

The value of supplementary anatomy workshops for improving undergraduate performance

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Background: With many anatomy courses within the medical curriculum suffering reductions in lecture and dissection time, supplementary programs in anatomy have shown to improve performance of medical students. This study was conducted to evaluate the efficacy of anatomy workshops on undergraduate anatomy grade performance.

Methods: From 2012 to 2014, mean anatomy and physiology scores of medical students who attended anatomy workshops were compared to those who did not attend. Furthermore, mean scores in anatomy were also compared between students who attended one workshop to those who attended multiple workshops. Data analyses included comparing mean test scores using Student's *t*-test for normally distributed data.

Results: A total of 55 medical students were included in this study. Significant differences in both anatomy ($p < 0.0001$) and physiology ($p = 0.0113$) scores were found between medical students who attended the anatomy workshops versus those who did not. Similarly, medical students who attended multiple workshops, compared to those that attended a single workshop, obtained significantly higher anatomy grade performance ($p = 0.0043$).

Conclusion: The results of this study are supported by comparable studies that have shown similar improvements in grade performance. In a time where reduced undergraduate medical teaching time is prevalent, supplementary education in the basic sciences, with an emphasis on anatomy, may prove a successful adjunct to the medical curriculum.

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Introduction

Anatomy is regarded as a pillar of medical education.¹ A sound knowledge of anatomy is essential for medical education and surgical training.² The last 15 years have seen major changes to the medical curricula throughout the world.³ The Problem-based Learning (PBL) curriculum involved the simultaneous introduction of the basic science instruction with the clinical science instruction.⁴ The rigid pre-clinical and clinical divide has to a large extent been eliminated, and exclusive department based courses are a thing of the past. Unfortunately, the new curriculum has resulted in a significant reduction in teaching of the basic sciences, including anatomy.

Many practising clinicians are of the opinion that graduates of the new medical curricula have limited knowledge in basic anatomy.⁵ Furthermore, retention of anatomical knowledge continues to be one of the greatest challenges experienced by medical students.⁶ Despite this, many institutions have implemented supplementary education programs which have

been shown to improve medical student performance in the basic sciences, including anatomy.⁷

The University of Cape Town (UCT) Surgical Society is a student-run society established in 2006 to promote surgery amongst undergraduate medical students and offers regular anatomy workshops to students as an educational tool supplementing the medical curriculum.⁸ The aim of the current study was to determine the efficacy of these anatomy workshops in improving knowledge in anatomy amongst undergraduate medical students.

Methodology

Design and Population

This descriptive cross-sectional study was approved by the UCT Human Research Ethics Committee (HREC REF 175/2015). The population studied included Bachelors of Medicine and Surgery (MBChB) students within the UCT

Health Sciences Faculty, who had been enrolled between 2012 and 2014. The UCT MBChB degree comprises six years of full-time academic and clinical study, with years two and three forming the foundation for teaching the basic sciences. All participants had completed the anatomy courses offered by the faculty, as well as all the anatomy examinations in the curriculum in year two and three.

Anatomy Workshop

The anatomy workshops were held every quarter during the medical academic year. Each workshop was attended by medical students who were members of the UCT Surgical Society. All medical students were required to sign-up online and accepted on a 'first come, first serve' basis. The anatomy workshops held between 2012 and 2014, which are the subject of this study, focused on the following: Head and Neck, Orthopaedic (upper and lower limb), Abdominal and Cardiothoracic Anatomy.

The structure of the workshop included a 30-minute introductory didactic lecture describing the anatomy of the system on which the workshop was based. Though the lectures were abbreviated in terms of time, similar principles taught in the UCT MBChB academic curriculum were covered. The workshop continued with a three- to four-hour practical cadaver dissection with a surgeon specialising in that anatomical region. The dissection allowed for practical learning as the medical students assisted the surgeon during the dissection. In addition to the surgeon describing the anatomy throughout the dissection, explanations of basic surgical principles and procedures were explored. The content of each practical dissection varied as each workshop was conducted by a surgeon specialising in that specific discipline. Finally, a 30-minute post-workshop discussion was held with both surgeon and medical students. The discussion was designed to allow students to ask questions, both clinical and theoretical, that were either unclear during the didactic lecture, or during the practical cadaver dissection.

