

Inside Out: Role of Body Painting in Learning Human Anatomy- An experience from a Public and Private Medical College

Asma Basharat Ali¹, Nadeem Baig², Nadia Younus³, Sahrish Mukhtar⁴, Urooj Fatima⁵, Syed Meesam Iftkhar Rizvi⁶

Abstract

Objective: This study was planned to evaluate the role of body painting in short-term retention of knowledge and to assess students' perception of this activity in a public and private medical college.

Methods: This interventional study was conducted in a private and public medical college in the month of September and October 2023. The students of MBBS 1st year from the 2 colleges were invited to participate in the study and those who volunteered were randomly divided by the balloting method into 2 equal groups: control and intervention. The control group was given a traditional lecture with the help of a Power point presentation, on the course and markings of the nerves and vessels of the hand and forearm. The intervention group was given an interactive body painting demonstration, with hands-on practice of painting the same vessels and nerves on each other. At the end of these sessions, the students attempted a multiple-choice-question paper and the results were compared using SPSS version 21.00. A questionnaire was also filled by the intervention group to provide the students' perception of the activity.

Results: There was no significant difference between the mean multiple-choice-question scores of the control and intervention group. More than 85% of the students from both the colleges strongly agreed that the session was enjoyable and interesting and also 80% and beyond of students also believed that the exercise would help them to retain knowledge.

Conclusion: The study concluded that there was a negligible difference in knowledge retention between the intervention group and the control group. However, the results of the questionnaire strongly suggested the use of the body painting technique in anatomy curricular teaching as it has proven to stimulate knowledge retention by enhancing students' interest, active participation and peer learning.

Keywords: Body painting, Anatomy, active learning, knowledge retention

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Introduction

Although Anatomy as a subject is considered to be the 'foundation of medical sciences', it is a challenging discipline to teach and learn, especially because of the large volume of content¹. All medical students are required to memorize, reproduce, and apply this core anatomical knowledge of the

human body throughout their undergraduate and postgraduate years. The intricate details of human anatomy, from the macroscopic structures to the microscopic level, require a deep level of comprehension that goes beyond rote memorization. Even the sheer expanse of subject matter can lead to cognitive overload. Students have described this subject as being 'tiring', 'boring' and 'difficult'². Teaching an uninterested class of students, further makes the instructional task arduous for the teachers. With the advent of the active learning theory, anatomists have been compelled to consider using interactive and enjoyable strategies to make anatomy learning effective³. Furthermore, low effec-

^{1,3,4,6} Department of Anatomy, Jinnah Medical & Dental College

² Department of Anatomy, Karachi Medical and Dental College

⁵ Department of Anatomy, Sindh Medical College, Jinnah Sindh Medical University

Correspondence: Nadia Younus
Jinnah Medical & Dental College
Email: nad_younus@hotmail.com
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tiveness of dull didactic lectures and dwindling supply of dissectible cadavers have made the educators shift their attention to more student-centered educational approaches like problem-based and team-based learning and flipped classrooms⁴. One of these engaging methods to learn surface anatomy is body painting⁵.

Surface anatomy is the study of the relationship of deeper structures with surface landmarks and painting them on living bodies⁶. Painting on the body is not a new technique and has been used for ages in different customary rituals as a form of art⁷. Anatomists started exploring it as a form of teaching in the early years of this century and it was formally inculcated in the curriculum of anatomy more than two decades ago⁸. It gave the preclinical medical students an opportunity to consolidate learnt anatomy by relating it to actual living beings. Several studies have found body painting as a valuable tool for learning surface anatomy. These studies have strongly advocated the use of body painting sessions in adjunct with classes of clinical skills teaching⁹. Studies have also reported these sessions to be feasible for the educators in terms of expenses and manpower involved and motivating for the students. When the time required to plan and execute these classes and the impact on learning was weighed against didactic lectures, researchers found these sessions to be more beneficial. In Pakistan, initially, students practiced surface anatomy by marking the structures on a volunteer with white and colored chalk. Separate classes were scheduled in the curricular timetable, especially in the locomotor module where the preclinical medical students identified and traced bony features, muscles, nerves and arteries on the skin. Time constraints and dearth of trained and motivated faculty had slowly shifted the focus away from this activity but recent years saw its revival in the form of colorful body painting in our country.

Research on memory retention further supports the efficacy of such interactive learning strategies.

