

Can a Projected Image Test replace the Traditional Gross Anatomy Spot Test?

Amaratunga, H. A., Kosgallana, W. E.

Abstract

Introduction: Conducting traditional gross anatomy spot (spotter/tag) (3D) in the laboratory is becoming increasingly difficult due to the large number of students and shortage of staff. This study aimed to assess the practicality of conducting projected gross anatomy image test (2D) conducted in a lecture hall for first year medical undergraduates and assessing their performance and attitudes towards this form of testing.

Material and Methods: First-year medical undergraduates were subject to two forms of gross anatomy testing in the form of traditional spot test (3D) and projected gross anatomy image test (2D). An online questionnaire was administered to the students to gain information regarding their attitudes regarding the two types of examinations. Descriptive analysis and one-sample T-test was used to compare the results

Results: Sample consisted of 248 students. There were 149 females (60%). Mean age in years was 21.34 (SD=2.3). The mean projected image test scores out of hundred was 70% (SD=3.14). The mean score for the OSPE component of the Y1S1 examination was 63.3% (SD=4.11). The observed difference in the means was statistically significant ($p < 0.001$).

Conclusion: While the projected gross anatomy image test (2D) was less time consuming and easy to setup and the students performed better in it they prefer the gross anatomy spot (3D) type of test. Both types have their advantages and disadvantages and maybe used in combination to reduce examination time and invigilator requirements.

Keywords: Gross anatomy, Spotter test, Projected image test

Introduction

Anatomy lays the foundation to the study of the normal human body and there after the identification of disease and thus plays a pivotal role in medical education. Being a highly visual subject, it requires a good understanding of relationships between structures, and this is achieved by hands-on experience with cadaveric dissections, prosected specimens, plastic models, and image sources.

Department of Anatomy, Faculty of Medicine,
University of Peradeniya, Sri Lanka

Corresponding author: Dr. (Mrs.) Himani Amaratunga
Email: himani.amaratunga@med.pdn.ac.lk

Testing in anatomy all over the world would have some form of identification of gross structures. Traditional gross anatomy spot tests have been used to assess anatomy knowledge in first year students from the inception of the medical curriculum at Peradeniya. The traditional gross anatomy spot generally consists of cadavers and prosected specimens with flags/tags on the structures to be identified. Around 15-20 spots are usually displayed at consecutive stations and the students walk to each station. Generally, 2-3 minutes are given to a student to go through each spot.

With the government policies to increase the intake of medical students every year Peradeniya



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South-East Asian Journal of Medical Education
Vol.18, no.2, 2024

currently teaches batches of 240-250 students. A typical gross anatomy spot test therefore takes at least 8 hours to complete, and as many as 10-15 invigilators throughout the day. Further, it takes 2 trained senior anatomy lecturers at least 3 hours to setup the specimens, not considering the time taken to setup the laboratory before and after. With the reduction in staff conducting such an examination is a daunting task and places a great burden on the academics.

At Peradeniya projected image tests are used for testing histology, radiological anatomy, genetics, embryology and clinical anatomy. However, images of prosected specimens are never used in these tests and gross anatomy spot is a component of all anatomy OSPE components. A projected gross anatomy image test would take very little time. Even the whole batch of students could take the test at the same time and only 30 - 40 minutes will be needed. However, conducting a gross anatomy test in a projected manner may have its drawbacks. Therefore, it was the aim of this study to conduct such a test and check the practicality, student attitudes and student performance compared to the traditional gross spot test.

Methodology

First year students of the 2021 academic year were recruited for the study. Informed consent was sort from all participants and those who refused to participate were allowed to withdraw immediately. Ethical clearance was granted by the institutional committee. The students had completed their first semester work, where anatomy of limbs had been taught, and they were awaiting their Y1S1 semester examination.

A projected gross anatomy image-based test on the region of limbs was developed by the principal investigator who is a senior lecturer in anatomy and has been a senate appointed examiner for the past 17 years. The test consisted of clear digital photographic images, of prosected specimens. The prosected specimens used were from the department collection used by students as study material. The images contained arrows

pointing at the structures to be identified. It was ensured that the test items had the same difficulty level as the usual test items given for semester exams. Twenty test items were prepared in a PowerPoint presentation.

The students were seated comfortably in the lecture hall and the slides were projected onto the large screen used for projected OSPE tests and it was ensured that all students had a clear view of the slides. The students wrote down their answers in an answer sheet provided to them. The answer scripts were corrected by a marking panel consisting of anatomy teachers. Marks were expressed out of 100.

Following the Y1S1 exam, a feedback questionnaire consisting of 5-point Likert scale questions and open-ended questions was administered to the whole batch via google forms. The gross anatomy overall mark and the gross anatomy OSPE marks for the Y1S1 examination were extracted from the records with permission from the head of the department and the chief examiner. The overall marks were compared using Pearsons's rank correlation.

