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ORIGINAL ARTICLE

IMPACT OF USING COMPUTER ASSISTED LEARNING IN II MBBS PHARMACOLOGY TEACHING - PERCEPTIONS OF STUDENTS IN A MEDICAL COLLEGE

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ABSTRACT: BACKGROUND: Animal experiments are essential as per II year MBBS practical syllabus for learning basic concepts in Pharmacology. Due to the strict regulations and ethical issues in procurement of animals related to their use, a need was felt to design and develop computer based simulation software as an alternative to animal use. It is a group learning technique used offline or online involving interaction of the student with programmed instructional materials or through it with teacher. These integrated multimedia software's act as animal simulators provide an environment that closely mimics reality. **OBJECTIVES:** The aim of this study is to assess the students opinions on the interactive computer assisted learning (CAL) in Pharmacology practical experiments. **MATERIALS AND METHODS:** This is an observational questionnaire based study. Seventy seven (77) II-year MBBS students at BGSGIMS attended the practical's and filled a survey questionnaire on the outcomes, advantages and disadvantages of the CAL session using a 5-point Likert scale. **RESULTS:** More than 90% of II MBBS students find that CAL helped them to achieve the learning objectives, enriches and personalizes the learning experience at their own pace within the time slot. CAL helped students recollect and apply theoretical knowledge of drugs in practical session. **CONCLUSION:** Learning basic concepts in Pharmacology using CAL, animal simulation software as an education tool has been perceived positively by II MBBS students. CAL program coupled with application of theoretical knowledge of drugs to the practical classes helped them to fulfil the learning outcomes.

KEYWORDS: Computer Assisted Learning (CAL), Perception, Interactive learning, II MBBS.

INTRODUCTION: Demonstration of effects of drugs on tissues or whole animal is an integral and essential part of undergraduate pharmacology practical classes. Though widely used traditional animal experiments are invaluable and time tested, they have their own limitations. It has become increasingly difficult to perform animal experiments, because of issues related to the strict regulations and ethical issues and procurement of animals related to their use.[1,2]

Interactive multimedia software's have been designed in developed countries to demonstrate experiments in pharmacology using virtual animals claiming benefits of the same. Computer Assisted Learning (CAL) with Computer Simulated Animal models (CSM) is an individual or a group learning technique used offline or online involving interaction of the student with programmed instructional materials or through it with teacher.[3] it is a method of reinforcing concepts and topics first introduced to students through the textbook and discussion in the classroom.

Guidelines by Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA), University Grants Commission (UGC) and the Medical Council of India (MCI), suggest 3 Rs i.e., replacement, refinement and reduction in animal experiments, with the fourth R

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added, that is their rehabilitation, as an added measure for their care.[4,5,6] In this changing scenario, development of alternatives are the need of the day As per the recent guidelines computer simulated experiments are encouraged by CPCSEA, UGC and MCI. Hence CAL has been introduced in our institution and the study has been undertaken.

METHOD:

Setting and Sampling: The study was conducted with a single cohort (n=77) of second-year medical students at BGS Global Institute of Medical Sciences, Department of Pharmacology, Bangalore, in the academic year 2014–2015. The study assessed students' attitudes to using CBL. Written informed consent was obtained from all the students.

The CAL programme: The CSMs that was used in BGS GIMS: X-cology CD-available from Elsevier publication house developed by JIPMER Pondicherry in association with Indian Pharmacological Society. (Paid version). Three experiments was selected for students: Effect of various drugs on Rabbit eye

1. Effect of Adrenergic drug on Rabbit eye.
2. Effect of Cholinergic drug on Rabbit eye.
3. Effect of Anti-cholinergic drug on Rabbit eye.

Study Design: A time schedule was generated for CSMs for students so that it is done within the time allotted to experimental pharmacology. The students were then briefed regarding the purpose of the study and were invited to participate and provide their response, after obtaining an informed consent. A self-administered questionnaire that was prepared after thorough literature review and validated from the BGS GIMS Pharmacology faculty were issued to the students.

