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RESEARCH ARTICLE

Effectiveness of mind maps as a self-learning tool in 1st year MBBS students of an Indian medical college

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ABSTRACT

Background: The mind map (MM) is a powerful graphic technique that can be applied to improve learning and clearer thinking. MMs can be used as self-learning methods that facilitate understanding of difficult concepts. A learning strategy underutilized in medical education is MM. MMs are multisensory tools that may help medical students organize, integrate, and retain information. Recent work suggests that using MM as a note-taking strategy facilitates critical thinking. **Aims and Objectives:** Our objective was to evaluate the effectiveness of using MMs as a self-learning method for the 1st year MBBS students. **Materials and Methods:** A total of 60 1st year MBBS students were randomly selected and assigned to two equal groups (MM vs. usual study technique). A text on glucose homeostasis was selected as self-study material. The MM group was given a 45-min lesson in the technique. Both groups were exposed to the study text for a 45-min period and were requested to answer four structured questions based on the study text. **Results:** There was no significant difference between the test scores of two groups. The average marks obtained by the MM group were 30.97 ± 0.40. It was 32 ± 0.32 in the usual study technique group. Majority from the MM group felt that it is useful to summarize information and active learning. They wanted to study further about MM and use it in other subjects. **Conclusion:** MM technique is not superior in newly admitted medical students for short-term learning; however, most students reported it as a useful learning tool in active learning.

KEY WORDS: Mind Maps; 1st year MBBS Students; Self-learning Tool

INTRODUCTION

The mind map (MM) is a powerful graphic technique that can be applied to improve learning and clearer thinking.[1] MMs can be used as self-learning methods that facilitate understanding of difficult concepts. A learning strategy underutilized in medical education is MM. MMs are multisensory tools that may help medical students organize, integrate, and retain information.

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During their undergraduate years, medical students are exposed to a large amount of information. It is likely that students often become passive recipients of abundant information transmitted by teachers and are rarely actively involved in the learning process itself.[2] This situation requires a change in the role of teachers and their teaching methods. They should increasingly be mediators and facilitators of student learning.[3] Medical schools have been changing their educational programs and teaching strategies, at national and international levels, to ensure that students have active responsibility for their learning process and are prepared for life-long, self-directed learning.[4]

The effort toward developing active learning was based on the concern, expressed by experienced medical educators, that students memorized facts instead of understanding and applying concepts.[5] Unless there is understanding, students

may only commit unassimilated data to short-term memory and no meaningful learning will occur.[6]

In this context, a possibility arises of using a graphical technique called MM created by Buzan in the process of knowledge presentation.[1] This technique has been used in a variety of activities and by various professionals in the educational field. It serves to facilitate and enhance the learning process.[1] MM is a visual technique where information and knowledge are converted into a hierarchical diagram, formatted and illustrated, with structural key terms. It is associated with a theme helping learners to understand certain contents better, integrate it and memorize it faster.[7] As the MMs are entirely structural; their applications in teaching and learning are not restricted to a particular context or knowledge domain.

A MM is a diagrammatic representation of words, ideas, tasks, or other items associated with a study topic. These maps are useful tools that can be utilized to represent the structure of knowledge in a form that is psychologically compatible with the way human beings construct meaning.[6] A MM is the organizational thinking tool which can be used as easiest way to put information into your brain and take information out of your brain. It's a creative and effective means of note taking that literally maps out your thoughts.[1] In a MM, the main study topic is drawn at the center with keywords branching out in a divergent pattern [Figure 1]. These keywords correspond to subtopics, and then, smaller branches project from the subtopics with further details regarding the subject being included in a progressively branching pattern. By undergoing this process, information initially contained within passages of text becomes hierarchically organized, with the most general information being presented in the center of the MM and material of increasing detail being presented at the extremes.[8] It is used to generate, visualize, structure, and classify ideas, and as an aid in study, organization, problem-solving, and decision-making. The elements are arranged intuitively according to the importance of the concepts, and they are organized into groups, branches, or areas. The uniform graphic formulation of the semantic structure of information on the method of gathering knowledge may aid recall of existing memories [Figure 2].

