EVALUATING THE EFFECTIVENESS OF "THREE DIMENSIONAL VIDEOS ON THE COMPREHENSION OF ANATOMY" AMONG NEW STUDENTS OF MEDICINE (FIRST YEAR MBBS STUDENTS)

Santhini Arulselvi Kaliyaperumal[1], Udaya Sankari Tamilarasan[2], Shanmugapriya Velayudham[3], Indhu Priyadharshini Rajaraman[4]

[1]Associate Professor, Department of Anatomy, Vinayaka Missions Medical College, Karaikal.
[2]Tutor, Department of Anatomy, Vinayaka Missions Medical College, Karaikal.
[3]Assistant Professor, Department of Biochemistry, Vinayaka Missions Medical College, Karaikal.
[4]Tutor, Department of Anatomy, Vinayaka Missions Medical College, Karaikal.

ABSTRACT

BACKGROUND

In a modern gadgets era, most of the teaching methods are turning into electronic format even in schools. The new students of medicine (First MBBS) use to face difficulty in understanding the complexity of Human Anatomy. Computer technology, including internet can enhance the learning activities.

METHODS

This Interventional study was conducted among first year MBBS students of VMMC students, Karaikal. A total of 100 students were included in the study, assigned into two groups of 50 each. All subjects were given pre-test and post-test questionnaire of two different clinical based topics. Learning was assessed by written examinations and responses were linked to students' performances in dissection theatre.

RESULT

The mean score was significantly higher among the students who had received 3-D video demonstration compared to those who had received traditional method of teaching. Participants stated that visual learning is easier to remember and gives the real appearance of anatomical structure.

CONCLUSION

This study confirms the three dimensional video demonstration is an effective method for communication and learning anatomy.

KEYWORDS

Medical Education, anatomy, students, interactive media, topographical knowledge, traditional lectures, dissection, 3-D video demonstration, performance, assessments.

HOW TO CITE THIS ARTICLE: Kaliyaperumal SA, Tamilarasan US, Velayudham S, et al. Evaluating the effectiveness of "Three dimensional videos on the comprehension of anatomy" among new students of medicine (First year MBBS students). J. Evid. Based Med. Healthc. 2016; 3(33), 1581-1585. DOI: 10.18410/jebmh/2016/355

INTRODUCTION: In many Indian medical colleges, the teaching of Human Anatomy involves the drawing of relevant anatomical structures on a black board followed by a practical session of dissection or demonstration using a pre-dissected specimen. The majority of medical institutions in our country still follows this traditional methodology of education, where learning is dependent on the educator imparting information by word of mouth, to a large or small group of listeners within the setting of a classroom. The rapid growth of technology over the last decade has resulted in significant changes in the way in which Human Anatomy is taught across the world. However, many Indian Institutions have been slow to adapt these changes. The reasons for this may be multifold. It may be possibly due to the lack of technical know-how, availability of resources or hesitancy to change existing beliefs, perceptions and biases about how education is provided. These factors might hinder the ability to utilise alternate forms of education that may help significantly improve the comprehension of anatomy among new medical students.[1,2]

Human anatomy is a study of a very complex object, the human body in a three-dimensional (3-D) space. Understanding this kind of complexity requires the ability to visualise vivid 3-D images. Research has provided evidence that spatial ability is one of the main key-components of being successful in the learning of anatomy which forms the base work for the development of future surgical skills.[3,4,5]

The need to keep up with the fast growing field of modern medicine and new technological advancements has emphasised the need for lifelong learning and competency-based education among both medical students as well as practicing physicians.[6] In this dynamic archetype, educators no longer serve as the sole distributors of content, but are becoming facilitators (teaching) of learning and assessors of competency. In order to be able to use technology for

Financial or Other, Competing Interest: None.
Submission 29-03-2016, Peer Review 12-04-2016,
Acceptance 20-04-2016, Published 25-04-2016.
Corresponding Author:
Dr. Santhini Arulselvi Kaliyaperumal,
K1 Staff Quarters, VMMC Campus, Karaikal-609609, Puducherry.
E-mail: drksanthiniarulselvi@gmail.com
DOI: 10.18410/jebmh/2016/355

education, the educator needs to first become comfortable using these technologies themselves so that they may enable their students to explore these additional resources, help them strengthen their self-learning skills, which in turn will facilitate the ability to stay current in this growing era of medical advancements and specialisation.

