The Impact of Images on Anatomy Scores in Nursing Students

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Introduction

Anatomy has been a foundational class in the curricula of medical and other health related-disciplines. There are many tools for teaching anatomy which approach learning through both verbal and visual means including textbooks, online modeling and computer software, dissection of cadavers or other preserved specimens and anatomical models (Drake RL, 2014). Practical examinations in anatomy assess visual knowledge through slides, labeled tissues, and body images, but the impact of using images in written examinations is less understood. Research shows that visualization can increase confidence in learning and retention of long-term knowledge (Bartholome and Bromme, 2009) while potentially altering learner's cognitive load, memory, and examination anxiety and stress (Mayer RE, 2005). Most of the studies on the effects of including images on anatomy examinations are focused in medical, pre-nursing, or pre-health science students but have not yet been assessed in nursing students.

Purpose

To determine the effects of images on nursing students' anatomy examination scores, examinations containing multiple-choice questions with greater or lesser anatomical images were assessed.

Methods

This study was conducted in Fall 2017 and was comprised of two sections of human anatomy, with 75-80 students each. A total of 3 anatomy examinations with multiple-choice questions (MCQ) were included in this study. In examination 1, section 1 (Sec. 1) consisted of 66 multiple-choice questions and 13 images, compared to 66 MCQs with only 5 images in section 2 (Sec. 2). This was reversed for examination 2, with 62 questions and 11 anatomical in section 2 compared to 62 questions with only 5 images in section 1.

Methods- cont'd

In examination 3, both sections 1 and 2 consisted of 120 questions and 9 identical anatomical images.
The data from all 3 examinations for each section was expressed as means and standard deviation (SD) after statistical evaluation by using the on-line Usable ∑ (Sigma) statistical tool and 2- sample t-tests. From each examination, the scores of individual questions containing images were pooled and compared to questions without images, with their means expressed as percent (%) scores.

Results

Results show that inclusion of more anatomical images in a MCQ anatomy examination in section 1 significantly ($P<0.05$) increased their percent class average compared to a similar examination with fewer images in section 2 (Figure 1). Reversing this order in examination 2 showed that reducing the number of images by 50% in anatomy section 1 resulted in a significant decrease ($P<0.01$) in their percent class average compared to an image-rich examination in section 2 (Figure 1). However, the third anatomy examination containing an equal number of images in both anatomy sections led to comparable percent class averages. Interestingly, the percent score of individual questions from the examinations with images was significantly higher ($P<0.01$) than the same questions without images (Figure 2 and Table 1).

Figure 1

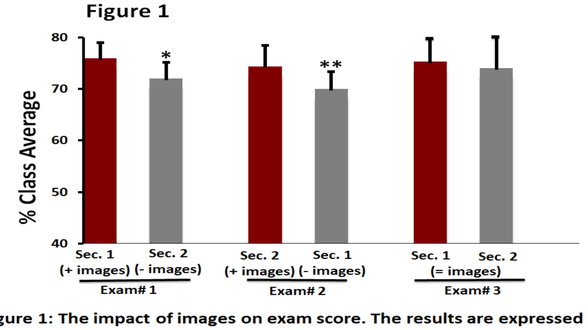


Figure 1: The impact of images on exam score. The results are expressed as mean + SD and converted into a percent class average. * <0.05 compared to Sec.1 and ** <0.01 compared to Sec. 2

Results - cont'd

Figure 2

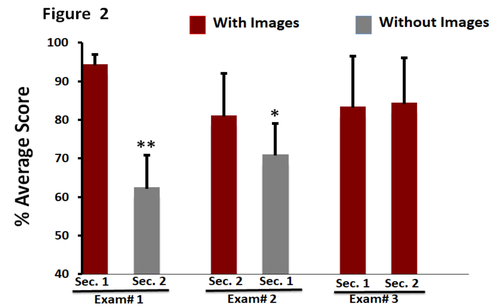
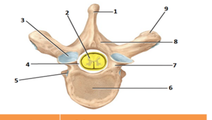


Figure-2: Comparison between the average scores of all the questions with images versus the average score of the same questions without images. The results are expressed as means + SD and converted into percent scores.
* <0.05 compared to Sec.1 and ** <0.01 compared to Sec. 2

Table 1: An example of the inclusion of a human thoracic vertebrae as a reference figure in one anatomy examination. The percent score of 3 pooled questions was calculated based on the use of this figure compared to the same questions with text only.



Questions	% score with images	% score without images
1. Which structure separates the spinous processes from the transverse processes in a typical vertebra?	68.0%	59.7%
2. Which structure passes through 'vertebral foramen'?	79.2%	68.8%
3. Which structure serves as the attachment site for the 'facet for head of rib'?	56.9%	25.9%

Discussion & Conclusions

The present study has evaluated the impact of images on examination scores in two ways; one by increasing or reducing the number of images in anatomy examinations and comparing the overall exam score, and secondly, by examining the percent score of individual questions with images compared to those without images. Results clearly indicate that inclusion of images in the multiple-choice question examinations increases the mean examination score as well as performance on individual questions containing images, which is consistent with similar studies carried out in medical students (Butcher KR, 2009).

Discussion & Conclusions-cont'd

In conclusion, depending on the type of images used, image inclusion in anatomy examinations can have a positive impact on recall of anatomical knowledge and may provide a hint to an answer in anatomy examinations for nursing students. Studies are now underway to evaluate whether inclusion of images in anatomy examinations reduces cognitive load, examination anxiety and stress, and helps nursing students retain anatomical knowledge.

Acknowledgement

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