Data analysis

Students who attended the UCT Surgical Society anatomy workshops were assigned into the workshop group, whereas all other enrolled medical students in that specific year were placed within the control group. The UCT MBChB examinations in years two and three consisted of four

assessments per year. The exams included: written short-answer questions (SAQ), computer based multiple-choice and extended matching questions (MCQ), as well as an objective structured practical examination (OSPE). The examinations of the curriculum assessed all the basic sciences including anatomy, physiology, biochemistry, histology and pathology. The examinations covered content taught to all medical students throughout the UCT academic year.

Test scores in each exam were coded and randomised on a spread sheet in Microsoft Excel (Microsoft Corp, Redmond, WA), maintaining students' confidentiality. Anatomy and physiology test scores of each participant were extracted from each exam. The individual scores from each exam were added and a mean score was calculated for each participant. Data was imported and analysed using software on STATA SE (StataCorp LP, College Station, TX). Statistical analysis included comparing mean test scores of the workshop and control groups, using Student's *t*-test for normally distributed data, in each year from 2012 to 2014. Furthermore, grades of medical students who attended one anatomy workshop were compared to those who attended multiple workshops. Statistical significance was accepted with a *p*-value of less than 0.05.

Results

A total of 139 medical students attended the anatomy workshops between 2012 and 2014. Eighty-four students were excluded because they had not written the relevant examinations as they were not in either year two or three between 2012 and 2014. The remaining 55 participants were allocated to the workshop group. The control group was made up of 1 164 medical students who were eligible to participate in this study.

The mean scores in anatomy for all the examinations during the 3-year study period were significantly higher in the workshop group compared to the control group (67.65 ± 8.58 versus 56.38 ± 12.14 ; $p < 0.0001$) as shown in Figure 1. The mean scores in anatomy were also significantly higher in the workshop group compared to the control group in each individual year of the study, as shown in Table 1.

Table 1: Comparison of anatomy grade performance between control and workshop groups from 2012 to 2014

	2012		2013		2014	
	Control	Workshop	Control	Workshop	Control	Workshop
n	388	11	368	45	408	34
mean ± SD	54.73 ± 9.30	64.04 ± 10.70	53.72 ± 13.70	68.71 ± 9.68	60.33 ± 12.04	64.90 ± 9.48
CI	53.81 - 55.66	56.86 - 71.23	52.32 - 55.13	65.80 - 71.62	59.16 - 61.50	61.59 - 68.20
p-value	0.0012		< 0.0001		0.0316	

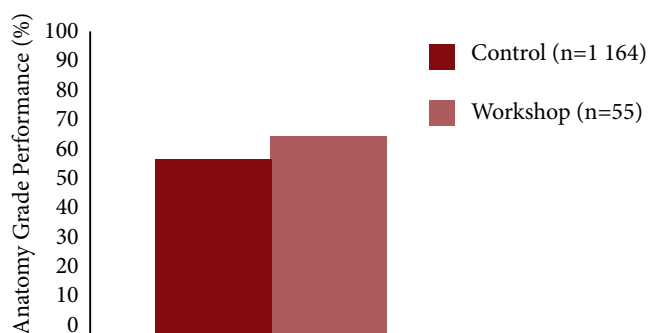


Figure 1. Overall mean anatomy grade performance from 2012 to 2014

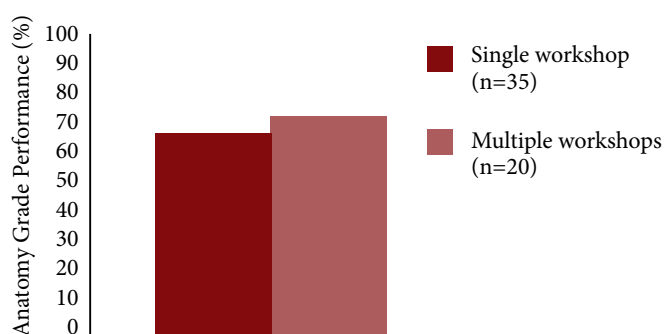


Figure 2. Mean anatomy grade performance of workshop group attending single and multiple workshops from 2012 to 2014

There were 20 participants who attended more than one anatomy workshop which resulted in a total of 90 attendances to the workshops between 2012 and 2014. The mean scores in anatomy were significantly higher in the students who attended multiple anatomy workshops compared to those who only attended a single workshop (71.92 ± 9.68 versus 65.21 ± 6.90 ; $p = 0.0043$), as shown in Figure 2.

