

Cardiovascular drug fun cricket: Students' perception on an innovative active teaching–learning method in pharmacology

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ABSTRACT

Background: Modern teaching trends in medical education exhibit paradigm shift from conventional classroom teaching to nonconventional teaching aids. Continuous efforts are required to incorporate innovative teaching–learning methods in curriculum to make learning interesting and interactive for students. **Aims and Objective:** Determine students' perception toward an innovative, active teaching–learning method and its effect on learning. **Materials and Methods:** An intervention study conducted with second-year MBBS students ($n = 77$) after approval from institutional ethics committee. Test group ($n = 44$) was taught cardiovascular pharmacology by innovative way while control group ($n = 33$) was taught the same topic by conventional way. Knowledge of both groups was assessed by pre and post-test of objective type while perceptions of test group toward the innovative way were documented on Likert scale by semi-structured questionnaire. A pre-activity opinion was taken to know about perceptions toward conventional pharmacology teaching from all the students. Paired and independent t -tests were applied for statistical analysis of data. **Result:** There was no statistically significant difference in performance of pre- and posttest scores between the groups ($p > 0.05$). Students' perceptions in the pre-activity questionnaire feedback revealed that more than 60% of students found teaching of pharmacology monotonous and not fostering active learning. About 70% students felt the need for active teaching–learning modules that can generate interest in subject. Post-activity feedback revealed that majority of students (about 66%) had enjoyed the new learning process and found it to be more engaging, interesting, and interactive. **Conclusion:** Students need to be actively engaged while learning and faculty should explore novel teaching practices that help in maintaining students' interest.


KEY WORDS: Pharmacology; Cardiovascular Cricket; Active Teaching Learning; Antihypertensive Drug

INTRODUCTION

Modern teaching trends in medical education exhibit a paradigm shift from conventional classroom teaching methods

to nonconventional teaching aids so as to encourage interactive forms of learning in medical students.^[1,2] It is a well-known fact that students learn and retain better when they are actively involved in the process of learning.^[3,4] Active learning also has other benefits such as fostering development of critical thinking, communication, cooperative learning skills, and promoting concept formation.^[5]

Various formats of interactive educational games^[6–13] have been advocated by researchers as active learning strategies to transform inactive learning experiences to active learning episodes without stress. In developing and playing educational games, teachers add a variety of alternatives to the traditional lecture format. There are evidences citing that the educational

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games increase student involvement, motivation, and interest in the material, and allow the instructor to be creative when presenting the topics.^[14-16]

An innovative educational game by name of “Cardiovascular Fun Cricket” (CFC) was devised, introduced, and conducted during revision classes in the subject of pharmacology on the topic of “Antihypertensive drugs.” The rationale behind this educational activity was to enhance learning, increase participation, and reinforce therapeutic knowledge. The overall objective of this educational activity was to develop an active teaching-learning method that made learning more interactive, interesting, enjoyable, and helped students to reinforce their concepts of antihypertensive drugs through their most loved and favorite game, that is, cricket.

MATERIALS AND METHODS

This study was an open-label, randomized control, parallel group intervention study.

After the ethical clearance, students in their second-year MBBS were invited to take part in the given study. Topic for CFC was assigned 1 week before activity, that is, “Pharmacotherapy of hypertension and associated comorbidities.” During the session, the students were explained about the concept of innovative educational activity. At the same time, they were also introduced and briefed about terms such as active teaching-learning methods, student centric activities, and so on. Of 105 students, 77 students volunteered to participate in the study. Before dividing students into two groups, the test group and the control group, a pretest was given to all ($n = 77$) students to test their knowledge in the given topic. The test comprised 10 questions each in the form of short answer type, true/false, and multiple choice questions. Framing of questions was done in such a way so that all important points on antihypertensive drugs could be covered. Thereafter, students were divided into

two groups by lottery method of sampling into test group that consisted of 44 students, so as to mimic a cricket team, which has 22 players while the control group consisted of 33. Test group ($n = 44$), was further divided into two teams (with 22 players each, that is, two groups of 11 bowlers and batsmen each). At the start of activity, players in test group were reoriented again about the dynamics of playing CFC.

Net Practice

The players were given 45 min to brush up their knowledge, cricket-playing skills, and compile information in the areas listed by the teacher as shown in Table 1. In addition, a collage was also prepared by students of different test subgroups—batsmen, bowlers, and fielders to revise information before the actual play.