In medical education, it is imperative for the students to retain the learnt knowledge in short-term memory and then consolidate it into long-term me-

memory. When required in the future, this memory needs to be easily available for recall and application in practical settings. Effective learning and retention are achieved through active engagement of the students, with the knowledge being taught¹⁰. Through active learning strategies, students can determine the pace and degree of their learning. They acquire higher-order critical thinking and decision making through application of their knowledge. These practical application exercises further increase the students' motivation and interest in the subject through immediate feedbacks. These tools are also beneficial in skills training and reflective learning. Body painting, as a pedagogical tool, encompasses the multifaceted advantages of active learning methodologies, thereby enhancing educational engagement of the students and bolstering their retention of knowledge.

The present bicentric study was planned to evaluate the role of a body painting session on short-term retention of knowledge. It further assessed the perception of the students regarding this activity. The students of both public and private medical colleges were recruited in this study to generate local data keeping in mind their different viewpoints and make improvements in anatomy teaching techniques in both these set-ups accordingly.

Methodology

Following ethical approval from the Ethical Research Committee of Sohail University, this interventional study was carried out individually in two medical colleges of Karachi in September and October 2023. The sample size was calculated by using OpenEpi version 3.0. By taking 95% confidence level and 5% margin of error, the calculated sample size for a class of 100 students was 80. Hence, all male and female students of first year MBBS were invited to participate in the study. Those who volunteered, were included in the study. The participants were apprised of the process and purpose of the study. Two groups, control and intervention, were formulated. To ensure the integrity of our study and to prevent selection bias, we employed a randomization process to assign each student to either the control group or the intervention group. A simple randomization method of lottery

draw was used, whereby the names of all the students were written separately on identical slips of paper and placed in a large container. Two separate bins were also labelled 'Control' and 'Intervention'. The head of the Anatomy Department was asked to draw one slip at a time and place the slip alternatively in the two bins, hence assigning separate groups to the students. The 'control group' was given a 30-minute traditional didactic lecture using a PowerPoint presentation about the course and surface markings of the nerves and vessels of the forearm and hand while the 'intervention group' received the same information through a live demonstration of body painting on a volunteer faculty member. The latter group was further divided into smaller groups of 6 students each and was allowed hand-on practice of painting the nerves and vessels on each other for 30 minutes. Water paints of different colors and different-sized paint brushes were used to indicate the radial and ulnar arteries, and radial, ulnar and median nerves, and their supply areas. These sessions were followed by a 10-marks Multiple choice questions quiz attempted by both groups to assess their short-term retention of knowledge. The 'intervention group' was also asked to fill a questionnaire pertaining to their perception of this activity using Likert 5-point scale (an ordinal scale): strongly agree, agree, neutral, disagree, and strongly disagree.

Scores were analyzed using IBM SPSS Statistics (Statistical Package for the Social Sciences software), Version 21.0. The scores were expressed as mean and standard deviation. Analysis of Variance (ANOVA) was applied to compare the scores, with p value significance level of less than or equal to 0.05 at 95% confidence interval. The variables on the questionnaire were tabulated.

Results

The Multiple-choice-question based quiz was applied to evaluate the students' short-term knowledge retention. The results of our study showed that for both the public and private medical colleges the mean scores \pm standard deviation (SD) of the control (n=88) was 7.72 ± 1.55 and intervention group (n=83) was 7.52 ± 1.40 and the difference in scores was not significant ($p = 0.385$) (Table 1).

The stratified mean scores of controls and intervention group of public medical college were 7.98 ± 1.42 and 7.41 ± 1.499 and of the private medical college were 7.38 ± 1.66 and 7.68 ± 1.27 respectively. There was no significant difference between the scores of control and intervention groups in both the colleges ($p = 0.834$ and 0.225 respectively) (Table 1).

Five students each from the control and intervention group of the private medical college and one student from the control and 6 students from the intervention group of the public medical college left during the activity, therefore, their scores and feedback could not be included in the study.

