

Original research article

Evaluation of Jigsaw Learning Methodology as An Active Teaching Strategy for First Year Indian Medical Students

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Abstract

Modern teaching methodologies advocate a shift from passive teaching to an active cooperative learning approach as a supplementary teaching approach. Jigsaw methodology advocates a fellow learner group-based teaching style fostering team work based cooperative learning. In the present work, effectiveness of jigsaw teaching method on first year medical students is evaluated on nerve physiology class of first year medical students by a post-test in the form of multiple-choice questions to assess their knowledge and would be compared with the traditional passive method of teaching. The students' perception about the jigsaw teaching method is also evaluated in the form of a questionnaire, which would include quantitative Likert scale questions and qualitative open-ended comments. The jigsaw method of teaching is overall an effective method for increasing the student-student as well as student-teacher interaction.

Keywords: Jigsaw Learning, Indian medical students, teaching methodology

Introduction

Technological advances in the medical education have undergone a tremendous change in the past decade. Passive learning based traditional teaching approach including lectures are usually unilateral in orientation and allow minimal opportunities for students to work together ending up taking limited responsibility for their learning outcomes. The traditional chalk and board teaching to Overhead Projector based and PowerPoint based lecturing methodology are technological extensions of the passive approach. With the new internet age in the past decade, medical education researchers have started probing into student interaction-oriented approaches in medical education to improve student learning.

While traditional approaches have been well researched and understood over the past century, considering the millennial generation, active learning including interaction-based approaches has seen an explosive flurry of interest in medical faculty in the past decades. Active learning is based on the sociocultural theory of learning that people learn from each other in a social context. Lev Vygotsky (1978) found that with collaboration, direction, or support, learners were always able to do more and solve more difficult tasks than they could independently^[1]. Active learning contrasts a passive type of learning where students simply listen to information being presented to them. According to Vygotsky, learning has its basis in interacting with other people. Once this interaction has occurred, the information is then integrated on the level of individual cognition. The learner is not merely a passive recipient of adult guidance and assistance; the active involvement of the learner is crucial to development (Bruner, 1968)^[2]. Active learning^[3] can take on many forms that encourage students to apply new knowledge to current understanding or to authentic situations, to synthesize information, and create new ways of understanding and creating. The problem lies in lack of student-teacher interaction and student-student interaction in the traditional method of classroom teaching^[4]. Reduced interest of students in the subject due to the passive method of teaching. Lack of adequate teacher-student interaction as well as student-student interaction have led to reduced understanding of the concepts in physiology^[5]. The students' interest in the subject also have reduced due to the passive traditional way of teaching in the classrooms^[6,7]. Due to this, the students find it difficult to apply the concepts of physiology in the various clinical scenarios. Delay in the correct diagnosis has led to increase in the morbidity and mortality rates in the society due to various diseases.

This paper aims to increase the teacher-student interaction as well as student-student interaction by active involvement of the students in the classroom teaching. This will enhance their confidence level as well as their understanding of the concepts in physiology will also improve. The student will be able to diagnose a case early, give timely treatment and also about the preventive measures for the same. The long-term aim is to help reduce the morbidity and mortality due to nerve diseases in the society. In the present work, effectiveness of jigsaw teaching method on first year medical students would be evaluated on nerve physiology by a post-test in the form of multiple-choice question to assess their knowledge and would be compared with the traditional passive method of teaching. The students' perception about the jigsaw teaching method shall be evaluated in the form of a questionnaire, which would include quantitative Likert scale questions and qualitative open-ended comments.

Materials and Methods

About 50 first year MBBS students from a tertiary care hospital in Mumbai (India) were included in the study. The study was conducted after obtaining the institutional ethics committee approval. Participation of the students was entirely voluntary and a written consent was obtained from them. Out of about 50 first year MBBS students, about 25 participated in a jigsaw session in a physiology classroom & about 25 attended the didactic lecture on the same topic i.e., Resting Membrane potential (RMP) in another classroom. Further, crossover design was undertaken to assess another topic [Action Potential (AP)] of nerve physiology which is of similar weightage & importance. This discussion was followed by a post-test in the form of multiple-choice question and students were given a questionnaire to evaluate their perception of the Jigsaw method. Same post-test in the form of MCQs was given to the students who attended the traditional classroom lecture.

