A Pilot Randomized Controlled Trial of Anatomy Coloring Books for First-Year Medical Students: Impact on Anxiety and Anatomical Knowledge Retention

Salomon Fotsing[1,3,4], Lisa Xuan[1], Michel Khoury[1], Hsin Yun Yang[1], Nicole Parent[2], Manon Denis-LeBlanc[1,3,4], Sarvesh Jaunky[1], Alireza Jalali[1,5]

[1] Francophone Affairs, Faculty of Medicine, University of Ottawa, Ottawa, ON, Canada

[2] Médecins francophones du Canada, Montréal, QC, Canada

[3] Institut du Savoir Montfort, Ottawa, ON, Canada

[4] Department of Family Medicine, University of Ottawa, Ottawa, ON, Canada

[5] Division of Clinical and Functional Anatomy, Faculty of Medicine, University of Ottawa, Ottawa, ON, Canada

Correspondence:
Alireza Jalali; ajalali@uottawa.ca

Date Submitted: February 26, 2025
Date Accepted: June 5, 2025
Date Published: December 9, 2025

DOI: https://doi.org/10.18192/UOJM.V15i2.7422

Keywords: anatomy education, teaching-learning strategy, undergraduate medical education, coloring book

ABSTRACT

Objective: Recent pedagogical shifts and limited resources have led many medical schools to adopt alternatives to cadaveric dissection and didactic anatomy lectures. Although some studies have focused on art/drawing as an alternative learning modality, no previous studies have explored coloring books as an accessible way of consolidating anatomy knowledge. We aimed to investigate whether anatomy coloring books could enhance knowledge retention and reduce anxiety in medical students compared to traditional methods.

Methods: First-year medical students (n = 17) at the University of Ottawa were randomly assigned to either an intervention group or a control group. The intervention group received an anatomy coloring page, and the control group received an annotated anatomy diagram with corresponding structures to learn from. Both groups completed questionnaires prior to and after their learning activity to gauge anxiety, and they took serial knowledge tests one week apart to evaluate retention.

Results: Although there were no statistically significant differences in retention test scores between the two groups, the coloring group reported significantly lower levels of anxiety after their learning activity, whereas the control group experienced a significant increase. In addition, the majority of the intervention group (78%) agreed or strongly agreed that coloring helped them consolidate knowledge. Further, students reported that the anatomy coloring book was a good supportive learning tool (67%) and they would recommend it to their friends (78%).

Conclusion; Anatomy coloring books appear beneficial in anatomy education, offering stress reduction and improved knowledge consolidation. However, results should be interpreted cautiously due to the limited sample size.

RÉSUMÉ

Objectif : Des changements pédagogiques récents et des ressources limitées ont conduit de nombreuses écoles de médecine à adopter des alternatives à la dissection cadavérique et aux cours d'anatomie didactiques. Bien que certaines études se soient concentrées sur l'art/le dessin en tant que modalité d'apprentissage alternative, aucune étude antérieure n'a exploré les livres de coloriage en tant que moyen accessible de consolider les connaissances en anatomie. Nous avons cherché à savoir si les livres de coloriage d'anatomie pouvaient améliorer la rétention des connaissances et réduire l'anxiété chez les étudiants en médecine par rapport aux méthodes traditionnelles.

Méthodes : Des étudiants en première année de médecine (n = 17) de l'Université d'Ottawa ont été assignés au hasard à un groupe d'intervention ou à un groupe de contrôle. Le groupe d'intervention a reçu une page de coloriage d'anatomie, et le groupe de contrôle a reçu un diagramme d'anatomie annoté avec les structures correspondantes à apprendre. Les deux groupes ont rempli des questionnaires avant et après l'activité d'apprentissage pour évaluer l'anxiété, et ils ont passé des tests de connaissances en série à une semaine d'intervalle pour évaluer la rétention.