The Match

After the students in test group were through with compilation of information, two matches of 1 hr each duration was organized, wherein first 22 players played CFC and remaining 22 were spectators, the later were not allowed to prompt. Bowlers bowled in form of questions from aforementioned topics completing the arm action of bowling with a short run up, while batsmen were supposed to answer the same with a swing of the bat, for example, if the service ball represents hypertension with moderate congestive cardiac failure, the batsman has to be quick enough to bat with high ceiling diuretic drugs. Alternately in next chance, if a student from “Batsman” subgroup chooses to bat with an angiotensin-converting enzyme inhibitor (ACE i) then the opposite team should be quick enough to bowl a comorbid condition such as hypertension with diabetes or hypertension with congestive cardiac failure. In each case, the prerequisite was that students of each group should be able to justify information of the listed antihypertensive drug and its use in given comorbid condition.

Table 1: Task allotted in test group ($n = 44$), compilation of information in following areas

| Batsmen group: Antihypertensive groups collect information on individual names of antihypertensive drugs, brief mechanism of action, indications, and their doses | Bowler and fielders group: HT with comorbid conditions collect information on comorbid conditions with HT and appropriate justification of use |
|--|---|
| Diuretics | HT + congestive cardiac failure |
| CCB | HT + asthma |
| ACE inhibitor | HT + diabetes mellitus |
| β-Blockers | HT + migraine |
| α-Blockers | HT + benign prostatic hypertrophy |
| α- + β-Blockers | HT + depression |
| Arterial dilators | HT + pregnancy |
| Venous dilators | HT + gout |
| Direct renin inhibitors | HT + osteoporosis |
| Central sympatholytics | HT + angina |
| Adrenergic neuron blockers | HT + isolated systolic hypertension |

HT, hypertension; CCB, calcium channel blocker; ACE, angiotensin-converting enzyme.

The same was repeated for the other 22 test group students who were spectators earlier.

The umpire (the teacher) was entitled to adjudicate on the appropriateness of an answer and assign runs 1, 2, 3, 4, 5, and 6 and scores. In case of any dispute, decision of the third umpire (any student from spectator group) was binding. The team that scored maximum right answers was declared the winner.

Materials needed for collage preparation were foolscap white (or any other) colored chart paper, assignment sheets for the purpose of compiling information, pins, colored sketch pens whereas the cricket kit comprised cricket bat, a normal tennis ball (so that students do not get hurt), wickets (stumps), pads, and gloves so as to mimic cricket game.

On the other hand, control group ($n = 33$) was made to sit in another lecture hall and revision on antihypertensive drugs was conducted in a conventional way by tutorial wherein the teacher emphasized on the important points from the topic by asking questions to students. The entire activity was conducted in a big lecture hall. Time taken for the activity was 2 h, that is, first 15 min were required for giving instructions and groups allocation, whereas next 45 min for collecting information. In the remaining 1 h students played the game. A total of two teachers were required, one each to facilitate the test and control groups, respectively.

Pre and Post-test

Quantitative assessment as described before was conducted in both the groups to assess their knowledge with the help of a pre- and post-objective test format. The tests comprised 30 questions, 10 each in the form of multiple choice questions, short answer questions, and true/false types. As described earlier, questions were framed to cover all important points on antihypertensive drugs. The same set of questions was used for the pre- and posttest. The key to the questions was scrupulously verified from the standard textbooks of pharmacology.

Students' Feedback Questionnaire

Perceptions of the student (test group), toward the new activity and conventional teaching of pharmacology was collected in the form of anonymous questionnaire. The questionnaire consisted of 10 items that focused on perceptions toward current teaching of pharmacology and revision, whereas 15 items focused their experience of the innovative learning game, that is, CFC. The questions had a combination of both close- and open-ended questions. The responses to all the items were recorded on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree).

RESULT

Quantitatively, it was seen that there was a significant improvement in marks within the groups (paired *t* test) but there was no statistically significant difference in between the scores of both the groups (unpaired *t* test). Although from the feedback analysis of the responses to the semi-structured questionnaire we found that the majority of the students, who attended the intervention, responded positively regarding this innovative educational module (Tables 2– 4).

Overall, 35 students (81.4%) perceived this to be useful and relevant whereas three students reported it to be not of much of use and four other said it to be a waste of time.