The mean scores in physiology for all the examinations during the 3-year study period were significantly higher in the workshop group compared to the control group (64.47 ± 13.73 versus 59.86 ± 13.42 ; $p = 0.0113$) as shown in Figure 3. The mean scores in physiology were also significantly higher in the workshop group compared to the control group in each individual year of the study, as shown in Table 2.

Discussion

The UCT Surgical Society was established in 2006 to promote surgery amongst undergraduate medical students. In addition to hosting monthly talks by specialised surgeons, surgical skills workshops and research opportunities, the society offers supplementary anatomy workshops which include lectures, cadaveric dissections, as well as an opportunity for small group discussion on the theoretical and practical application in the study of anatomy. The current study was designed to determine whether the supplementary anatomy workshops organised by the UCT Surgical Society had any impact on the performance of undergraduate medical students in the anatomy examinations. Significantly improved scores in anatomy examinations were achieved by students who attended the anatomy workshops when compared to those who did not. Furthermore, significantly higher scores were achieved in each year from 2012 to 2014 by the students who attended the workshops. These results are corroborated by other studies which observed similar significant improvements in test scores following participation in additional learning opportunities outside of the standard curriculum.^{9,10}

In addition to extra-curricular teaching being of benefit to students studying anatomy, it has been shown that the duration of such teaching can likewise influence grade performance. A study conducted by Peterson and Tucker¹¹ illustrated that the longer the course in anatomy, consisting of lectures and dissection, the greater the improvements in both the test scores and understanding of concepts among students. This was supported by the finding in the current study which showed

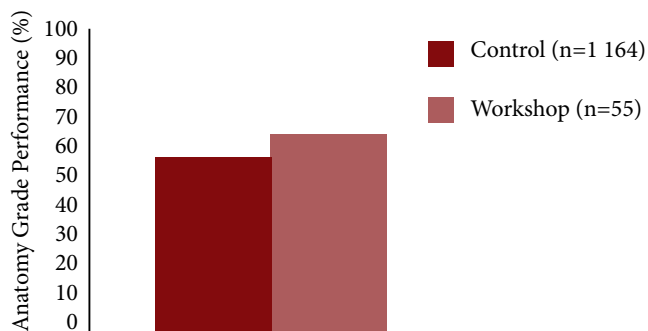


Figure 3. Overall mean physiology grade performance from 2012 to 2014

Table 2: Comparison of physiology grade performance between control and workshop groups from 2012 to 2014

	2012		2013		2014	
	Control	Workshop	Control	Workshop	Control	Workshop
n	388	11	368	45	408	34
mean ± SD	58.84 ± 13.14	72.05 ± 10.40	53.63 ± 13.49	62.01 ± 14.26	66.49 ± 10.32	74.39 ± 8.38
CI	57.53 - 60.15	65.07 - 79.04	52.25 - 55.02	57.72 - 66.29	65.48 - 67.49	71.46 - 77.31
p-value	0.0010		0.0001		<0.0001	

that participants who attended more than one workshop in the given time period obtained statistically higher mean scores compared to participants who attended a single workshop.

It could be argued that the students who attended the anatomy workshops were students who were more enthusiastic, more dedicated and harder working than the average student, and therefore not surprisingly achieved higher grades in the anatomy examinations. This was supported by the finding that the same students also achieved significantly higher grades in the physiology examinations. However, in support of a positive influence of the anatomy workshops was the finding that the students who attended multiple workshops did significantly better in the anatomy component of the examinations than the students who only attended a single workshop.

Conclusion

This study found significant improvements in mean grade performance in students who attended anatomy workshops. In a time where reduced undergraduate medical teaching time is prevalent, supplementary education in the basic sciences, with an emphasis on anatomy, may prove a successful adjunct to the medical curriculum. Though a large body of research has been conducted on the efficacy of supplementary programs at medical schools, it is imperative that further research be conducted to determine the extent of its impact.

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