Résultats : Bien qu'il n'y ait pas eu de différences statistiquement significatives dans les résultats des tests de rétention entre les deux groupes, le groupe de coloriage a rapporté des niveaux d'anxiété significativement plus bas après leur activité d'apprentissage, alors que le groupe de contrôle a connu une augmentation significative. En outre, la majorité des membres du groupe d'intervention (78 %) étaient d'accord ou tout à fait d'accord pour dire que le coloriage les avait aidés à consolider leurs connaissances et que le livre de coloriage sur l'anatomie était un bon outil d'apprentissage (67 %) qu'ils recommanderaient à leurs amis (78 %).

Conclusion : Les livres de coloriage d'anatomie semblent bénéfiques pour l'enseignement de l'anatomie, car ils permettent de réduire le stress et d'améliorer la consolidation des connaissances. Toutefois, les résultats doivent être interprétés avec prudence en raison de la petite taille de l'échantillon.

INTRODUCTION

Basic knowledge of human anatomy is fundamental in the field of medicine and essential for clinical practice.[1] Comprehensive anatomy teaching is incorporated into the early curriculum of medical schools worldwide, as it provides students with a solid foundation of knowledge that they can build upon throughout their careers. However, recent shifts in pedagogy have resulted in a reduction of traditional methods of teaching anatomy, such as cadaveric dissections and didactic lectures, and an increase in problem-based and self-directed learning,[2-4] which may not provide the same level of hands-on experience and in-depth understanding of anatomy. Constraints in faculty resources, the scarcity of cadavers, and changes in the demands of the medical profession have prompted many schools to adopt alternatives in anatomy teaching, including prosections and computer-assisted learning.[2,3,5] Although human cadaveric dissection is the preferred teaching method for achieving the expected learning outcomes in a model anatomy curriculum, it has certain drawbacks. One limitation is its inherent lack of responsiveness to interactive investigations such as palpation and percussion.[6] Furthermore, the information acquired from dissection does not readily align with the cross-sectional perspectives commonly presented through imaging methods.[7] Hence, finding alternatives to teaching anatomy has become an even more pressing matter. These teaching methods generally limit students' exposure to anatomy compared to traditional methods .[2,5,8] This is a concern for future patient safety, as well as medical students interested in surgery who need to develop competency in anatomy before entering clerkship .[5,8]

Throughout history, drawing and art have been employed as a method of studying human anatomy to aid students in comprehending relationships between structures.[2,8,9] Many studies have shown that students' confidence and understanding of anatomical structures increase when art is incorporated into anatomy education.[2,8,10] In addition, students reported better retention of anatomical knowledge[11] and greater satisfaction with their learning.[4,8,12] Art modalities are especially effective for students with multimodal or visual learning preferences, comprising approximately 68% of medical students.[13] It has even been found that coloring may stimulate neural connections and foster muscle memory, resulting in increased content retention.[14] Indeed, even by simply selecting a color, the reader is compelled to engage more deeply with the subject matter compared to reading a conventional text.[15] Students transcend the role of a passive reader and become something akin to cocreators, contributing their own perspective and interpretation to the book. The chosen colors for anatomical structures can be influenced by logic, emotion, or wordplay. For example, the radial nerve could be represented by a cool mint blue to symbolize its peripheral location, whereas the muscles it innervates, originating from the lateral epicondyle, could also be depicted in a chilly blue hue; unconventional reasons for color choices can be memorable.[15] As an adjunct to traditional teaching methods, art modalities can be a cost-effective and nonlabor-intensive way to help medical students consolidate anatomical knowledge.[11]

Further, color functions as a powerful information channel to the human cognitive system and has been found to enhance memory performance significantly.[16] In this context, coloring emerges as a valuable tool for the cognitive development of medical students, establishing itself as an essential method for learning anatomy. In fact, artistic methods like body painting have been shown to enhance the understanding of anatomy by involving students through kinesthetic and visual learning. Research has indicated that the hands-on nature and active participation, combined with the striking visual representations of underlying anatomy, significantly contribute to the effectiveness of body painting as a teaching tool. Art modalities utilized in anatomy education include drawing, pipe cleaner models, and three-dimensional (3D) printing. To our knowledge, no one has explored coloring as a method of learning anatomy. Moreover, coloring has been shown to lower depressive symptoms and anxiety in a study involving university students.[17] This added benefit could prove helpful for medical students who are vulnerable to increased stressors such as academic load, financial strain, lack of work–life balance, uncertainty about the future, and decreased sense of personal accomplishment.[2,4,8,10,12,18,19] Furthermore, medical students report higher levels of depression, distress, and burnout compared to their same-aged peers in other fields[18,19,20], making them a particularly appropriate target for the intervention.