The five essential characteristics of a MM are:

1. The main idea, the subject is crystallized in a central image.
2. The themes radiate from the central image as branches.
3. The branches comprise a key image or keyword drawn on its associated line.
4. Topics of lesser importance are represented as twigs of the relevant branch.
5. The branches form a connected nodal structure.

MMs can be used as self-learning methods, which enhance the focus on salient rather than irrelevant aspects. It also

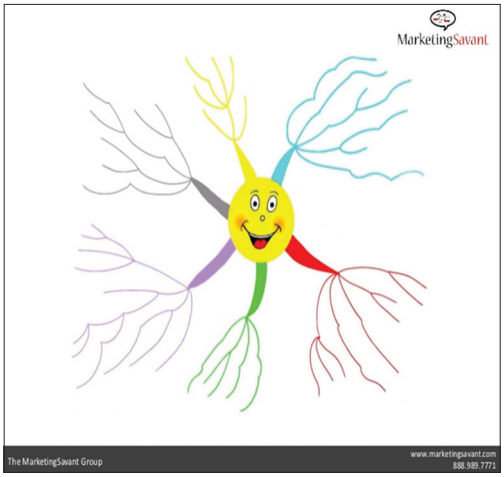

Figure 1: Example to create a mind map

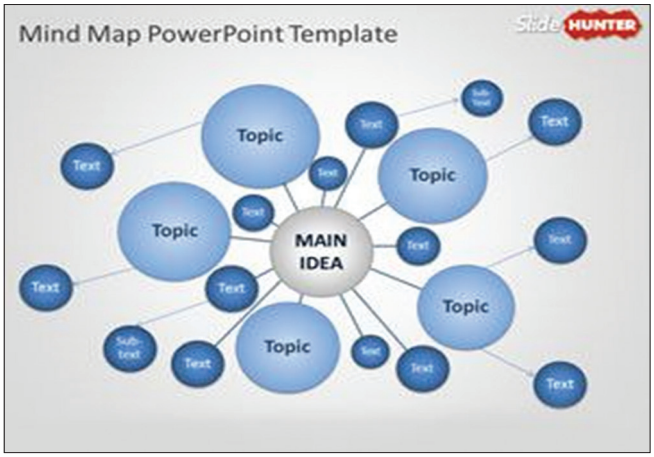

Figure 2: Example to create mind map

facilitates the achievement of a conceptual understanding of the fundamental principles of a huge amount of information and enables to assemble and integrate many concepts together. MMs promote active learning. Analysis of the data indicates that, as a strategy to improve memory for written information, the MM technique has the potential for an important improvement in efficacy.[8] Previous studies have shown the importance of the MMs use in medical education,[8-10] and the researchers have studied the comparison of concept maps and MMs. The efficacy of MMs as a self-learning method was in question in those studies. Therefore, the study was performed to evaluate further the effectiveness of MMs as a self-learning method.

MATERIAL AND METHODS

The study was approved by the institutional ethical committee. A total of 60 students from the 1st year MBBS students of the Government Medical College, Aurangabad, were randomly selected to participate in the study. The entry score for MBBS was not taken into consideration. They were assigned to two equal groups of 30 each designated as the MM group and the usual study technique group. The students were given

detail information about the study and those who volunteered were selected for the study. Due to the small sample size, there were no dropouts in the study. A text on "glucose homeostasis" was selected from a recommended textbook as self-study material. The topic of the text was carefully chosen to minimize the possibility of participants' existing knowledge in the selected study material from interfering with the results. The investigators developed four structured essay questions from the study text, and all questions were of a similar length and required the recall of a specific piece of information presented in the text. Each question reflected a similar level of difficulty which was assessed by the department's faculty members.

