Research Article

SPOT-CRAFT (Spotter Performance Observation Through Technology-Computerised Resource Assessment for Fundamental Testing): A Comparative Study of Traditional And Digital tools in Anatomy Spotter Assessments.

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(Received: 26-08-2024 Revised: 13.10.2024 Accepted: 10.11.2024)

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ABSTRACT

Background: In the dynamic field of medical education, assessment methods have evolved significantly. One notable shift is the transition from traditional paper-based spotter tests to digital formats, primarily facilitated by PowerPoint presentations. Traditionally, spotter tests involved identifying and labeling anatomical structures on physical images, a method central to medical assessments. However, digital tools have introduced a new dimension to this evaluation process.

Method: This study involved 150 first-year MBBS students, each assessed through both traditional and PowerPoint methods in a sequential cross-over design. A survey was administered to gather student perceptions of these two assessment methods.

Results: The findings revealed that students performed significantly better with the PowerPoint method, achieving a mean score of 24.1 ± 9.09 compared to 13.09 ± 4.49 with the traditional method. While 51.3% of students preferred the PowerPoint approach, 48.7% favored the traditional method. The difference in performance was statistically significant, with a p-value of 0.026.

Conclusion: Traditional methods excel in assessing higher cognitive functions and clinical reasoning, while PowerPoint assessments offer efficiency and broader acceptance among large cohorts. Integrating both approaches can enhance performance and engagement, catering to diverse learning styles. The implications of our findings suggest that adopting a blended assessment framework can not only improve learning outcomes but also better prepare future healthcare professionals for the complexities of clinical practice.

Keywords: Anatomical structures, Power-point presentation, Medical education, Assessement.

INTRODUCTION

In the rapidly advancing field of medical education, the methodologies employed for student assessments are continually evolving. Traditional paper-based spotter tests, a longstanding practice in anatomical education, require students to identify and label anatomical structures on physical images or specimens. These tests have been a fundamental component in assessing the knowledge and skills of aspiring medical professionals. However, the integration of digital tools, particularly PowerPoint presentations, has introduced new possibilities and challenges in this evaluation process (1–3).

The traditional method of spotter tests is praised for its direct engagement with physical specimens, providing a tangible and often more intuitive understanding of anatomical structures. Nonetheless, it demands considerable resources in terms of personnel, facilities, and time, posing logistical challenges for educational institutions. On the other hand, digital tools offer a streamlined approach that can enhance the

efficiency and scalability of assessments. PowerPoint presentations, in particular, allow for a wider variety of questions and more consistent examination conditions for large groups of students (4, 5).

The transition from traditional to digital assessment methods aligns with broader trends in medical education, which emphasize not only the acquisition of knowledge but also the development of competencies across multiple domains. The Accreditation Council for Graduate Medical Education (ACGME) highlights the importance of medical knowledge, patient care, professionalism, communication and interpersonal skills, practice-based learning, and systems-based practice (6). Modern assessment techniques must therefore be comprehensive, reliable, and valid, ensuring that they accurately measure these diverse competencies. While previous studies have examined each method independently, this research fills a significant gap by directly comparing their effectiveness.

Moreover, student engagement is a crucial factor in the effectiveness of any educational assessment. Engaged students are more likely to perform better, retain information longer, and apply their knowledge more effectively in clinical settings. This study aims to explore how different assessment methods impact student engagement, and in turn, their overall learning experience. By comparing traditional paper-based spotter tests with PowerPoint presentations, we seek to provide a nuanced understanding of which method fosters deeper engagement and facilitates a more effective learning environment. Through this research, we hope to offer valuable insights into the strengths and limitations of both assessment methodologies. Ultimately, our goal is to identify practices that enhance the quality of medical education, ensuring that future healthcare professionals are well-prepared to meet the demands of their field.

The purpose of this study is to directly compare traditional paper-based spotter tests with PowerPoint-based assessments to determine which method offers greater advantages in terms of performance, student engagement, and learning outcomes. By identifying the strengths and limitations of both approaches, this research aims to provide educators with evidence-based insights that can guide the design of more effective assessment practices. This study aims to advance medical education by comparing the effectiveness of traditional and digital anatomical assessment methods.

