

## RESEARCH ARTICLE

# Comparison of computer-assisted learning and lecture-based learning in teaching pharmacology for undergraduate medical students

Sunil Nettath

Department of Pharmacology, Government Medical College, Palakkad, Kerala, India

Correspondence to: Sunil Nettath N, E-mail: docsunil2005@gmail.com

Received: October 28, 2018; Accepted: November 24, 2018

### ABSTRACT

**Background:** Due to the complexity of pharmacology as a discipline, it is important to develop innovative methods to improve student performance. Computer-assisted learning (CAL) may play an important role in any instructional situation, whether practical or theoretical. CAL deals with a range of computer-based packages, which are focused on to provide interactive instruction usually in a specific subject area. CAL projects are designed in such a way that it helps to provide students with an alternative to traditional lectures. **Aims and Objectives:** The objectives of the study were (i) to assess the change in knowledge level with CAL and lecture-based learning (LBL) and (ii) to assess students' perception about CAL and LBL. **Materials and Methods:** A quasi-experimental study was carried out among undergraduate medical students in pharmacology. The study was carried out using Ex-Pharm T 1.0 Software, Animation Software, and Questionnaire cum Feedback form. **Results:** The mean score for test followed by lecture was  $5.93 \pm 0.82$  while for the mean score for test followed by CAL was  $8.89 \pm 0.98$ . The test mean score was significantly higher ( $P < 0.05$ ) for test followed by CAL as compared with lecture. The students' perception total score as well as mean score was higher for CAL as compared with the lecture, but the difference in score was not statistically significant ( $P = 0.094$ ). **Conclusion:** There is a significant improvement in the knowledge level of students with CAL. The students' perception score for all the item analysed is greater for CAL than LBL.


**KEYWORDS:** Computer-assisted Learning; Lecture-based Learning; Medical Education; Teaching-learning Methodology

### INTRODUCTION

Due to the complexity of pharmacology as a discipline, it is important to develop innovative methods to improve student performance.<sup>[1]</sup> Computer-assisted learning (CAL) may play an important role in any instructional situation, whether practical or theoretical. It has the qualitative and quantitative potential to raise teaching standards to new levels of sophistication,

and it invariably proves cost effective especially when time is limited, and equipment is in short supply.<sup>[2]</sup> CAL deals with a range of computer-based packages, which are focused on to provide interactive instruction usually in a specific subject area. CAL projects are designed in such a way that it helps to provide students with an alternative to traditional lectures.<sup>[3]</sup> These can range from sophisticated and expensive commercial packages to applications developed by projects in other educational institutions or national initiatives to simple solutions developed by individuals with no funding or support to tackle a very local problem. They offer a range of benefits like it is convenient and flexible.<sup>[4]</sup>

Thus, this study is planned to compare the effectiveness of CAL and lecture in understanding pharmacology with following objectives: (i) To assess the change in knowledge

Access this article online	
Website: <a href="http://www.njppp.com">www.njppp.com</a>	Quick Response code
DOI: 10.5455/njppp.2019.9.1133824112018	

National Journal of Physiology, Pharmacy and Pharmacology Online 2019. © 2019 Sunil Nettath. This is an Open Access article distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), allowing third parties to copy and redistribute the material in any medium or format and to remix, transform, and build upon the material for any purpose, even commercially, provided the original work is properly cited and states its license.

level with CAL and lecture-based learning (LBL) and (ii) to assess students' perception about CAL and LBL.

**MATERIALS AND METHODS**

A quasi-experimental study was carried out at Government Medical College, Palakkad, Kerala, a tertiary care teaching hospital. The study was approved by Institutional Review Board. Informed written consent was obtained from each participant before enrolling them into the study. 80 2<sup>nd</sup> year MBBS students were enrolled in the study. The students who have declined to give consent were excluded from the study.

The students were exposed to both types of teaching methodology - LBL and CAL. In the first phase, the students were taught two topics using lecture and preceded by the test. In the second phase, the students were taught two different topics using CAL and preceded by the test. For CAL, one topic was taught using Ex-Pharm T 1.0 Software. The software is aimed at helping the undergraduate students understand, remember and recall drug actions. Ex-Pharm, a demonstration software, developed by Jawaharlal Institute of Postgraduate Medical Education and Research, Pondicherry, India. The package contains programs such as effects drugs on the rabbit eye, effects of drugs on the frog heart, bioassay of histamine on the guinea-pig ileum, effects of drugs on the frog esophagus, and effects of drugs on dog blood pressure and heart rate. These programs can simulate drug actions. The user can conduct experiments and collect data.<sup>[5]</sup> The second topic for CAL was taught using an animal software from Goodman and Gilman. Students' perception regarding both teaching methodology was evaluated using questionnaire cum feedback form.

The data were recorded and entered in Microsoft Excel. The data were represented in number, percentage, and ratio. Unpaired *t*-test was used to analyze the difference in 2 methods. Mann-Whitney U-test for ordinal data (Likert scores of students' satisfaction) was performed using SPSS 21.0 Software. Differences are considered to be statistically significant if *P* < 0.05.

**RESULTS**

The mean score for test followed by lecture was 5.93 ± 0.82 while for the mean score for test followed by CAL was 8.89 ± 0.98. The test mean score was significantly higher (*P* < 0.05) for test followed by CAL as compared with the lecture. The students' perception total score as well as mean score was higher for CAL as compared with lecture but the difference in score was not statistically significant (*P* = 0.094) [Tables 1-3].