The learning of gross anatomy by dissection remains the core of most anatomy education programs, and the importance of this hands-on experience cannot be underrated. However, the efficiency of dissection is also based on the skill of the dissector. For a new student of anatomy who is not as skilled as the professional anatomist, the use of 3-D images helps make more clear the expected layout of muscles, tissues, blood vessels, nerves organs and other body parts, which the messy dissection field created by the inexperienced hand may not be able to clearly convey. As a response to this issue, learning through interactive media and 3-D technology has been adopted in most developed nations and even a few Indian medical institutions. Research has proven that interactive media is effective in enhancing clinical education. Students are more engaged and able to learn more effectively from interactive media, making this a useful educational tool, which is currently being underutilised, especially in the field of medicine where the volume of study material may far exceed the capacity of the human brain to assimilate information.[7] Furthermore, educational videos allow us "to capitalise on the ability of moving images to teach procedures requiring skilled techniques and specialised physical examination.[8]

The ability to pull up 3-D videos on a personal computer enables the student to self-learn at their own pace, as well as allowing them to play back videos when they need to reinforce what they may have already learned, without the need of having to rely on the detailed diligent notes taken in a classroom setting.

AIM & OBJECTIVES:

AIM: This study aims to evaluate the effectiveness of three dimensional video aided teaching, compare the benefits of adding video aided teaching to the traditional classroom teaching and also evaluate the perception of new students of Anatomy to this teaching aid.

OBJECTIVES:

1. To facilitate the students in the acquisition of Anatomical knowledge effectively.
2. To sensitise the students for the 3-dimensional view of anatomical structure and better understanding.
3. To create more interest towards Anatomy.

NULL HYPOTHESES: This study aims to determine if the following null hypotheses are proven or disproven.

- There is no difference in the level of comprehension of Anatomy when using 3-D video training in addition to the traditional classroom lecture and dissection methodology.
- New students of Anatomy will not be able to perceive a difference in a stand-alone traditional classroom based education and a 3-D video technology enhanced classroom based education.

MATERIAL AND METHOD:

Inclusion Criterion: First year MBBS students who wish to participate in this study.

This study was conducted on volunteer students of first year Bachelor of Medicine, Bachelor of Surgery (MBBS) program, ages ranging between 17 to 20 years enrolled for study in the Department of Anatomy, Vinayaka Missions Medical College (VMMC), Karaikal, Puducherry, India. Institutional Ethical Committee clearance was obtained to conduct this study. A total of 100 students were included in the study. The students were assigned into two groups of 50 each by simple random sampling. The control group administered with dissection and classroom lectures, training methodology while the test group received 3-D video training in addition to the dissection and classroom lectures training. All subjects were given a pre-test and post-test questionnaire of two different anatomical topics – the nose and larynx.

Subjects of both the groups were evaluated based on a twofold process.

1. Students performed dissections of the nose and larynx to demonstrate practical understanding of the anatomical structure.
2. Written tests on the same topics were conducted to demonstrate theoretical understanding of the subject.

STATISTICAL ANALYSIS: The data were analysed using SPSS software version 18. Initially descriptive statistics like the mean and standard deviation were calculated on the pre- and post-test scores for both the topics. A T- test analysis was done to determine the statistical significance.

RESULTS: Among the 100 students evaluated during the study, the majority (90%) were in the age group of 17-18 years. The post-test scores showed a significant difference between the control group and the test group. The p value was found to be highly significant ($p<0.000$). The significant increment in post-test score was found in both the topics (nose and larynx) which were evaluated, with the test group showing a significantly higher performance compared to the control group.