Instrumentation: Questionnaires: The questionnaire included sections to determine students‟ viewpoint of their perception in using CAL and disadvantages of replacing animal experiments with CAL in undergraduate practical classes.

The students were asked to respond to items using a 5-point Likert scale from 1 to 5, ranging from 1-strongly disagree to 5-strongly agree. The completed questionnaires were then collected, compiled and analyzed. The participants had the option to remain anonymous and were informed that the survey was not related to their continuous assessment or end block assessment. Finally a series of classes were taken to complete the training of students, who either did not participate or were absent.

Statistical Analysis: Descriptive analysis was used for individual questions and the results were expressed in terms of frequencies and percentages. The responses were then divided into Accept category (Strongly agree & agree) and Reject category (Strongly disagree & disagree) and not sure was considered as separate. Chi-square test and Fischer exact test (Cell frequency <5) were then computed for statistical significance. The Confidence interval an interval estimate of scale was obtained for the whole population. The CI derived from the sample results was used for generalizing the result to the whole student population. All the statistical analysis was carried out with Statistical Package for Social Sciences, version 16.0 considering $p < 0.05$ as statistically significant.

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RESULTS:

Perception of students on CAL: The results from the feedback questionnaire are shown below in Table 1, Figure 1.The outcomes of CAL in Pharmacology experiments reveal that 88.3% achieved learning objectives. 94.8% of students felt that the overall simulations were good and written instructions were helpful. 79.2% claimed that they were able to clearly visualize the drug response with no experimental errors and 61.6% felt that this helped them better understand the mechanism of action of specified drugs used in the experiments. 84.4% enjoyed the experiment and 78.9% felt the process was under their control.

Nearly 95% felt that they had achieved the learning objectives of experiments as they were appropriate and prefer simulation experiments with CAL to live animal experiments.

The limits of Confidence intervals show for the above six variables infer that the whole student population scales fall between 1.62 to 2.605 with 95% confidence level. As far as the p-values are concerned, all the test results show that the discrepancies are significant. The responses are towards strongly agree and Agree level only.

The shortcomings of CAL as felt by the students are shown in figure 2. More than 80% students felt the lack of hands on experience, live interaction with animals and the biological variations seen in living animals and more than 90% conveyed that the doses of drugs were prefixed in the experiments.

DISCUSSION: Animal use for education and training in university teaching is small compared to that for research but it is still significant, and often unnecessary for many students. Computer-based learning programs, which simulate such experiments, offer a virtual laboratory experience which may meet the great majority of the learning objectives for most students. In this study the positive attitude to CAL seemed to be due to students feeling that the CAL facilitates the student to learn at their own pace, enables them to repeat the steps of studying the drug action and responses to a particular drug. This is an advantage especially to the slow learners. CAL in this study reinforced the lectures, enriched the learning experience, personalized learning at their own pace within the time slot.

The scale reflected that opinion was generally favorable and that most students felt they had extended the range and depth of their knowledge base. Many of the students expressed the lack of actual experience with animals and felt the need for experiments with range of doses rather than experiments with prefixed dose. The reason for prefixed doses in the experiment was to stress on the specific pharmacological actions of drugs on receptors. Overall results demonstrated a positive attitude towards the CAL program coupled with application of theoretical knowledge of drugs to the practical classes that helped them to fulfill the learning outcomes.

CONCLUSION: Learning basic concepts in experimental Pharmacology using CAL, an animal simulation software as an education tool plays an imminent role in the scholastic achievement of the students in developing positive attitude towards basic sciences. CAL helped students not only recollect and apply theoretical knowledge of drugs in practical classes but also personalized learning at their own pace adding the element of fun in pharmacology that is considered a dry subject. CAL, thus provides a unique teaching and learning experience among teachers and students, widening the horizons of learning in pharmacology.