MATERIALS AND METHODS

This cross-sectional descriptive study received approval from the Institute Research Ethics Committee (122/SVMCH/IEC-cert/October 2023), and written informed consent was obtained from all participants. A total of 150 first-year medical students were selected from Sri Venkateshwaraa Medical College Hospital and Research Centre, Ariyur, for the study using a convenience sampling method, based on their availability to attend the examination since their initial exposure to anatomical assessment allows for a more accurate comparison and respond to the survey questions. The study was conducted in the Department of Anatomy over a period of four months, from October 2023 to January 2024.

Two modes of practical examination were conducted: the traditional spotter test and the PowerPoint spotter test. Bloom's Anatomy tool was used to craft the question for both tests (7). Using a steeplechase pattern, the traditional spotter test took place in the dissection hall with cadaveric specimens. Ten spotter stations were set up. The questions focused on anatomical identification, nerve supply, location, blood supply, and clinical importance. Each station was timed for around 1 minute and student response was provided in free- answer format.

Following the traditional examination, the same group of students participated in the PowerPoint spotter test. This test included around 20 spotter questions using 2D images of prosected cadaveric specimens, images from the Colour Atlas of Anatomy, videos, and histology slides. Each question featured an image with arrows indicating specific structures, and, like the traditional test, each station was timed for one minute and student response was provided in

free- answer format. The entire PowerPoint examination was monitored.

Students' scores from both examinations were recorded in Microsoft Excel. After the tests, students completed a printed questionnaire to evaluate their perceptions of the traditional spotter examination and the PowerPoint spotter examination. The questionnaire included 20 questions focused on identification and learning ability, clinical reasoning skills, critical thinking, and student engagement. These questions were prepared following international guidelines and validated by subject experts and medical educationists. The students' responses were entered into an Excel sheet for analysis.

STATISTICAL ANALYSIS

All data were analyzed using the SPSS statistical package, version 23, and presented descriptively. Mean ± SD scores for performance outcomes were compared using an independent sample t-test, with a p-value of ≤ 0.05 considered statistically significant.

The questionnaire designed to gather student perceptions of the PowerPoint and traditional exam formats utilized a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree) for each item. The questionnaires were validated by subject experts and medical educationist based on the Cronbach's alpha and content validity index which was 0.73 and 82 respectively. These ordinal responses were summarized using descriptive statistics, including means, standard deviations, and frequency distributions, to provide insights into overall trends in student perceptions.

For further analysis, Likert-scale items were treated as interval data (where appropriate), allowing for comparisons between groups using independent sample t-tests to identify any statistically significant differences in student perceptions across the two formats. Additionally, percentages were calculated for each response option to offer a clearer understanding of how students distributed their preferences. This dual approach-combining percentage-based reporting and descriptive statistics-ensured that both individual item-level responses and overall trends were captured accurately.

RESULT

IDENTIFICATION AND LEARNING ABILITY

In evaluating identification and learning ability, respondents showed varied perceptions between traditional and PowerPoint-based assessments for spotters. The traditional method was recognized for effectively assessing understanding (26.6% agreement) and aiding knowledge retention (22% agreement). Conversely, the PowerPoint method received slightly higher ratings for evaluating understanding (26.6%) and aiding retention (24.6%). Feedback clarity was notably stronger with the traditional method (22.6%) compared to the PowerPoint method (20%).

CLINICAL REASONING SKILLS

When assessing clinical reasoning skills, opinions diverged. The traditional method was viewed as adequately covering topics by 22.6% and accurately reflecting understanding by 26% of respondents. In contrast, the PowerPoint method received higher ratings for covering topics comprehensively (26%) but lower for accurately reflecting understanding (20%).

CRITICAL THINKING

Both assessment methods were perceived to encourage critical thinking and problem-solving skills equally, with approximately 23.3% of respondents indicating that both methods promoted these skills. This balanced perception suggests that using either method can foster essential cognitive skills effectively, although the tactile nature of traditional assessments may offer a more immersive critical thinking experience.