The students completed the questionnaire giving feedback on their perception of this exercise. Figure 1 shows the results of the questionnaire in the form a stacked bar chart. More than half of the students of both the public and private medical colleges strongly agreed (87 & 59.1% respectively) that this session was interesting and fun. Most of them also strongly agreed that it involved active participation (71.7 & 59.1%) which would help them retain the relevant knowledge (81.4 & 61.4%). While 82.6% of the students at the public medical college strongly believed that this exercise helped them indicate important landmarks, only 22.7% of the private medical college students thought that body painting aided them to do so. The majority of the private medical college students were either neutral or just agreed regarding the efficacy of body painting in being able to indicate landmarks. They were also divided in their opinion regarding peer learning facilitation; 71.7% of the public medical college students and only 47.7% private medical college students strongly agreed on this facilitation. When inquired about whether this exercise could be applied to other regions, approximately 59% of the students at public medical college were strongly optimistic about it while most of the students of the private sector were not sure of its efficacy in other regions. Only 2.2% of the students at the public medical college stated that they disagreed that this tool involved active participation of the students and another 2.2% of the students did not agree that

body painting could be applied to other regions. In the private medical set-up, 2.3% of the students did not think that the activity helped them to indicate anatomical landmarks and 2.2% of the students also did not believe that it could be useful in other

parts of the body. No student from either college strongly disagreed with the benefits of body painting sessions, which include being interesting and interactive, aiding in knowledge retention and peer learning, allowing for the indication of landmarks, and being applicable to other regions of the body (Figure 1).

Table 1. Mean scores of controls and intervention groups

Groups	Public medical college		Private medical college	
	Control*	Intervention*	Control*	Intervention*
n	39	34	49	49
Score (Mean + SD)	7.98 ± 1.42	7.41 ± 1.5	7.38 ± 1.66	7.68 ± 1.27
p-value	0.225		0.834	

*Mean ± SD (Standard Deviation)

Figure 1

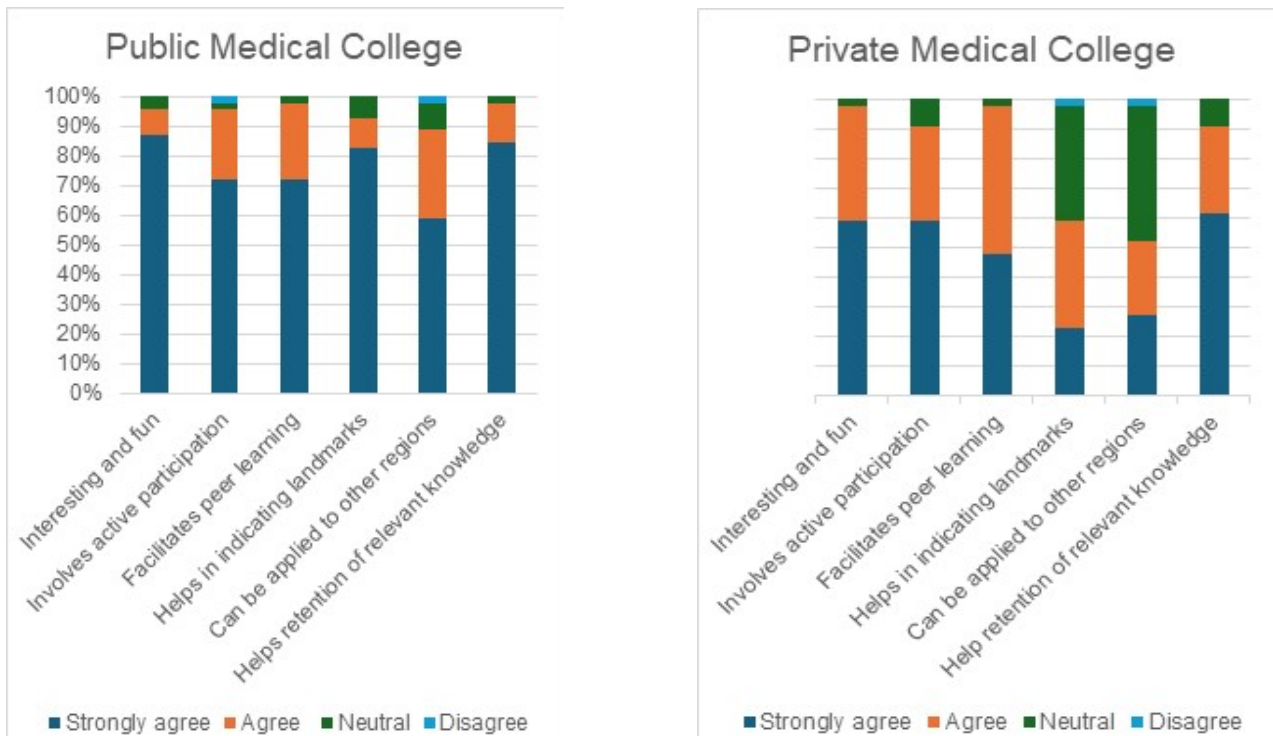


Figure 1: Stacked Bar chart showing results (in percentage) of students' perception questionnaire for public and private medical college.