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Sl. No	Parameter	Strongly agree	Agree	Not sure	Disagree	Strongly disagree	Mean score	Standard deviation	P value
1	Objectives of experiment appropriate	31.2	63.6	3.9	1.3	1.3	1.75	0.588	P<0.0001
2	Achieved learning objectives	31.2	57.1	6.5	5.2	1.3	1.86	0.756	P<0.0001
3	Drug responses clearly visualized	24.7	54.5	14.3	5.2	1.3	2.04	0.850	P<0.0001
4	Improved my understanding of MOA	9.7	51.9	28.6	9.1	1.3	2.42	0.833	P<0.0001
5	Enjoyed the learning process	32.5	51.9	13	2.6		1.86	0.738	P<0.0001
6	Felt the learning process under my control	24.7	54.2	15.6	3.9	1.3	2.03	0.827	P<0.0001

Table 1: Perception of students on CAL

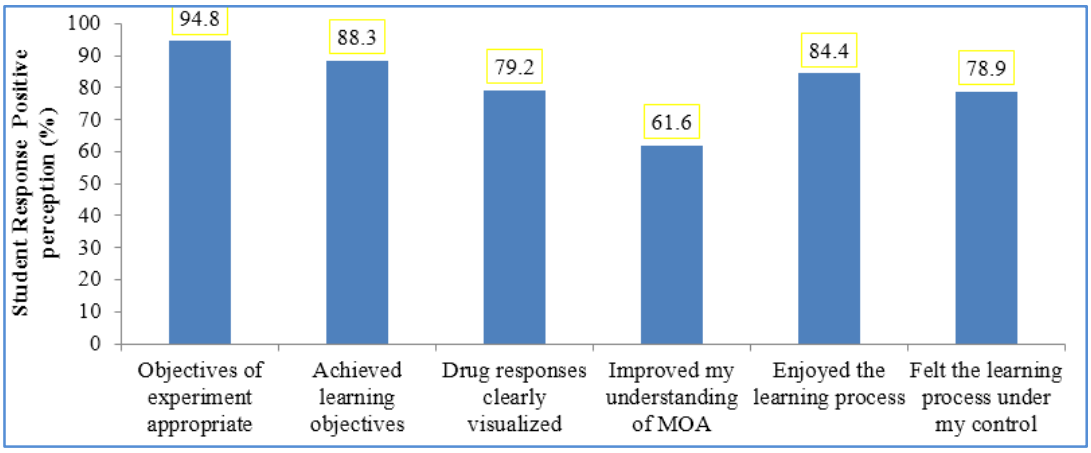

Fig. 1: Perception of students on CAL

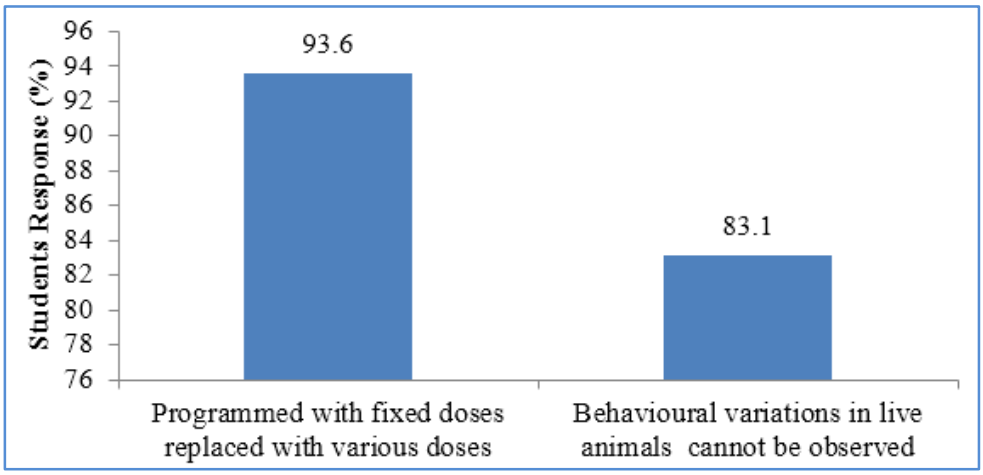

Fig. 2: The shortcomings of CAL as felt by the students

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