Initially, the participants in the MM group were given a 45-min lesson on the MM technique to train them on the application of the method. The session included the slides explaining about MMs and how to create one. The lesson used material totally unrelated to the study text to demonstrate the best ways to produce and memorize MMs. During the training, the participants were given the opportunity to ask questions regarding the technique. Each student in the group was asked to prepare at least one MM after the training lecture. Following this training, both groups were exposed to the selected study text on glucose homeostasis for a 45-min period. Participants in the MM group were advised to divide the time between reading the study text and producing a MM and studying it [Figures 3 and 4]. In the study, a method was

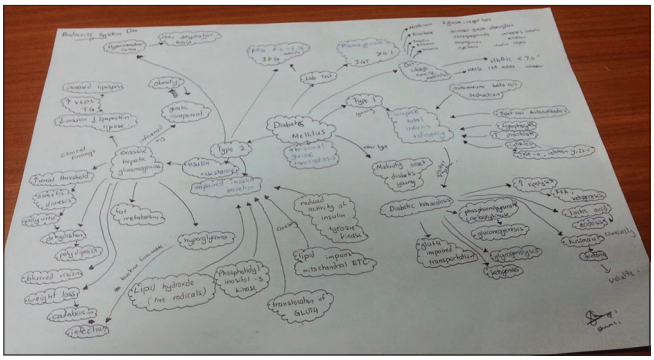

Figure 3: Mind map created by the students

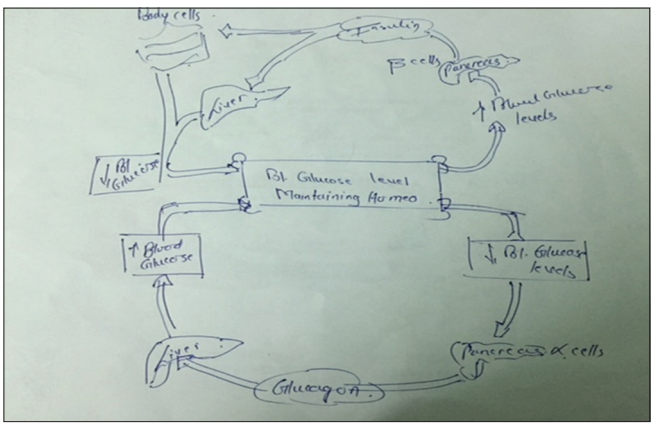

Figure 4: Mind map created by the students

developed to score the MM s prepared by students taking into account the map's structure as well as its content. The answers were marked using this pre-prepared marking scheme. However, the grades were used only for student's facilitation and encouragement to develop the MMs. Participants in the usual study technique group were advised to divide their time between reading the text and applying their existing study methods. None of the participants in the usual study technique group used MMs as their preferred method of study. Following the study session, all participants were given a test having structured essay questions. There were four questions of 10 marks each. The questions were like "what is the normal blood glucose levels in adults? Give an account of the hormonal regulation of it; discuss endocrine functions of pancreas in detail. Give an account of disorders of glucose metabolism disorders."

The feedback regarding the technique was obtained from the MM group using a self-administered questionnaire which was validated by other faculty members.

Data were analyzed using the SPSS version 15.

RESULTS

Both the groups were having 30 students each. The MM group (Group I) was having 18 males and 12 females with average age 18.56 years. The usual study group (Group II) was having 16 males and 14 females of age 18.68 years. The marks at the entry level of MBBS were not taken into consideration.

The average mark obtained by the MM group was 30.97 ± 0.40. It was 32 ± 0.32 in the usual study technique group. There was no statistically significant difference between the examination scores of two groups [Table 1]. However, students felt that it helps in active learning.

Majority from that group perceived the technique as a useful method of summarizing information and wanted to follow the technique for their future studies. The students in the MM group have realized that it is a useful way of memorizing information. Moreover, many of them wanted to use for other subjects. The technique also aroused interest and curiosity in the students. The students felt that it may be helpful for understanding the subject and may help in better performance in the examinations. The only drawback they

Table 1: Comparison of scores

Groups	Male	Female	Age (years)	Score (40)	*P*
Group I (*n*=30)	18	12	18.56	30.97±0.40	*P*=0.001
Group II (*n*=30)	16	14	18.68	32±0.32	

mentioned when asked was the time required for creation of these MMs [Table 2].