Our study aimed to test the hypothesis that anatomy coloring books can decrease anxiety and increase anatomy knowledge retention in first-year medical students compared to conventional learning methods.

MATERIALS AND METHODS

Study Design and Sampling

This study was reported in concordance with the CONSORT guidelines for writing and reading a randomized controlled trial.[21] The complete table is presented in the Supplementary Digital (**Appendix 1**). To assess knowledge retention and anxiety levels, this project was conducted with 17 participants, all of whom provided their verbal consent to participate.

Settings and Participants

The participants were first-year medical students enrolled in the University of Ottawa, Faculty of Medicine, and data collection took place from November 15 to December 13, 2018. To ensure that the results were not influenced by prior exposure to formal cadaveric anatomical pedagogy, participants with such prior experience were excluded from the study, and the study was conducted before these students received the course on mediastinal anatomy. This exclusion criterion helped to ensure that all participants had a similar baseline level of anatomical knowledge 11 and were not advantaged or disadvantaged based on prior educational exposure.

Recruitment and Randomization

Seventeen first-year medical students were recruited through an email. No financial compensation or academic credits were awarded for their participation in the study. The students were randomly assigned to either the conventional studying group (control group, n = 8) or the coloring group (intervention group, n = 9). It is important to note that participants were randomly assigned to groups in order to minimize bias. The research assistant assigned students to either the control or intervention group using an online randomizer tool.

Blinding

In this project, single-blind randomization was used. Thus, to minimize participant bias, participants did not know whether they belonged to the "control" or "intervention" groups, so they could not influence the results.

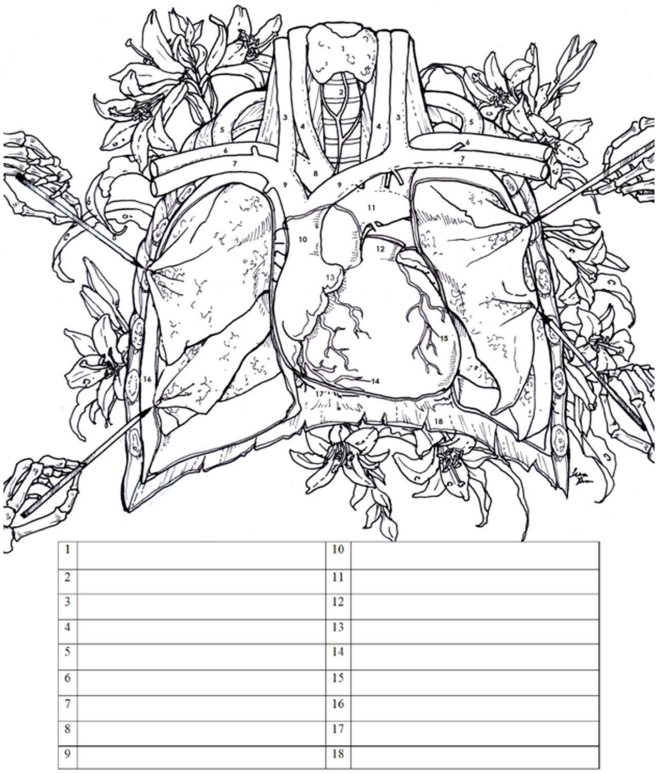
Data Collection and Outcome Measures

The data collection was carried out at the Anatomy Division, Faculty of Medicine, University of Ottawa. The study's primary objective was to evaluate knowledge retention, comparing the conventional studying group and the coloring group. Additionally, the study aimed to measure anxiety levels in both groups before and after the learning activities. Pre- and post-tests were administered to assess knowledge retention, whereas the Trait Anxiety Inventory (TAI)[22] questionnaires were used to measure anxiety levels. By utilizing a randomized controlled trial design and applying specific inclusion and exclusion criteria, the study aimed to provide valuable insights into the effects of conventional studying and coloring studying on knowledge retention and anxiety levels among first-year medical students.

