



Rotatory Review also Known as Carousel Brainstorming: Does This Small Group Teaching Method Boost Knowledge in Medical Students?

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ABSTRACT

Background

Rotatory review (RR) or carousel brainstorming is a Team-Based learning (TBL) method. Study of this particular method of teaching in anatomy is scarce, more so in the eastern region of the country. This present study aimed to determine the impact of RR method of teaching on student learning outcome in anatomy education and compare the same with small group discussion (SGD). Further to obtain students' feedback on their preferred method of teaching.

Methods

An educational intervention study was done over period of three months from May 2025 to July 2025 at RG Kar Medical College. First year MBBS students, 98 in number were divided into two equal groups, studied in two phases, separately undergoing the RR and SGD and later crossover. Both pretest and posttest evaluations were done and results compared. Students feedback was also taken in writing. Study was done at our Medical College over period of three months.

Results

Researcher compared the improvement of marks post one methodology versus the other in each phase and failed to find any statistically significant difference (p values of difference between the two groups were 0.68 and 0.33 in the two phases of study). Students' opinion about each of the teaching methods was equivocal but all agreed that interaction within the group improved their learning ability.

Conclusions

In the present study, our educational intervention did not have a significant impact on RR compared with SGD. Solely on the basis of non-significant statistical findings one cannot imply equivalence of the two methods. Students had differing opinions about the advantages and disadvantages of the two methods of TBL.

Keywords: Rotatory review; Carousel brainstorming; Small group discussion; Student learning outcome.

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INTRODUCTION

Team based learning (TBL) techniques have recently gained popularity in medical education as mode of student-cantered learning.^{1, 2, 3} Rotatory review (RR) or carousel brainstorming is a method through movements where at each station, students recall their pre-existing knowledge on a topic.^{4, 5} In addition, they gain information from inputs given by a prior group. Such mutual effort strengthens coordination and cooperation, leads to better memory and comprehension of the topic.^{6, 7} Study of this particular method of teaching in anatomy is scarce, more so in the eastern region of the country. The objectives of our study are as follows: 1. To determine the impact of rotatory review method of teaching on student learning outcome in anatomy education and compare the same with small group discussion.² To obtain students' feedback on their preferred method of teaching.

METHODS

Study Area

The study was done at RG Kar Medical College among first year MBBS students enrolled in the academic year 2024-2025.

Study Design

This was a crossover educational intervention study.

Sample Size and Sampling

The sample size was calculated to be 100 by considering: $SD = \text{Standard deviation from previous study} = 1.5$; $Z_{\alpha/2} = 1.96$ at type 1 error of 5%; $Z_{\beta} = 0.842$ at 80% power; $d = \text{effect size} = \text{difference between mean values} = 0.6$. 5, 8 We have taken $d = 0.6$ to have a workable sample size similar to a previous study. 5 Cluster sampling technique was employed to choose any two batches of students from the five available at a time Batch division at our institute is based on roll number which in turn depends on the surname. We chose the two batches that had the first lot and the last lot of roll numbers. The batch selection inclusion criteria were that all first MBBS students who had attended lecture classes on two specified topics. All students from both the batches gave consent. Two students, one from each group,

remained absent during these special classes. Hence 98 students participated in the study.

Data Collection

Data collection done over period of three months from May 2025 to July 2025 by both MCQ and students' own words as explained below.

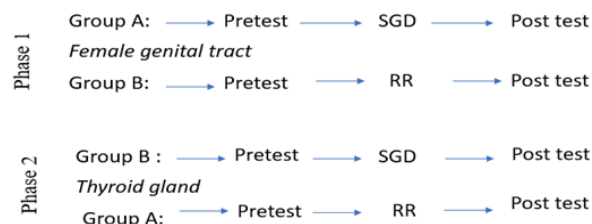


Figure 1: Schematic representation of the study design and intervention sequence.