When students were asked on the scale of 10, how much rating would they like to give for the whole process, 28 students (64%) rated equal to or more than 7.

Out of all the intervention group students (44), about 16% felt their experience of learning was excellent through this process, 35% had a very good experience, and another 40% reported their experience to be good.

When asked whether they were aware of any other medical college that is conducting such activity, all the students reported of their unawareness about any other college implementing any such activity.

DISCUSSION

Pharmacology is a fact-filled subject in second-year professional MBBS course in the Indian medical curriculum. Students perceive pharmacology as a dry and a “volatile subject.”^[17] Unless the subject becomes “interesting,” the students’ perception will not change, this in turn affects the quality of their understanding and performance.

In this study, the knowledge gained by the students through the conventional method and the innovative method was comparable (Table 2) but the students who experienced the newer method of learning enjoyed the process a lot and that improves the overall experience of learning, which can have a lasting effect on their understanding and recall of the subject.

Therefore, it is imperative on the part of the educationalists to incorporate some innovative teaching-learning modules over and above the conventional approaches, which will specifically target to reinforce their knowledge and understanding. There are studies wherein educators have used games for multiple purposes such as innovations in teaching, helping in reinforcement of a previously covered material, for understanding of

Table 2: Group-wise score comparison pre- and post-activity

| Assessment of performance in both groups | Pre-activity mean (SD) | Post-activity mean (SD) | Difference | <i>p</i> -value |
|--|------------------------|-------------------------|-------------|-----------------|
| Control (33) | 12.25 (3.12) | 20.00 (2.51) | 7.75 (3.68) | > 0.05 |
| Intervention (44) | 12.32 (3.26) | 18.57 (3.71) | 6.25 (3.13) | |

SD, standard deviation.

Table 3: Pre-activity questions and responses of test group

| Item no. | Strongly agree or Agree <i>n</i> (%) | Uncertain <i>n</i> (%) | Strongly disagree or Disagree <i>n</i> (%) |
|--|---|---------------------------|---|
| 1. I enjoy reading pharmacology in second year. | 29 (67.44) | 11 (26.19) | 3 (7.14) |
| 2. I feel that pharmacology teaching is monotonous. | 27 (64.28) | 10 (23.81) | 5 (11.91) |
| 3. The present style of teaching pharmacology does not foster active engagement of students. | 25 (59.52) | 11 (26.19) | 6 (14.29) |
| 4. Active teaching modules are required in pharmacology. | 29 (67.44) | 10 (23.26) | 4 (9.30) |
| 5. It will be exciting for me to learn pharmacology by an active teaching-learning (student-centric) activity. | 28 (66.66) | 11 (26.19) | 4 (9.52) |
| 6. I feel that learning pharmacology can become easier by amalgamating theory with active teaching student-centric activities. | 24 (57.14) | 15 (35.71) | 4 (9.52) |
| 7. I feel that novel educational modules help in generating interest in the subject. | 30 (71.42) | 10 (23.80) | 4 (9.52) |
| 8. I feel that novel educational modules will help in better understanding of pharmacology. | 21 (50.00) | 19 (45.23) | 3 (7.14) |
| 9. I am aware of different types of active teaching-learning modules. | 19 (45.23) | 15 (35.71) | 8 (19.04) |
| 10. Given an option would you like to change the way pharmacology is taught in second-year MBBS. | 24 (57.14) | 13 (30.92) | 5 (11.90) |

concepts, and at the same time motivating the participants.^[18-24] In this study, the game format sparked interest among the students as was evident by improved qualitative scores (Tables 3 and 4). This is in similar lines to a study conducted by Patel^[25] in pharmacology, wherein educational games have been used in small groups. In their study, 78% students reported that the game format of learning is a positive and an effective way of actively engaging students in higher learning. They perceived games as an interesting way to review

case material and also felt that inclusion of games while learning provided a fresh and an enjoyable learning experience.