Intervention

The control group received a conventional study aid—that is, an annotated diagram of the mediastinum from the eighth edition of the *Atlas of Human Anatomy* (**Appendix 2**).[23] The intervention group was provided with a coloring page depicting the relevant anatomy, taken directly from physical coloring books designed at the University of Ottawa's Faculty of Medicine (**Figure 1**). Both modalities incorporated the same 18 mediastinal anatomical parts.

Stage 1: The control and intervention groups completed the Trait Anxiety Inventory (TAI)[22] as a pretest. This validat-



1		10	
2		11	
3		12	
4		13	
5		14	
6		15	
7		16	
8		17	
9		18	

Figure 1. Anatomy coloring page depicting mediastinal structures, provided for the intervention

ed 20-item tool is widely used in research to measure students' state of anxiety and anxiety traits.[24] In other words, the student who fills in this questionnaire shares 1) how they feels at a particular moment and 2) how they feels generally.

Stage 2: Both groups studied mediastinal anatomy over a 20-minute period in a self-directed activity. We relied on the similar time required for medical students to study comparable content. The control group members did not have to write or draw on their annotated diagram, which was taken from a human anatomy atlas. The intervention group was instructed to color and label a coloring page depicting mediastinal anatomical structures and to complete the coloring activity on physical paper (**Appendix 3**).

Stage 3: After participants finished their respective learning activities, they completed the TAI for a second time.

Stage 4: Following Stage 3, students proceeded to the anatomy lab to examine cadaveric prosecutions of the mediastinum. Two-dimensional (2D) to 3D knowledge translation was assessed by giving students 10 minutes to identify 10 labeled structures (**Appendix 4**). This tool was designed by a multidisciplinary research team including anatomy professors involved in exam question design and student evaluation at the University of Ottawa's Faculty of Medicine. To perform the knowledge test, students were instructed to identify 10 parts of the mediastinum previously labeled on a cadaver in the anatomy laboratory. To do so, they completed a grid numbered from 1 to 10. This tool has not yet been validated. However, discussions were held within the team in order to reach agreement on the ideas of the team members, particularly with regard to the parts to be identified an anatomy teacher member of the research group graded the results.

Stage 5: After leaving the anatomy lab, students in the intervention group completed an online qualitative questionnaire about their learning habits and their perception of the anatomy coloring activity. The research team, which includes students, anatomy professors, research professionals, and medical education experts, created and revised the questionnaire. After its initial preparation by the research assistant, it was first distributed to team members for suggestions and comments, after which they met to reestablish concordance. The points of discussion at the meeting concerned the content of the items, the scoring of the items, and the chronological order of the items. In the event of disagreement, the discussion remained open until a consensus was reached.

Stage 6: Long-term knowledge retention[17] was assessed with a cadaveric mediastinal anatomy test 3 weeks after the initial intervention, with students been informed in advance of the test. Students were prompted to identify another 10 labeled structures (**Appendix 4**) in 10 minutes.

Data Analysis

Anxiety

Anxiety was evaluated in Stages 1 and 3 with the TAI, which was adapted from Spielberger's State-Trait Anxiety Inventory.[22,24] Students self-rated their level of anxiety using a four-point Likert scale (*not at all, somewhat, moderately*, and *very much*) for 14 items. One example of an item from the questionnaire is "I feel tense, stressed." An analysis of variance (ANOVA) was conducted to determine whether a statistically significant difference in anxiety could be observed between the conventional studying group and the coloring group before and after their respective interventions.

Cadaveric Posttest and Knowledge Retention

Students in both groups completed serial posttest in Stages 4 and 6. Repeated measures of analysis of variance (ANOVA) on two factors (time and group) were conducted to determine if a difference in scores could be observed between the coloring group and the conventional studying group. Tests were two-tailed, and a p-value of 0.05 or less was considered statistically significant.