STUDENT ENGAGEMENT AND PERCEPTION ANALYSIS

Active engagement during assessment sessions slightly favored the traditional method (22.6% agreement) over the PowerPoint method (21.3%). Additionally, the traditional method facilitated more direct interaction with material and instructors (23.3%) compared to the PowerPoint method (20%). These results suggest that the hands-on nature of traditional

assessments fosters higher engagement, especially through real-time feedback and direct handling of anatomical specimens.

Interestingly, the higher engagement levels associated with the traditional method correlated with enhanced knowledge retention, as reflected in student responses. However, the PowerPoint method's efficient use of multimedia resources may have compensated for lower direct engagement by offering broader content coverage and immediate reinforcement of concepts. Students who reported higher engagement with PowerPoint-based assessments were more likely to perform better, achieving higher mean scores (24.1 ± 9.09) compared to the traditional method (13.09 ± 4.49), highlighting the potential impact of active digital learning tools on performance outcomes.

Further analysis reveals that student preferences also influenced engagement and learning outcomes. Among students who preferred the PowerPoint method (51.3%), performance was notably higher, suggesting a positive relationship between preference, engagement, and academic outcomes. This preference indicates that students may engage more deeply with a format that aligns with their learning style, reinforcing the importance of providing multiple assessment formats to cater to individual needs.

DISCUSSION:

In the dynamic landscape of medical education, the debate surrounding assessment methods—traditional spotter tests versus digitized PowerPoint-based assessments—reflects broader discussions on pedagogical effectiveness, technological integration, and student engagement. This study provides valuable insights into how these methods influence learning outcomes, clinical reasoning skills, student engagement, and preferences among medical students and educators.

Traditional spotter tests are renowned for their hands-on approach, where students interact directly with physical specimens to identify anatomical structures and apply clinical reasoning. Respondents in this study recognized traditional methods for their effectiveness in assessing understanding and aiding knowledge retention. The tactile experience of handling specimens was noted for its ability to immerse students in practical scenarios, enhancing their ability to apply theoretical knowledge to clinical practice. Moreover, the immediate feedback provided by instructors during these sessions was crucial in guiding student learning and improving performance (8, 9).

However, traditional spotter tests present logistical challenges, including the availability and quality of specimens, which can vary widely. Setting up and conducting these assessments require significant resources in terms of time, personnel, and materials, particularly in large-scale educational settings. The variability in specimen quality and the logistics of coordinating such exams for a large cohort of students were noted as potential drawbacks. Critical for medical practice, clinical reasoning skills were viewed favorably in traditional spotter tests. Respondents felt that these assessments adequately covered topics and accurately reflected their understanding of complex medical concepts. The hands-on nature of traditional assessments allows students to develop critical thinking and problem-solving skills in real-time, preparing them for the complexities of patient care. This direct engagement with physical specimens is crucial in bridging the gap between theoretical knowledge and practical application, ensuring that students are proficient in clinical decision-making (10-12)

In contrast, PowerPoint-based spotter examinations offer a digital, scalable, and standardized approach to assessment. These assessments integrate multimedia resources such as images, diagrams, and videos to provide a comprehensive evaluation of student knowledge across a wide range of topics. The digital format allows for flexibility in question types and facilitates efficient administration and grading, providing timely feedback to students. Moreover, digital assessments align with modern educational practices, catering to student preferences for technology-enhanced learning experiences.

The efficiency and consistency of PowerPoint-based assessments were highlighted as

significant advantages, particularly in managing large cohorts of students and ensuring uniform evaluation standards. The ability to integrate multimedia resources enhances the depth and breadth of assessment coverage, offering a more holistic view of student proficiency in anatomical understanding and clinical reasoning.

The study's quantitative analysis revealed a notable performance advantage for the PowerPoint method, with students achieving higher average marks compared to those undergoing traditional spotter tests. This statistical difference underscores the effectiveness of digital assessments in enhancing academic outcomes and supporting continuous learning. Moreover, student preference favored the PowerPoint method, reflecting a growing inclination towards digital learning tools that offer flexibility, accessibility, and interactive engagement (3-5, 13).