Similarly another study conducted by Adam *et al.*^[26] on students' perceptions of incorporation of games in pharmacokinetics highlights that overall, students found the games enjoyable and gave an opportunity to increase their personal involvement as well as positive attitude. In one of the study conducted by Barclay *et al.* more than 90% of students strongly agreed that playing educational games was a valuable contribution to their learning^[7] and it was an

Table 4: Post-activity feedback questions and responses

| Item no. | Strongly agree or Agree <i>n</i> (%) | Uncertain <i>n</i> (%) | Strongly disagree or Disagree <i>n</i> (%) |
|--|---|---------------------------|---|
| 1. I learnt and experienced something extra useful, which I could not have experienced by traditional way. | 29 (67.44) | 8 (19.04) | 5 (11.90) |
| 2. I enjoyed reading pharmacology in this way. | 25 (58.13) | 13 (30.00) | 4 (11.60) |
| 3. The present style of teaching pharmacology fosters active engagement of students. | 27 (64.28) | 9 (21.42) | 6 (14.28) |
| 4. Active learning modules are required in pharmacology. | 31 (73.80) | 9 (21.42) | 2 (4.76) |
| 5. It was exciting for me to learn pharmacology by this way. | 28 (66.66) | 8 (19.04) | 6 (14.28) |
| 6. I feel that learning pharmacology becomes easier by amalgamating pharmacology theory with active teaching-learning modules. | 26 (61.90) | 8 (19.04) | 8 (19.04) |
| 7. I feel that such educational modules help in better understanding of subject. | 27 (64.28) | 12 (28.57) | 3 (7.14) |
| 8. I feel that such educational modules help in better understanding of subject. | 27 (64.28) | 11 (26.19) | 4 (9.52) |
| 9. Given an option I would like to amalgamate this activity in other topics of pharmacology. | 23 (54.76) | 12 (28.57) | 7 (16.6) |
| 10. I found this activity wastage of time. | 13 (30.95) | 11 (26.19) | 18 (42.85) |
| 11. I think more of such sessions can be planned and later conducted in pharmacology. | 23 (54.76) | 14 (33.33) | 5 (11.90) |
| 12. I feel only seminars/tutorials/CBLs/quiz are enough in revision classes. | 18 (42.85) | 11 (26.19) | 13 (30.95) |
| 13. I think adequate time was given for this activity. | 31 (73.80) | 6 (14.28) | 5 (11.90) |
| 14. I found this activity difficult to perform. | 12 (28.57) | 5 (11.90) | 25 (59.52) |

innovative method to understanding the study material. A few educationists such as LeCroy^[27] as well as Resko and Chorba^[28] document that playing educational games was taken as a challenge by students and it fosters an environment that is less stressful, more interactive, and helps the learners to engage more freely with their peers. Comparative studies with standard lecture format have also found games and interactive teaching to be superior in enhancing the learning process.^[29,30] In addition, it promotes and enhances decision making, communication, and knowledge acquisition.

In our study, game did not improve the quantitative test scores. This could possibly be explained by the fact that students need to concentrate more on retention process and application of games while learning. Many factors must be considered before initiating games in the classroom such as the goals and objectives of the game should be defined before its development and students should be informed ahead of time. This will motivate them to prepare for the class in advance as they will be exposed to a competitive learning environment and also help in overcoming these limitations. Also the batch size and the setting, for example, content amount, timing, and targeted audience needs to be kept in mind.^[27] Time and cost to be invested in developing or purchasing the products could be a constraint in some cases. Thus, it is important to select an appropriate game for each topic and also to bear in mind that fun games may not be an effective teaching strategy for some learners who struggle to process the information or who do not enjoy playing games. Furthermore, evaluation and feedback from the participants is valuable in assessing the success of the games and making necessary revisions.^[28] Improved posttest scores in the qualitative assessment and students' acceptability toward the innovation suggests that cardiovascular cricket is a useful educational method. Overall, students found the CFC enjoyable and interesting as it breaks the academic monotony by offering a creative and an interactive alternative to traditional lecture or a revision method.

CONCLUSION

Thus, to conclude, gaming as a form of interactive learning is one particular tool, which has gained increasing attention in education. Use of games offers a variety of in-class experiences and makes the learning experience more dynamic and informative. As in this study, the games aroused students' interest and participation. Based on the feedback from the questionnaire, games can be incorporated in the class and utilized by other instructors for their small group classes within the same course. Important topics considered tough and difficult to remember by the students can be conducted and rendered interesting by using such interactive teaching-learning methods in a more organized and structured way.

In light of the results and observations of the given study, it seems pertinent to carry out continued research in the areas of creative educational strategies with a focus on how active learning methods can gain acceptance and be used most effectively within the medical education. However, determining how these games improve learning and retention will require further assessment. Finally, it is upon the faculty to explore and

implement the myriad possibilities of novel teaching practices to keep the interest alive among the students.

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