Data was entered to GraphPad prism and descriptive statistics were generated. Paired sample T test was used to compare the marks of the two tests.

Casual discussion was held among 12 anatomy teachers from different faculties regarding their opinion on the two types of tests.

Results

The 2021 batch consisted of 255 students and all of them consented to participate. However, only 248 students were present on the day of the test. From the batch 253 students sat the Y1S1 examination. There were 149 females (60%). Mean age in years was 21.34 (SD=2.3).

The mean projected image test scores out of hundred was 70% (SD=3.14). The mean score for the OSPE component of the Y1S1 examination was 63.3% (SD=4.11). The observe difference

in the means was statistically significant ($p < 0.001$). Table 01 displays general information on the two tests. Table 02 depicts the descriptive and statistical information on the test score with

the results of the paired t test. Both projected image test and gross spot scores were compared to the overall test score and both showed significant positive correlation (Table 03).

Table 01: Information regarding the two tests

	Projected Image test	Traditional spot test
Number of test items	20	20
Time taken to complete the exam	40 minutes	8 hours
Invigilators necessary	10	22

Table 02: Descriptive and statistical information on the test scores

Paired t test		
$t = 11.0310$, $df = 247$, standard error of difference = 0.215, $p < 0.001$		
Group	Image projection	Traditional spot
Mean	70	63.3
SD	3.14	4.11
SEM	0.20	0.26
N	248	248

Table 03: Correlation between overall anatomy score and test scores

Variables	Image projection test and overall marks	Traditional spot test and overall marks
Correlation	$r(0.48)$ $p < 0.001$	$r(0.74)$ $p < 0.001$

Only 202 responses were received from the feedback questionnaire. Majority (92.8%) agreed that they were given clear prior instructions and that the language used in questions was simple and easy to understand and 89.6% said that the question format was clear. Of the respondents, 55.8% felt that the allocated time was not enough for each question, however only 32.88% said that the questions were difficult. A majority (85.43%) agreed that the question difficulty between the test and the Y1S1 exam were equal, 12.3 % were neutral on this matter while the rest disagreed.

Of the respondents 76.2% stated that the quality of 100% of the images in the test items were clear and identifiable, while 22.6% stated that more than 80% of the images were clear, while only 1.2% stated that the images were unclear. Of the respondents, 39.19% had said that the anatomical orientation of the specimens was not clearly understandable on the image and therefore they had trouble identifying the structures.

Close to half of the students (48.2%) said that they felt they would have performed better if the test was conducted as a spot test. 75.4% of the students said that they preferred the projected image test to the traditional spot test. More than half the students (55.41%) suggested that we conduct a projected image test as a practice test before the exam and conduct the OSPE component of the examination as a traditional spot test.

Discussion with the anatomy teachers revealed that they were all of the opinion that a traditional gross anatomy spot was the best tool to assess gross anatomy knowledge of first year students.

Discussion

In a day and age where virtual dissectors and digital images are taking the place of the cadaver as the first anatomy teacher to first year students, its not surprising that assessments are also following this trend (Biasutto *et al.*, 2006, Tanase

et al., 2014). However, student preference for conventional anatomy assessment methods rather than digital methods have been reported by several educationists (Sadash *et al.*, 2021, Inuwa *et al.*, 2011). We too observed that even though the students scored significantly better at the projected image test, they preferred the traditional gross anatomy spot for their exams. It is also interesting to note that even though close to half the students thought they would perform better in a spot setting on average they had performed better on the projected image test. This is understandable since students learned their gross anatomy through cadaver dissections and prosection based practical sessions they may feel more comfortable with directly viewing the specimen in 3D rather than viewing a 2D representation. Coming to the reasons for choosing the 3D version the students claimed that the biggest problem they faced in the test images was the difficulty in orientation of the specimen in some of the images. This problem may actually be solved by adding labels to the image to make it easier for them to orientate it.

Ozen and his team report that in their study the test score of the traditional spot test and projected image test were similar (Ozen *et al.*, 2021). However, we find that the students performed better in the projected image test. There maybe due to the fact that even though it was conducted similar to an exam the students were aware that the marks would not be considered for any examination, and therefore relaxed and scored better. It may also be the case that even though all precautions were taken to make the questions at the same difficulty level as the Y1S1 examination OSPE the questions in the image test were easier.

The projected gross anatomy image test is an easy, practical method of testing gross anatomy knowledge and is much less time consuming and requires much less man power. It is our view that the traditional gross anatomy spot cannot be replaced by the projected image test, however

what can be done is a combination of both. By adding few gross anatomy images to the projected test, it is possible to reduce the number of test items in the gross spot thereby saving time and energy of the students and the staff.

Conclusion

Even though technology-based assessment techniques have expanded especially due to the shortage of staff and increase in the number of students, it cannot yet replace the traditional methods. Further students and staff prefer this method of assessment. Limiting factor of this study was that it was conducted for a single batch and reflects only their view.

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