Perception

Student perceptions were assessed in Stage 5 using a Likert questionnaire (options included *strongly disagree, disagree, neutral, agree*, and *strongly agree*). The questions assessed students' appreciation for coloring as a learning modality and its efficacy in translating 2D to 3D knowledge. The intervention group was exclusively surveyed, as the control group was not exposed to anatomical coloring.

RESULTS

A total of 17 first-year medical students agreed to take part

in this project. They were randomly assigned to one of two groups: the intervention group (n = 9) and the control group (n = 8).

Anxiety

The comparison between pre- and posttest shows a significant interaction between time (pre- vs. posttest) and group (coloring vs. conventional studying) with an F(1,14) value of 11.613 and a p-value of 0.004. The effect size, as measured by the partial eta squared (ηp^2), was 0.453, indicating a medium effect size and that the coloring group showed a decrease in state anxiety after their intervention, whereas the conventional studying group showed an increase in state anxiety after their intervention.

Cadaveric Posttest and Knowledge Retention

In terms of improving knowledge and retention, there were no significant differences over time (p = .755) or by group (p = .933), as well as no significant interactions between group and time (p = .246).

Perception

67% of participants considered the anatomy coloring book a valuable supportive learning tool, while 78% expressed their willingness to recommend it to their friends (**Table 1**). Approximately half of the intervention group reported that the anatomy coloring book enhanced their confidence in translating 2D knowledge to a 3D understanding. Participants also highlighted that the coloring book aided in developing spatial orientation skills for the tested 3D structures. These outcomes suggest that the use of coloring as a learning technique positively impacted participants' perception of their anatomical knowledge acquisition.

DISCUSSION

In this study, the effectiveness of coloring as a method to consolidate anatomical knowledge retention, as well as develop 2D to 3D knowledge translation and its effect on stress reduction during the learning process, was explored for the first time. The study findings revealed no statistically significant differences in the scores between the two groups on the immediate posttest or long-term knowledge retention posttest 3 weeks later. However, it is possible that the effect was present but small, and so the power of the study was not sufficient to detect such an effect.

Our results also report a significant interaction between the time and group (F(1,14) = 11.613, p = 0.004, ηp^2 = 0.453, medium effect size), indicating that the coloring group's state anxiety decreased after their intervention, whereas the state anxiety for the conventional studying group increased after their intervention. This suggests that the new learning strategy of coloring can improve student satisfaction and reduce stress while maintaining similar knowledge retention in the same amount of time compared to conventional studying by reading. This is consistent with the findings of Eaton and Tieber, who showed that engaging in traditional coloring, without specific instructions, for a short period can decrease anxiety and potentially enhance perseverance on challenging tasks. Providing coloring opportunities to individuals with anxiety could not only alleviate their anxiety but also promote proactive behavior.[25]

Moreover, most of the intervention group indicated that coloring helped to consolidate their anatomical knowledge (78%) and that coloring was a good learning tool (67%), which they would recommend to their friends (78%). The findings from the perception questionnaire indicate a positive response from most participants in the intervention group regarding the effectiveness of coloring as a tool for consolidating anatomical knowledge. The majority (78%) of the intervention group agreed or strongly agreed that coloring helped them in this regard. Various colors can have stylistic effects in anatomical representations, emphasizing organs or structures and enabling the highlighting of ele-

Table 1. Perceptions of students in the intervention group (anatomy coloring)

Perception	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Q1: Coloring helped me learn anatomy	0	0	2 (22.22%)	4 (44.44%)	3 (33.33%)
Q2: I will use coloring/drawing to learn anatomy in the future	1 (11.11%)	0	4 (44.44%)	3 (33.33%)	1 (11.11%)
Q3: Anatomy coloring book is a good support	0	1 (11.11%)	2 (22.22%)	5 (55.55%)	1 (11.11%)
Q4: Anatomy coloring book increased my confidence to apply 2D to 3D	0	2 (22.22%)	3 (33.33%)	4 (44.44%)	0
Q5: Coloring helped with spatial orientation for 3D structure	0	0	5 (55.55%)	3 (33.33%)	1 (11.11%)
Q6: I would recommend the coloring book to a friend	0	0	2 (22.22%)	6 (66.66%)	1 (11.11%)