Topic	Control Group		Test Group		t value	p value
	Mean	SD	Mean	SD		
Nose	2.40	0.88	6.54	1.77	14.562	0.000 (s)
Larynx	1.84	0.91	5.32	1.94	11.762	0.000 s)

Table 1: Comparison of pre-test and post-test scores in the study groups

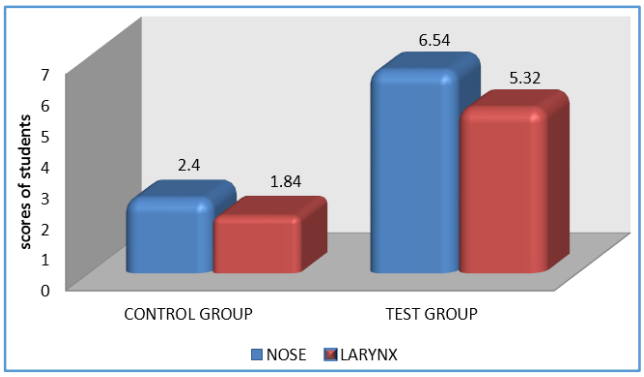


Fig. 1: Comparison of pre-test and post-test scores in the study groups

In comparison of the pre-test and post-test scores in both the groups, it was observed that both groups showed an increase in their post-test scores showing that both education methodologies have an effect on comprehension. However, the mean increment in score was higher among the students who had received the 3-D video demonstrations compared to those who had received only the traditional method of teaching.

TOPIC	Control Group		Test Group		t value	p value
	Mean	SD	Mean	SD		
NOSE	4.16	1.87	6.54	1.77	6.429	0.000(s)
LARYNX	3.92	1.65	5.32	1.94	4.098	0.000(s)

Table 2: Comparison of post-test scores between groups

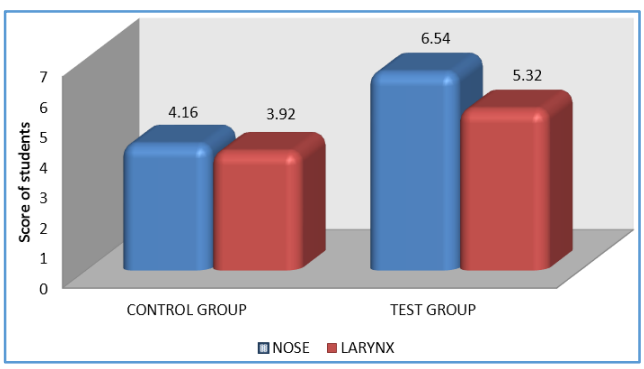
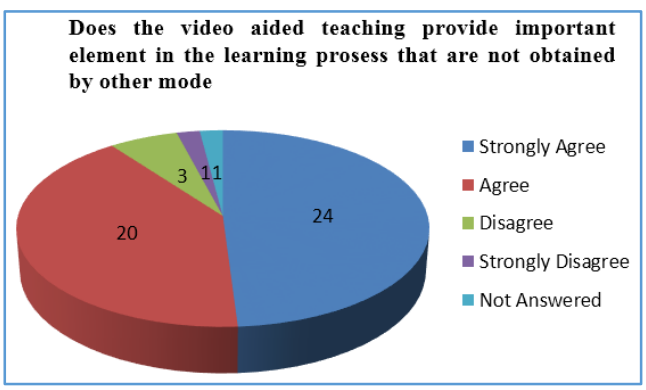
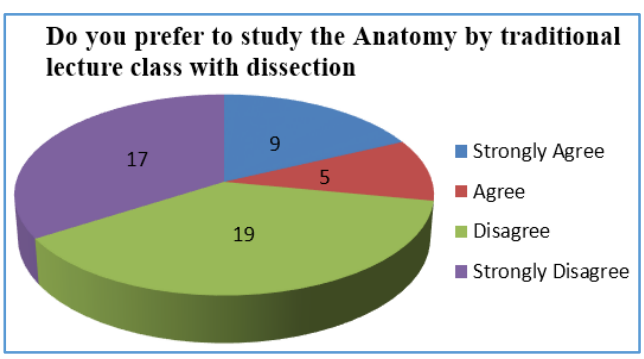


Fig. 2: Comparison of post-test scores between groups





The first null hypothesis of this study has been disproven. The study has shown that 3-D video demonstration enhances student comprehension, and enables students to better understand the spatial relationship between the anatomical structures.