DISCUSSION

The students of the MM group as well as the usual study technique group were able to achieve a satisfactory performance level after being exposed to a totally unfamiliar topic. It was observed that a majority of the students in the MM group have grasped the concept of developing MMs after the initial training session. A majority designed the MMs incorporating many of the key features of MMs. The information embedded in the MMs varied from one student to the other reflecting individual educational needs. Considering the fact that they have been exposed to the technique for the 1st time, it is supportive toward promoting the use of MMs as an effective self-learning tool. However, the MM technique did not show any superiority over other conventional study techniques as a short-term learning method in a newly trained population. The average mark obtained by the MM group was 30.97 ± 0.40. It was 32 ± 0.32 in the usual study technique group. There was no statistically significant difference between the examination scores of two groups, but the majority of the MM group perceived it as a useful way of summarizing information. They also perceived it to be helpful in memorizing information in an organized manner compared to their previous self-study techniques. Students expressed their interest to learn more about the MM technique and follow it in their future academic activities. The MM technique may not be effective in improving retention of information in the short term. The results of the present study support those of Wickramasinghe *et al*.,[9] who found that the mean quiz score of subjects in their MM group was 31.3% and the mean quiz score of subjects in their self-selected study group was 37.6%. These authors reported that there was no significant difference in scores between groups.[9] However, the results of the present study are in contrast to those of Farrand *et al*.,[8] who reported that recall was only slightly higher in the MM group after the second quiz. After adjusting for baseline performance and motivation, this difference was significant. Without the adjustment, the difference was not significant, which is consistent with the findings of the present study. Farrand *et al*.[8] reported a robust difference in recall in favor of subjects in the MM group after 1 week. Finally, as previous research indicated that the use of generative study strategies, such as MM, is associated with higher performance effects on students' free text recall was studied. No significant differences were found, however, between the conditions and between students who did or did not draw a MM. This result might be due to the fact that the strategy was of no direct help for immediate global text recall.[11] Another explanation might be that students were tested immediately after learning and no delayed recall test was administered[12] Furthermore, due to the relatively short time span wherein students had to study the text, it is also possible that MM users did not gain advantage of their strategy to study the text by MM. This presumption is based on the finding that the majority of the MM on the scratch papers were unfinished. In addition to administering a delayed recall test and providing more study time, another recommendation for future research is the inclusion of a recall test consisting of different question types (e.g., text-based questions and inference questions)[13] to gain insight into the specific relationship between MM and text recall. It must also be noted that the present explorative study focused on one specific direct observable overt study strategy (i.e., using MMs).

Therefore, future studies should also take into account covert study strategies, such as mentally associating or combining ideas without writing them down[14] and their effect on learning from text with or without MMs further studies should be undertaken to evaluate its effectiveness in retaining information in the long term. Students' perception of the MM technique as an effective learning tool is a positive factor in deciding the use of MMs as a learning method. Future studies should be designed to allow subjects to create multiple MMs so that they can gain proficiency in the technique. This would enable them to move from novice to expert regarding the creation of MMs, and therefore, could ultimately allow them to emphasize critical thinking.

Limitations

The present study was conducted on a very small sample size. Very less exposure for MM practice was given to the students and less study material was given to the students.

Table 2: Perceptions of students regarding MMs

Feedback questions	Agree (%)	Strongly agree (%)	Disagree (%)	Strongly disagree (%)
Method was useful to gather large information together	80	16	4	0
Aroused curiosity and interest	92	8	0	0
Helped in improving understanding of subject	92	8	0	0
Useful in summarizing information	88	12	0	0
Improved recall	96	4	0	0
Will help in better performance in examinations	92	8	0	0
Encouraged self-active learning	96	4	0	0
Can be used for other subjects	92	8	0	0

MMs: Mind maps

Future Plans

The effectiveness of MMs can be studied on a larger sample to evaluate it is importance in long-term learning. Exposure to various integrated topics can be given to the students.

CONCLUSION

Although MM was not found to increase short-term recall of information or critical thinking compared to self-study; it can be suggested that the use of MMs as an aid in medical education is a potentially valid tool that can be used by students and teachers for multiple purposes. It is a technique that can be easily taught and learned and requires no equipment or high costs. Since the combined use of learning methods could compensate for the limitations of different individual methods, enabling a better learning experience for students, MMs can be an attractive resource that, added to the teaching and learning, can help medical students to learn and organize information faster. Future studies should be designed to allow subjects to create multiple MMs so that they can gain proficiency in the technique. This would enable them to move from novice to expert regarding the creation of MMs, and therefore, could ultimately allow them to emphasize critical thinking.

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