ments to create a 3D organization within a 2D representation.[26] For instance, using color to distinguish between complex organs can aid in differentiating branches of blood vessels, especially in cases like cerebral blood vessels that exhibit intricate 3D paths.[27] Approximately half of the intervention group would continue to use coloring or drawing to learn anatomy as it assisted with developing their confidence in knowledge translation and the spatial orientation of 3D anatomical structures. Overall, the findings of this study suggest that coloring can be a promising adjunctive method for learning anatomy, as it not only supports knowledge retention but also has a positive impact on students' mental well-being.

Limitations

We acknowledge that the sample size in this study was relatively small (n = 17), and the sample size power analysis was not performed for this study, so the results should be interpreted with caution. This limitation may be attributed to the few numbers of eligible students at the Faculty of Medicine at the University of Ottawa, which led to a lower participant count. Even if the project was in the category of improving teaching quality, participation was voluntary. Self-selection bias, as well as the self-reported nature of the survey, is another limitation, which can lead to subjectivity bias, particularly in non-validated surveys completed by the intervention group. While the TAI is a validated tool, it still lacks of physiological measures (e.g., heart rate, cortisol), which could provide more objective data. This study focused on anatomical structures in the mediastinum for knowledge retention, but it would be interesting to explore any significant differences in knowledge retention and stress reduction in more complex anatomical systems. Nonetheless, these findings provide preliminary evidence to support the use of coloring interventions as a potential tool to reduce state anxiety among medical students. Our study model could be used as a pilot for future studies with larger samples to increase statistical power. Furthermore, baseline anxiety may have been over- or under-skewed by outliers. A solution for this limitation may involve starting an induction of anxiety exercises, which could potentially homogenize baseline scores.

CONCLUSION

Anatomy education is a vital component of the medical curriculum for students. In the modern age, anatomy pedagogies have evolved, with a decrease in traditional cadaveric dissection and an increase in self-directed learning. Overall, less time is devoted to anatomy education, which means new effective learning modalities should be explored. In addition, medical students have higher rates of burnout and distress compared to their peers. Our study explored anatomy coloring books as a learning modality and a way to decrease students' anxiety. Although the coloring group did not significantly differ in anatomical knowledge acquisition and retention compared to the traditional self-studying group, a significant decrease in anxiety was observed after the intervention, as well as strong support for using coloring as a recommended learning tool to consolidate anatomical knowledge. We hope to use this pilot study to explore further how coloring may positively influence knowledge retention and anxiety for medical students in the future. Because of the limitations in this study, the results should be interpreted with caution and further research with a larger sample size, a greater variety of anatomical systems as tested topics, and additional long-term time points to test how anatomical knowledge consolidation can better determine the effectiveness of coloring and support the consideration of integrating this learning strategy into the anatomy curriculum.

REFERENCES

1. Singh R, Yadav N, Pandey M, Jones DG. Is inadequate anatomical knowledge on the part of physicians hazardous for successful clinical practice? Surg Radiol Anat SRA. 2022 Jan;44(1):83–92.
2. Borrelli M, Leung B, Morgan M, Saxena S, Hunter A. Should drawing be incorporated into the teaching of anatomy? J Contemp Med Educ. 2018;6(2):34-48
3. Singh V, Kharb P. A paradigm shift from teaching to learning gross anatomy: meta-analysis of implications for instructional methods. J Anat Soc India. 2013 Jun;62(1):84-9
4. Noorafshan A, Hoseini L, Amini M, Dehghani MR, Kojuri J, Bazrafkan L. Simultaneous anatomical sketching as learning by doing method of teaching human anatomy. J Educ Health Promot. 2014 May 5;3:50.
5. Estai M, Bunt S. Best teaching practices in anatomy education: A critical review. Ann Anat-Anat Anz. 2016 Nov;208:151–7.
6. McLachlan JC, Bligh J, Bradley P, Searle J. Teaching anatomy without cadavers. Med Educ. 2004 Apr;38(4):418–24.
7. Kerby J, Shukur ZN, Shalhoub J. The relationships between learning outcomes and methods of teaching anatomy as perceived by medical students. Clin Anat. 2011 May;24(4):489-97.
8. Joewono M, Karmaya INM, Wirata G, Widianti IGA, Wardana ING. Drawing method can improve musculoskeletal anatomy comprehension in medical faculty student. Anat Cell Biol. 2018 Mar;51(1):14–8.
9. O'Byrne PJ, Patry A, Carnegie JA. The development of interactive online learning tools for the study of Anatomy. Med Teach. 2008 Jan;30(8):260–71.
10. Alhamdani FY, Hatem HA. Drawings as learning aid for the human anatomy students' based evaluation. J Oral Health Craniofacial Sci. 2017 Oct;2(4):090–5.
11. Alsaid B, Bertrand M. Students' memorization of anatomy,