The Jigsaw Method: The students were first divided into 5 home groups which took around 10 minutes. Further from each home group, one student was selected who formed jigsaw groups of 5 students each to form a total of five jigsaw groups. Every jigsaw group was given

a subtopic to be discussed among themselves. The study material for every subtopic was distributed among the groups by the facilitator (faculty). After 10 minutes, all students returned to their home groups and each student discussed their respective subtopic among the other students for around 20 minutes. Entire jigsaw session was completed in about 40 min. This discussion was followed by a post-test in the form of multiple-choice questions and students were given a questionnaire to evaluate their perception of the Jigsaw method. Same post-test in the form of MCQs was given to the students who attended the traditional classroom lecture.

RESULTS

The present work probed the effectiveness of jigsaw teaching method on first year medical students. Evaluation of the same was carried out by a post-test on nerve physiology in the form of multiple-choice question to assess their knowledge and was compared with the traditional passive method of teaching. About 50 first year MBBS students enrolled for the study with the same age bracket of 17-18 years and with no prior experience of Jigsaw method.

A comparison of the MCQ scores of students attending lecture and jigsaw method of teaching shows that there is significant difference in mean score obtained by students who were taught the topic Resting membrane Potential (RMP) using Lecture and Jigsaw method at 5% level of significance while it shows that the mean score obtained by students who were taught the topic Action Potential (AP) using Jigsaw method is more than those taught using lecture method (though the difference is not significant).

TABLE 1: Descriptive statistics of scores of students

	RMP		AP	
	Lecture	Jigsaw	Lecture	Jigsaw
Mean	4.61	6.26	7.17	7.44
SD	1.50	1.52	1.64	1.50
N	28	19	23	25
SE	0.054	0.080	0.071	0.060
CV	32.54	24.30	22.89	20.19
p-value	0.00071374		0.562016161	

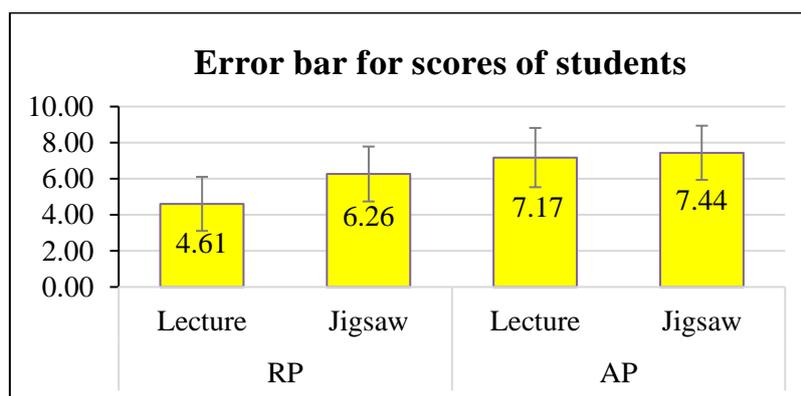


Figure 1: Error bar diagram

Table 2: Descriptive statistics of scores of students

	Total Lecture	Total Jigsaw
Mean	5.76	6.93
SD	2.02	1.61
N	51	44

SE	0.058	0.069
CV	34.97	23.16
p-value	2.28E-03	

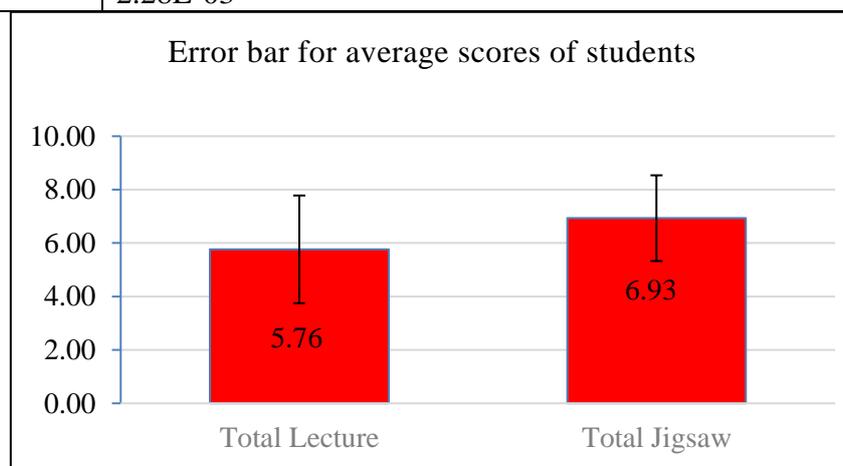


Figure 2: Error bar for average scores of students

Figure 2 shows that there is significant difference in mean score obtained by students who were taught topics (AP & RMP) using Lecture and Jigsaw method at 5% level of significance.