Design: In first phase, all students (98 in number) who attended lecture classes on Female Genital tract (FGT) were divided into two groups A and B (49 students each), figure 1. Group A students first took a pre-test after which they were divided into five groups of ten students each for small group discussion (SGD). The five groups performed discussions on five separate subtopics of FGT. They were allowed to prepare small notes. Following this, each group were summoned before the class to speak (notes could be used for help) while the others listened. Each group chose a single speaker, but prompting from the others was allowed. When all groups are done with, the 49 group A students took the post test. Both pre and post tests were MCQ type, 15 questions each. Assessment was made by single assessor.

Group B similarly first took a pre-test after which they were divided into five groups of ten students each to perform rotatory review (RR). Each group were given five separate subtopics of FGT along with separate chart papers to write down the noteworthy points. After the allotted time, one group moved to the position of its adjacent group to observe what the previous group had written and made alterations if required. When all five groups had visited the five stations in the rotational/ carousel manner, the 49 group B students were subject to the post test.

In second phase, the topic of lecture was thyroid

gland. Group A performed rotatory review this time while group B undertook group discussion. We decided to reverse the groups in second phase to minimize selection and procedure bias. Pre and post test results of two groups were compared after each phase. After completion of these two phases, students were asked to submit their feedbacks in their own words about the following points: 1. Utility of SGD at their current level, 2. Compare between SGD and RR and 3. How they thought such TBL might be helpful in their studies a few years hence. The students had the knowledge that information supplied was voluntary and there was no penalty for not providing it.

Data Analysis

Data was analyzed using R- 4.4.1 software. Wilcoxon Rank-Sum Test was conducted to compare the gain scores between the two intervention groups. Paired t-test was performed to compare pretest and posttest marks for same group

RESULTS

In both the phases, the post-test marks were greater than the pretest marks in both the student groups (Table1). The increase in scores varies from 2.1 to 4.3 depending on group and phase. In phase 1 SGD, marks improved in post-test but marks variability

also increased. In RR group of the same phase improvement in post-test marks was more uniform as standard deviation (SD) is lesser. This however did not stay the same in phase 2. Increment in post-test marks was accompanied by greater variability. This trend got reversed in SGD group of the same phase where the improvement was noted to be consistent across all students. Further, as noted in table 2, only the difference in pretest marks between RR and SGD in phase 2 was statistically significant. Neither the differences between pretest or post marks of the two study groups in phase 1, nor the post-test marks in phase 2 had any statistical significance. In addition, we compared the improvement of marks post one methodology versus the other in each phase. Here too, we failed to find any statistically significant difference. Wilcoxon Rank-Sum Test was conducted to compare the gain scores between the RR and the SGD methods. The results showed no statistically significant difference in improvement between the both methods (p value 0.51 and 0.56 in phase 1 and phase 2 respectively).

Improvement of marks in RR group in phase 1 was also statistically insignificant when compared to the RR group in phase 2. Since this interphase comparison has no difference, we take this as internal control and believe the study to be valid.

Table1: Comparison of pre- post-test and marks in the two study groups (n=98).

Phase 1				Phase 2			
Group A does small group discussion		Group B does Rotatory review		Group A does Rotatory review		Group B does small group discussion	
Pretest mean	Post-test mean	Pretest mean	Post-test mean	Pretest mean	Post-test mean	Pretest mean	Post-test mean
11.8 ±3.1	14.1±3.7	12.6±2.3	14.7±2.3	11.8±3.0	16.1±4.3	12.9±2.6	15.1±2.4

Among all, 55 students responded. Responses were collected anonymously; however no thematic or qualitative analytical method was used to categorize student responses. All (100%) agreed that interaction within the group improved understanding, clarity and grip over the topic, and quick assessments were beneficial for their preparation. Thirty-five students (63%) thought that RR was enjoyable but juvenile way of learning, and many liked the egalitarian way too (26/ 47%). Twenty-nine (53%) students thought

SGD was the more mature teaching strategy and believed that speaking in front of the class could increase their confidence.

Table 2: Comparison of marks and their statistical significance (n=98).