Student perception of the training: The fifty (50) students who did not initially receive the 3-D training were shown the 3-D interactive videos. The feedback was obtained from them, some of them listed here:

- Three dimensional interactive videos are more interesting, engaging and thought provoking.
- Helps to better imagine the anatomical layout and gives a better understanding of the topographic relationship of anatomical structures.
- The videos help facilitate the visualisation of laryngeal movements which would not otherwise be possible in the regular teaching process
- Visual learning is easier to remember and gives the real appearance of anatomical structure.

The second null hypothesis of this study has been disproven. The study has shown that students perceive a difference in a stand-alone traditional classroom based education and a 3-D video technology enhanced classroom based education and have a clear preference to the 3-D video technology enhanced classroom based education.

DISCUSSION: In Anatomy, it is important at the undergraduate level to understand anatomical concepts. The knowledge of anatomy forms the basis for many of the para-clinical and clinical fields such as pathology, surgery, orthopaedics and neurology. One needs to understand and have a structural knowledge of the whole human body to be

able to comprehend its complexity. The present study was designed to investigate whether using 3-D digital animations would facilitate the effective acquisition of anatomical knowledge.

Khalil et al, DiLullo et al, Moorman et al demonstrated that students perceived 3-D digital animations as being a good interactive media tool for learning human anatomy.[9,10,11] Such a pattern of results was quite similar to the results obtained in this study, which in the future will help us customise education and include digital technologies in the education curriculum in order to best meet the needs of students.

In a study done by Roopashree et al, the percentage of students preferring LCD as the best mode for Gross Anatomy lectures were about 61.2%, for embryology lectures were about 66.6% and 71.9% for the histology lectures. When asked the reasons for their preferences, they stated that gross anatomy lectures were performed using animated diagrams and the gross anatomy of joints were taught using videos of animated models in motion showing not only the movements but also the exact angle of movement and range of individual movements, showing exactly how the joint functions when in action. Embryology lectures had 3-D images to understand the whole morphology of the developing embryo, some videos of different stages of development in respective systems were shown which was very informative. Cross-sectional study of embryos was better understood using a liquid crystal display (LCD), then blackboard teaching (BBT).[12]

A study done by Vidya et al showed higher mean values in post-tests of both methods. Unpaired t tests showed a significant difference in video demonstration method which was similar to the present study.[13] The overall positive impact of objective structured clinical exam (OSCE) videos on student learning of clinical skills was assessed by Jang HW, Kim KJ who studied the use of online clinical videos for clinical skills training for medical students.[14]

Similarly, Barker SP studied comparison of videodisc demonstration and lecture demonstration method for physiotherapy students, which was assessed by written examinations and performance analyses. The results showed that interactive videodisc instruction was more valuable than the lecture-demonstration in teaching a particular psychomotor skill.[15]

Khogali SE and others studied about the integration of e learning resources into medical school curriculum, 96% of students rated e-learning resources as probably or definitely of value, particularly interactive activities, video clips and self-assessment exercises.[16] Goemley GJ and others assessed undergraduate medical student's attitudes and accessibility towards e-learning in basic skills education. Students rated e-learning just as highly as other traditional methods of clinical skills teaching and acknowledge its integration in a blended approach.[17]

Nowadays, live streaming of surgical demonstrations are gaining popularity and educational videos are being published in peer-reviewed journals which are also being used as an interactive tool in social networking services.[18]