The students' perception about the jigsaw teaching method was evaluated in the form of a questionnaire, which included quantitative Likert scale questions, in which 93% students report that their interest in the subject increased, 93% report they have better student-student interaction, 84% have better interaction with their teachers, 80% students report they have acquired better communication skills, 90% have overall satisfaction while 91% felt explaining the content to other students helped them to understand the topic better and 86% felt that the Jigsaw method of teaching was better than the traditional T-L method.

Table 3: Perception of students regarding the Jigsaw teaching method

	%
The active T-L method was interesting.	93
It has increased my interaction with other students	93
It has improved my interaction with my teachers.	84
It has enhanced my communication skills	80
Jigsaw Technique has helped me to work independently.	60
The time allotted for the discussion was adequate	51
It gave me an opportunity to help others in the group understand difficult material.	33
Group size was optimal	86
Overall satisfaction	91
The faculty present during the active teaching was cooperative.	91
Explaining the content to other students helped me to understand the topic better.	91
Jigsaw technique was better than the traditional T-L method.	86
Active T-L method was overall an effective tool for me.	80

Discussion

In the study, students were first divided into 5 home groups which took around 10 minutes. Further from each home group, one student was selected who formed jigsaw groups of 5 students each to form a total of five jigsaw groups. Every jigsaw group was given a subtopic to be discussed among themselves. The study material for every subtopic was distributed among the groups by the facilitator (faculty). After 10 minutes, all students returned to their

home groups and each student discussed their respective subtopic among the other students for around 20 minutes. Entire jigsaw session was completed in about 40 min. This discussion was followed by a post-test in the form of multiple-choice questions and students were given a questionnaire to evaluate their perception of the Jigsaw method. Same post-test in the form of MCQs was given to the students who attended the traditional classroom lecture.

The students felt that the Jigsaw teaching method was interesting as well as increased their interaction with other students as well as with the teachers (facilitators). Students felt that this active teaching method helped in enhancing their communication skills and also gave them an opportunity to help other students understand the topic better. Similar findings were seen by Doymus *et al*^[6] in their study where they found that the students had better understanding of the topic with the jigsaw method. It gave them an opportunity to teach fellow students and by doing this helped them to understand the topic even better. They also felt that the faculty members present were co-operative and facilitated their learning by solving their doubts.

86% of the study group felt that the group size (of 5 students) was optimal. Around 91% students reported that they were overall satisfied by the Jigsaw teaching-learning method and around 86% students felt that jigsaw method was better than the traditional teaching-learning method.

The post test scores indicate that the overall scores are significantly higher in students who were taught by Jigsaw method as compared to those students who were taught the same topic by the traditional method. Similar studies done by Carpenter *et al*^[7] show that the scores obtained by the students by jigsaw method were significantly higher than those obtained by various other teaching-learning methods^[8].

The jigsaw learning technique^[9] may be an effective way of transforming the medical students^[10] from passive to active learners^[11]. Knowledge, communication skills and team work are some essential components for being a successful medical practitioner. Moreover, this increased team-based interaction and 91% felt that explaining to other students helped them understand and learn the topic better.

Overall, 80% subjects felt that they felt Jigsaw teaching learning method useful for them. Thus, the present study facilitated the students to comprehend better, improve their analytical abilities and hone their communication skills.

The broader validity of Jigsaw method needs more wider studies encompassing topics of varying complexities and topics including practical topics. Utilization of technology could play an important role in validating Jigsaw techniques faster. As a start, societal disruptions like COVID-19 pandemic, helps us understand how techniques like Jigsaw teaching method could be utilized to make the online lectures more active, efficient and interactive.

Conclusion

The Jigsaw method of teaching is found to be overall an effective method for increasing the student-student as well as student-teacher interaction. It is an effective tool for increasing the students' interest in the subject of physiology so that they find it easy to apply the concepts of physiology in the various clinical scenarios. In the long-term, early and correct diagnosis will lead to decrease in the morbidity and mortality rates in the society due to various diseases. Expanding the study to multiple topics and subjects in varying complexities could validate the robustness of the study. Such investigations could help understand new training methodologies for medical physiology students and help them train adequately and holistically considering demand of the time and changing needs of the society especially in worldwide societal teaching disruptions like COVID-19. Jigsaw can provide a beaming opportunity for further utilization for medical teaching.

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