Difference in marks between		p value, significant or not
Phase 1	Pretest of RR and SGD	0.22, not significant
	Posttest of RR and SGD	0.33, not significant

Phase 2	(posttest minus pretest in RR) vs (posttest minus pretest in SGD)	0.68, not significant
	Pretest of RR and SGD	0.03, significant
	Posttest of RR and SGD	0.64, not significant
	(posttest minus pretest in RR) vs (posttest minus pretest in SGD)	0.33, not significant
	(Posttest minus pretest in RR group in phase 1) vs (posttest minus pretest in RR group in phase 2)	0.31, not significant

Key: RR= Rotatory review; SGD= Small group discussion

DISCUSSION

Across ages, quest is on for the best pedagogical method to impart medical education in so dynamic a field. Among such methods, TBL is being widely used.^{2,3,7} TBL is used in the medical field to enforce interactive learning in small groups.⁹ In case of the subject anatomy in particular, it has been shown that TBL technique could be used alone or in conjunction with traditional didactic lecturing in order to teach the subject more effectively and obtain higher scores in the TBL-based examination in comparison to lecture-based exam.¹⁰ The RR or carousel brainstorming as method of teaching and learning has been applied in earlier studies to develop language skills at school level where it has shown to reduce speaking anxiety and improve speaking ability.¹¹⁻¹³ The strategy produced better reading comprehension of the students compared to small group discussion. The method has later found its application in the medical field and has specifically been used for nursing training, imparting anatomy lessons and obstetrics education.^{5,14,15} The nature of tools used during the study depended on the nature of the targeted skill(s) the instructor wished to teach. In our study we could not find any statistically significant difference in improvement of scores in RR compared to SGD in either phase. In addition,

the increase in scores was also inconsistent across all students, with the exception of SGD in phase 2. An issue noted in the study is the statistically significant baseline difference in pretest scores between the RR and SGD groups during Phase 2. We are concerned more about post-test marks and the difference in marks between posttest minus pretest in RR and posttest minus pretest in SGD, so we chose to ignore the difference in pretest scores.

In contrast, one study concerning anatomy education reported higher post-test mean scores, though the comparison was done with tutorials.⁵ In the study involving trainee nurses in China, where comparison of RR method was done against classroom lectures, higher theoretical and operational scores and enhanced self-directed learning ability were observed in the former method.¹⁴ In the study from Brazil, the authors studied the reliability of training internship medical students in obstetrics. Participating students were assigned to take the examination of digital assessment of the cervical dilation on the simulator which was found to be a reliable method for student learning.¹⁴ However, because of the very nature of the skill under study, no comparison with other TBL methods could be performed.

Limitations

There are certain limitations in our study. Each team had ten members instead of the ideal teams of 5-7 students per team; also, individual and not team readiness assessment was done.¹⁶ Further, due to lack of faculty strength, only one faculty member and a non-faculty assistant was available to guide all the five groups. Another lacuna is that one group could not experience both RR and SGD on the same topic. Perhaps anatomy as a content heavy subject and students' prior familiarity with active learning approaches may all have influenced the outcomes. Single-centre nature of the study, relatively small sample size, short-term assessment of learning outcomes, absence of long-term knowledge retention assessment, possible contamination between groups due to interaction among students

from the same batch, and lack of assessor blinding are the other limitations. Additionally, the educational interpretation of “no statistically significant difference” should be approached cautiously, as absence of statistical significance does not necessarily indicate equivalence between interventions.

Thus, we see, as a teaching method RR showed no evidence of superiority over SGD in assessment of learning outcome in our study. Though all students agreed with the benefits of TBL as a whole, they had differing opinions about the advantages and disadvantages of the two types of TBL. TBL in preclinic undoubtedly enhances the teaching learning experience and prepares the students for later clinical classes. Due to inadequate faculty strength in many medical colleges, and the other limitations outlined above, for anatomy education it may be prudent to select the topics where such TBL methods may be used.

Conclusions

As a teaching method RR showed no evidence of superiority over SGD in assessment of learning outcome in anatomy education. Students have differing opinions about the advantages and disadvantages of the two types of TBL.

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Ethics approval

Ethical approval was received from Institutional Ethics Committee (Ref. No.: EC/NEW/INST/2023/3404) dated 25.04.2025.

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Conflict of interest

The author declares no conflict of interest.

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Availability of data and materials

All data analyzed during this study will be made available upon reasonable request from the corresponding author.

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