CONCLUSION: In the modern age, technology is creating a new evolution in education all over the world, providing newer educational platforms and reconfiguring the way education happens. As technology advances, technological educational resources in turn have become available to educators. These resources were not available to past generations who were forced to rely on traditional teaching methods and drawing on blackboards to convey information to their students. As Heraclitus, the Greek philosopher said "The Only Thing That Is Constant Is Change". It is clear from this study as well as multiple other research studies that have been performed that it is time for us to embrace change. Interactive media will become an important of education and training and the foundation of future educational programs, Video demonstration is an effective method for clear communication. It is the recommendation of this study that Indian Medical Institutions should follow best practices and make use of 3-D interactive technology in dissection theatres, and make available computer based educational videos for the study of anatomy at the beginner level for 1st year MBBS students as a part of their regular curriculum.

ACKNOWLEDGEMENTS: I thank all my students who participated, Head of the Department and Institution, Medical Educational Unit for constant support to conduct this study.

REFERENCES:

1. Ruiz JG, Mintzer MJ, Leipzig RM. The impact of e-learning in medical education. Academic Medicine 2006;81(3):207-212.
2. Galusha JM. Barriers to Learning in distance education. ERIC 1998;P-23. Website [http://www.infrastruction.com/barriers.htm]. Retrieved 201204-10.
3. Rochford K. Spatial learning disabilities and underachievement among university anatomy students. Med Educ 1985;19(1):13–26.
4. Garg AX, Norman G, Sperotable L. How medical students learn spatial anatomy. Lancet 2001;357(9253):363–364.
5. Risucci DA. Visual spatial perception and surgical competence. Am J Surg 2002;184(3):291–295.
6. Marie CA, Michael L. Untapped potential: seeking library donors among alumni of distance learning programs. Journal of Library Administration (Routledge) 2010;50(5):515–529.
7. Mayer RE. Applying the science of learning to medical education. Med Educ 2010;44(6):543-549.
8. McMahon GT, Ingelfinger JR, Campion EW. Videos in clinical medicine - a new journal feature. NEJM 2006;354(15):1635.
9. Khalil MK, Johnson TE, Lamar CH. Comparison of computer-based and paper-based imagery strategies in learning anatomy. Clin Anat 2005;18(6):457-464.

10. DiLullo C, Coughlin P, D'Angelo M, et al. Anatomy in a new curriculum: facilitating the learning of gross anatomy using web access streaming dissection videos. J Vis Commun Med 2006;29(3):99–108.
11. Moorman SJ. Prof-in-a-box: using internet-videoconferencing to assist students in the gross anatomy laboratory. BMC Med Educ 2006;6:55.
12. Roopashree R, Suman Tiwari, Niranjana Murthy KV. A student's prospective of anatomy lectures on different visual aids. Journal of Dental and Medical Sciences. 2013:10(2):33-37.
13. Vidya CS, Kulkarrni Praveen. Introduction of innovative teaching of clinical anatomy by demonstrating clinical anatomy based topics in dissection theatre for 1 year MBBS students. Indian Journal of Clinical Anatomy and Physiology 2015;2(4):226-230.
14. Hye Won Jang, Kyong-JeeKim. Use of online clinical videos for clinical skills training for medical students: benefits and challenges. Medical Education 2014;14:56. doi:10.1186/1472-6920-14-56.
15. Susan P Barker. Comparison of effectiveness of interactive video-versus lecture-demonstration instruction. Phys Ther 1988;68:699-703.
16. Khogali SE, Davies DA, Donnan PT, et al. Integration of e-learning resources into a medical school curriculum. Med Teach 2011;33(4):311-318. doi: 10.3109/0142159X.2011.540270.
17. Gormley GJ, Collins K, Boohan M, et al. Is there a place for e-learning in clinical skills? A survey of undergraduate medical students' experiences and attitudes. Med Teach 2009;31(1):e6-12. doi: 10.1080/01421590802334317.
18. Dinscore A, Andres A. Surgical videos online: a survey of prominent sources and future trends. Med Ref Serv Q 2010;29(1):10-27.