The preference for PowerPoint-based assessments resonates with contemporary educational trends, where technology plays a pivotal role in enhancing student engagement and optimizing learning experiences. Digital assessments provide students with opportunities to interact with multimedia content, simulate clinical scenarios, and receive immediate feedback, all of which are critical in developing competence and confidence in medical practice.

Despite these advantages, concerns were raised about the potential limitations of PowerPoint-based assessments in replicating the tactile and immersive learning experiences offered by traditional spotter tests. Some respondents noted that while digital assessments provide breadth in coverage and convenience, they may not fully capture the depth of understanding and clinical reasoning fostered by hands-on interaction with physical specimens (5, 10, 14).

Moreover, the implementation of digital assessments requires careful consideration of technological infrastructure, training for educators, and accessibility for all students. Ensuring that digital assessments maintain rigor, validity, and reliability in evaluating clinical skills remains a critical challenge in medical education (8, 13, 15).

While the traditional method allowed for deeper interaction and direct instructor feedback, PowerPoint-based assessments provided efficiency and consistency-factors that can improve performance in larger cohorts. Alternating between the two formats during the academic term could optimize engagement by leveraging the strengths of both methods, enhancing not only learning outcomes but also student's motivation and retention. This blended approach would ensure that assessments are engaging, effective, and aligned with student's diverse preferences and needs.

The choice between traditional spotter tests and PowerPoint-based assessments should be guided by educational goals, logistical feasibility, and student learning preferences. Both methods offer unique advantages and address specific educational objectives within medical training. Integrating a balanced approach that leverages the strengths of each method could optimize learning outcomes, prepare students for diverse clinical challenges, and foster continuous improvement in medical education practices (16).

As educators navigate these choices, the ultimate goal remains to ensure that assessment strategies effectively support the development of competent and compassionate healthcare professionals equipped to meet the demands of modern healthcare practice. By aligning assessment methods with educational goals and student needs, medical education can evolve to embrace technological advancements while preserving the essential foundations of clinical proficiency and patient-centered care (10).

Future research could explore hybrid assessment models that combine the strengths of both traditional and digital methods. Such hybrid approaches could leverage technology to enhance the realism and interactivity of traditional spotter tests while maintaining their educational benefits.

CONCLUSION

Both traditional and PowerPoint-based spotter examinations offer unique strengths and challenges in medical education. Traditional methods provide hands-on, immersive learning

that enhances critical thinking and clinical reasoning but require significant resources and may face issues with specimen quality. PowerPoint-based assessments offer efficiency, scalability, and standardized evaluations with broader coverage and timely feedback. A hybrid approach is recommended, where practical sessions with cadaveric specimens are reinforced by digital assessments using anatomical images and videos. Digital tools can provide formative assessments with immediate feedback, while traditional methods can assess clinical reasoning under realistic conditions. Additionally, educators can alternate between both formats during the academic term to maintain student engagement and cater to diverse learning styles. Multimedia elements like QR codes linking to videos can enhance physical assessments. A balanced strategy that integrates the tactile benefits of traditional methods with the technological advantages of digital tools will optimize learning outcomes, align assessments with educational goals, and foster competence and excellence in clinical practice.

ACKNOWLEDGMENT:
First-year MBBS students (2022-2023) of Sri Venkateswaraa Medical College Hospital and Research Centre.

LIMITATION:
Logistical challenges arose from the inconsistent availability of high-quality cadaver specimens for traditional assessments, potentially impacting evaluation reliability. Additionally, the effectiveness of PowerPoint assessments relied on adequate technological resources, which varied among students. Educators also required further training to effectively implement digital tools, and varying levels of student familiarity with technology influenced engagement. Finally, balancing both assessment formats posed scheduling and coordination challenges within the academic calendar.

FUNDING
This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

CONFLICT OF INTEREST
The authors declare that there is no conflict of interest regarding the publication of this paper.

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