B was also subdivided into group B1, group B2, group B3, group B4 and group B5 and same six topics were taught without the aid of mnemonics. The mean score difference between intervention and non-intervention group was compared.

Statistics

Percentage was calculated and compared between intervention-based mnemonic text-reading and or non-intervention group (control). ANOVA followed by Dunnett's multiple comparison test. Observations were mean ± SEM and p value < 0.05 was considered statistically significant.

Results

Table 1. Mean score difference between intervention and non-intervention group

Group A					Group B				
Sub Groups	Number of correct responses	%	Mean ± SEM	'P' value	Sub groups	Number of correct responses	%	Mean ± SEM	'P' value
1	8	80	8.4	<	1	5	50	4.8	>

2	9	90	± 0.24	0.0001	2	4	40	± 0.37	0.5
3	8	80			3	5	50		
4	8	80			4	6	60		
5	9	90			5	4	40		
Average	42	84			Average	24	48		
n=10 in each group, ANOVA followed by Dunnett's multiple comparison test. Unpaired T rest with Two paired 'p' value. Observations are Mean ± SEM and p value < 0.05 - considered statistically significant.									

Table 1 shows that, in group A, the sub group 2 and 5 were having 90% compared to sub group 1, 3 and 4 among high achievers with overall percentage of 84 with Mean ± SEM having p value of < 0.0001 which is highly significant, whereas in group B, the sub group 6 showed 60%, sub group 1 and 3 showed 50% whereas sub group 2 and 5 showed less than 50 % with overall percentage of 48 Mean ± SEM having p value 4.8±0.37showing p value of > 0.5 which is not significant. In group A, the sub group 2 and 5 benefited better compared to other sub groups, whereas, in group B, the sub group 4 showed better result in terms of percentage compared to other sub groups.

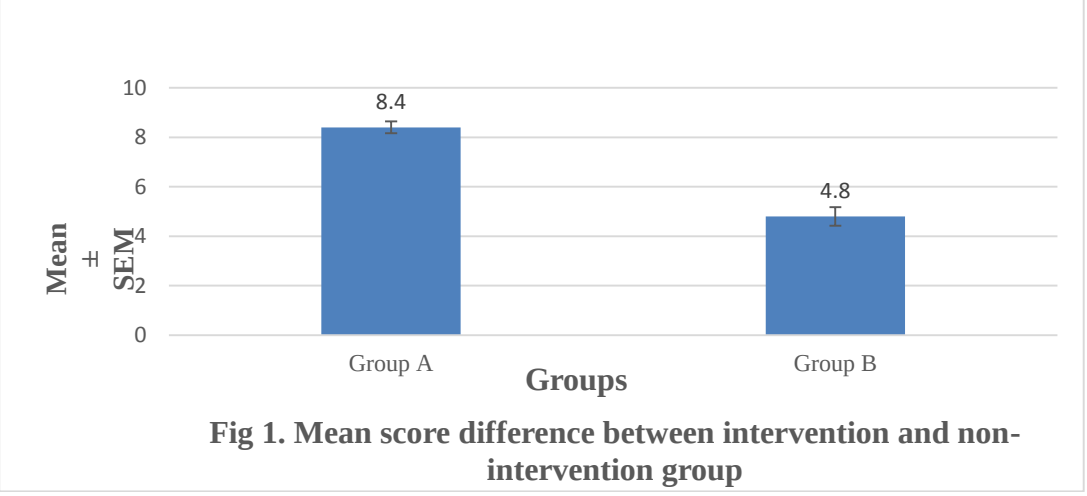

Fig 1. Mean score difference between intervention and non-intervention group

Figure 1 shows mean ± standard error of mean between group A (intervention) and group B (non-intervention).

Discussion

This research focused on common physiology topics for first year students to remember the key points and related explanation based on mnemonics and found to be better in intervention group when compared to non- intervention group which is similar to research done by Lois James Samuel et al showed that mnemonics and picmonics are beneficial strategies in terms of pharmacology which help students to improve their learning and memorizing thus improving their overall academic performance[11].

It has been observed in this research that, the subgroups among the non-intervention group have also performed fairly well compared to intervention group

scoring near 50% and this might be based on their memory retaining capacity from their basic education experiences and mnemonics might not be much beneficial as it was just a pre and posttest. But the real test would be testing the same on both the groups after few weeks or months to access their retaining and recalling capacity. This was little difficult in this research as the students can interact in their hostel or mess if they were allowed to come back after few weeks or months to give a retest and that may give false results between intervention and non-intervention group leading to bias.

One of previous research explored the efficacy of 10 learning techniques which included keyword mnemonic using keywords and mental imagery to associate verbal materials and found that leads to accelerated forgetting and students must decode each image to retrieve the appropriate target, and at longer delays, such decoding may be particularly difficult for learning 10 learning technique, but this research did not find any issue of that kind[12].

Research done by Ayisha Qureshi et al used method of loci (MOL) is a mnemonic device that relies on spatial relationships between "loci" (e.g., locations on a familiar route or rooms in a familiar building) to arrange and recollect memorial content. This study hypothesized that the use of MOL leads to better understanding of the topic among students in physiology and other subjects, which can be observed through better student performance on assessments. Their descriptive analysis showed that all students found MOL to be a helpful technique.

Limitations

- A stipulated time was not set to give the answers to access which subgroups among interventions submitted first.
- An audio-visual based integrating with mnemonics was not used in this study which would have resulted in more impact among the subgroups of intervention group.
- Only one similar MCQs question was given to each sub group in group A and B making a total of 10 mcq questions in this research, but some fixed multiple questions per each sub-groups in intervention group would have given even more better picture about the results of this research.
- This research showed only the importance of short-term memory, however a long-term memory assessment after four to eight weeks interval has to be evaluated.

Conclusion

This research as of now concludes that a mnemonic intervention-based text-reading method is more effective and impressive as evident from results of intervention groups compared to non-intervention groups than the ordinary classical faculty lectures method of teaching in remembering the medical concepts.

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