influence of drawing. Morphologie. 2016 Mar;100(328):2-6.
12. Lefroy H, Burdon-Bailey V, Bhangu A, Abrahams P. A novel technique for teaching the brachial plexus. Clin Teach. 2011 Sep;8(3):196-9.
13. Kharb P, Samanta PP, Jindal M, Singh V. The learning styles and the preferred teaching-learning strategies of first year medical students. J Clin Diagn Res. 2013 Jun;7(6):1089-92.
14. Dempsey BC, Betz BJ. Biological drawing: A scientific tool for learning. Am Biol Teach. 2001 Apr;63(4):271-9.
15. McConnell J. The anatomy coloring book. British Medical Journal Publishing Group; 2012 Nov .
16. Dzulkifli MA, Mustafar MF. The influence of colour on memory performance: a review. Malays J Med Sci. 2013 Mar;20(2):3-9.
17. Beers GW, Bowden S. The effect of teaching method on long-term knowledge retention. J Nurs Educ. 2005 Nov;44(11):511-4.
18. McMenamin PG. Body painting as a tool in clinical anatomy teaching. Anat Sci Educ. 2008 Jul-Aug;1(4):139-44.
19. Dyrbye LN, West CP, Satele D, Boone S, Tan L, Sloan J, Shanafelt TD. Burnout among U.S. medical students, residents, and early career physicians relative to the general U.S. population. Acad Med. 2014 Mar;89(3):443-51.
20. Hill MR, Goicochea S, Merlo LJ. In their own words: stressors facing medical students in the millennial generation. Med Educ Online. 2018 Dec;23(1):1530558.
21. Schulz KF, Altman DG, Moher D; CONSORT Group. CONSORT 2010 statement: updated guidelines for reporting parallel group randomised trials. BMJ. 2010 Mar 23;340:c332.
22. Spielberger CD. State-trait anxiety inventory for adults. Palo Alto, CA: Mind Garden; 1983.
23. Netter FH. Netter Atlas of Human Anatomy: Classic Regional Anatomy Approach. In: ClinicalKey. 8th ed. Elsevier; 2022.
24. Ramanaiah NV, Franzen M, Schill T. A psychometric study of the State-Trait Anxiety Inventory. J Pers Assess. 1983 Oct;47(5):531-5.
25. Eaton J, Tieber C. The Effects of Coloring on Anxiety, Mood, and Perseverance. Art Ther. 2017 Jan;34(1):42-6.
26. Clavert P, Bouchaïb J, Duparc F, Kahn JL. A plea for the use of drawing in human anatomy teaching. Surg Radiol Anat. 2012 Oct;34(8):787-9.
27. Segawa H, Araki N, Miki A, et al. Creation of Stereo-paired Color Vascular Anatomical Charts Using 3-dimentional Images. Nihon Hoshasen Gijutsu Gakkai Zasshi. 2022 Jan ;78(1):62-71.

Conflicts of Interest Disclosure
There are no conflicts of interest to declare.

Additional Information
Supplementary information is available at https://doi.org/10.18192/UOJM.V15i2.7422