**DISCUSSION**

CAL techniques are humane educational aids and teaching approaches that can replace harmful animal use or

**Table 1: Comparison of mean score of both methods**

Methods	n	Mean±SD	P-value
Lecture	80	5.93±0.82	<0.001*
CAL	80	6.89±0.98	

\**P*<0.05: Statistically significant difference. SD: Standard deviation, CAL: Computer-assisted learning

**Table 2: Students' perception total score for both methods**

Opinion	Lecture (total score)	CAL (total score)
Useful to understand the topic	75	84
Motivated to learn further	86	96
Makes more responsible for studying	83	95
Helps to integrate knowledge in pharmacology	91	99
Useful in scoring more marks in exams	96	107

CAL: Computer-assisted learning

**Table 3: Students' mean perception score for all the item analyzed**

Methods	n	Mean score±SD	P-value
Lecture	80	1.077±0.099	0.094
CAL	80	1.20±0.104	

SD: Standard deviation, CAL: Computer-assisted learning

complement existing humane education. The emergence and application of computer technologies have revolutionized science and society as a whole. High-speed processors and powerful Software have transformed the way that data are gathered and processed, how biological processes are modeled and explained, and how knowledge is transferred. The opportunities associated with the development of computer-based technology in contributing to effective life science education have grown exponentially within the last decade. The internet, and multimedia software available on compact disc read-only memory and digital versatile disc, is playing powerful roles in many universities, with applications in labs and lectures, tutorials, and project work.<sup>[6]</sup> In the present study, comparison of lecture-based learning with CAL is done where a software and an animation is used to complement the lecture.

The test mean score was significantly higher (*P* < 0.05) for test followed by CAL as compared with lecture. The students' perception total score as well as mean score was higher for CAL as compared with the lecture, but the difference in score was not statistically significant (*P* = 0.094). In Chuthapisith *et al.*, students who watched the CAL package had superior retention performance percentage scores (*P* = 0.02, 95% confidence interval [CI] = 0.83–12.19, and effect size = 0.8) and level of enjoyment (*P* = 0.04, 95% CI = 0.03–2.75, and effect size = 0.7) compared with students who read the information leaflet. In this study also, students who watched

CAL package, had superior retention evident from the test score percentage 6.88 average for CAL, as against 5.92 average for LBL, which is statically significant by unpaired *t*-test with  $P < 0.0001$ .<sup>[7]</sup>

CAL software can be used as an acceptable method of teaching practical pharmacology demonstrations to students.<sup>[8]</sup> Many studies have highlighted the usefulness of CAL.<sup>[9-11]</sup> In this study, the perception of students toward CAL is better than LBL in all the item analyzed by Likert scale, although not statistically significant.

### Strength and Limitations of the Study

The strength of the study is a repetition of the topic was not done in both methods. The major limitations for the present study were smaller sample size and single session study. The study with a larger sample size involving multiple sessions is needed to check for the reproducibility of the results.

### CONCLUSION

There is a significant improvement in the knowledge level of students with CAL. The students' perception score for all the item analyzed is greater for CAL than LBL.

### REFERENCES

1. Hughes I. Teaching pharmacology in 2010-new knowledge, new tools, new attitudes. *Folia Pharmacol Jpn* 2003;122:411-8.
2. Hounshell PB, Hill SR. The microcomputer and achievement and attitudes in high school biology. *J Res Sci Teach* 1989;26:543-9.
3. Ghaisas MM, Limaye RP, Mandre VV, Rane PM, Deshpande AD. The perception of final year B pharmacy students towards animal experimentation and ex-pharm

(a demonstration software) in experimental pharmacology. *Indian J Pharmacol* 2006;40:273.

4. Patil CR. Multimedia software for demonstrating animal experiments in pharmacology. *Altern Anim Test Exp* 2007;14 Suppl:329-32.
5. Raveendran R. Alternative for Animal Experiments in Pharmacology Teaching. *The International Conference on Alternatives to the Use of Animals in Research and Education*; 2004.
6. Jukes N, Chiulia M. Alternative methods and curricular transformation. In: Langley G, editor. *Guinea Pig to Computer Mouse*. Sweden: International Network for Humane Education (InterNICHE); 2006. p. 9a-23a.
7. Chuthapisith J, diMambro B, Doody G. Effectiveness of a computer assisted learning (CAL) package to raise awareness of autism. *BMC Med Educ* 2009;9:12.
8. Kuruville A, Ramalingam S, Bose AC, Shastri GV, Bhuvanewari K, Amudha G. Use of computer assisted learning as an adjuvant to practical pharmacology teaching: Advantages and limitations. *Indian J Pharmacol* 2001;33:272-5.
9. Ardin L, Patrick TB. Content review of medical educational software assessments. *Med Teach* 1998;20:207-11.
10. Sethuraman KR. Computer assisted learning. In: Srinivasa DK, Ananthakrishnan N, Sethuraman KR, Kumar S, editors. *Medical Education-Principles and Practice*. Pondicherry: National Teacher Training Centre, JIPMER; 1995. p. 77-81.
11. Horn DL, Radhakrishnan J, Saini S, Pepper GM, Peterson SJ. Evaluation of a computer program for teaching laboratory diagnosis of acid-base disorders. *Comput Biomed Res* 1992;25:562-8.

**How to cite this article:** Nettath S. Comparison of computer-assisted learning and lecture-based learning in teaching pharmacology for undergraduate medical students. *Natl J Physiol Pharm Pharmacol* 2019;9(1):83-85.

**Source of Support:** Nil, **Conflict of Interest:** None declared.