Discussion

Body painting has been proven to be an effective and popular approach for anatomy education. The exercise encompasses painting anatomical structures on the surface of skin¹¹. The process involves the students learning to inspect, palpate and identify anatomical surface landmarks and then using paints to demarcate them. It has the adaptability to teach both surface as well as gross anatomy and introduce clinical examination skills to the basic sciences' students.

The majority of our students reported this activity to be 'interesting and fun'. This was evident in other studies also^{12,13}. Body painting sessions provided the students with an opportunity to enjoy a hands-on, self-directed learning experience⁹. A study showed it to be very popular amongst all health professions' students¹¹. Another factor that contributed to making these sessions gratifying is the stimulating and positive learning environment because of the use of appealing colors¹⁴.

For most students involved in our study, the body painting activity provided an engaging, motivating, inspiring, and enjoyable exercise, that helped them in active learning, and assisted them to develop a deeper understanding of anatomy. It further helped them to remember the names and positions of anatomical structures¹⁵. They enjoyed this team activity as it stimulated their minds and gave them a break from learning from monotonous intensive reading and/or traditional lectures. The visual along with tactile stimuli facilitate the learning process. Through this exercise the students are also encouraged to change their approach from being mere listeners to becoming canvases for their peers or painters.

The body painting approach not only promotes stronger learning but also knowledge retention and recall as supported by most of our students. This has also been cited by many scholarly articles¹⁵⁻¹⁷. To validate the assessment of retention and recall, a multiple-choice question test was attempted by students in both the control and intervention group. Our results showed no significant difference in the mean scores of the two groups, and hence no significant difference in short-term knowledge retention. Our results correspond with other reports that also show no significant difference in the short-term and long-term retention of knowledge^{18,19}. In contrast, one study demonstrated significantly lesser retention of the intervention group as compared to the control group²⁰. Another study found significantly greater knowledge retention in the intervention group as compared to the control group¹⁶.

Learning from peers has been proven to be beneficial²¹. The public college students strongly agreed with the body painting activity to be representing peer-learning, which the majority of the students at the private medical college did not agree to. Studies have shown that these sessions promote peer learning which enhances deep, meaningful and collaborative learning^{5,15}. Furthermore, when working in groups and teams, body painting sessions help students acquire components of hidden curriculum and soft skills, like team building, empathy, professionalism and communication skills²².

Students also learn to address issues related to clinical examinations and ethics. This experience assists them to be prepared for similar matters that they would encounter in their later clinical years.

More than half of the students at the public medical college agreed that the activity helped them in demonstrating important anatomical landmarks. These study findings confirm the results of an earlier study, where an innovative form of body painting helped undergraduate students to identify and mark anatomical structures using these landmarks²³.

This study was done on the hand and forearm. To make it more feasible, the sessions should be planned and be applicable for other regions as well. In contrast to the private medical students' disagreement, the public medical students opined strongly that this activity 'can' be applied to other regions of the body. This is in accordance with the findings of the study conducted by Finn GM²⁴. In other studies, other regions like the neck, thorax and abdomen have been painted for the teaching and learning of surface anatomy²⁵. Although, there is another study where the students postulated that all regions cannot be painted²⁶.

Our study results correspond with other studies which prove body painting to be a very useful anatomical-teaching tool. The benefits of the body painting sessions are their cost-effectiveness and feasibility, especially when compared with cadaveric dissection^{11,27}. Furthermore, these sessions can be planned and applied to a larger number of students.

Conclusion

Body painting is an effective tool for aiding the interactive learning of medical students and increasing their understanding of gross anatomy. This study provides rationale for inclusion of regular body painting sessions into the curriculum of undergraduate preclinical and clinical medical students as a standard component. This would aid the students who prefer more kinesthetic, hands-on and group learning activities.

Conflict of Interest: None

Disclaimer: None

Source of Finding: None

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