

Modern Anatomy Resources; Is anatomical variation being neglected?

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Introduction

Human anatomy remains at the cornerstone of modern medical curricula and it is generally accepted that clinical examination cannot be carried out correctly without detailed knowledge of anatomy.

In addition to 'normal' human anatomy, a distinct number of anatomical variations are well described in scientific journals and an awareness of these is important in a clinical context. For example, knowledge of the possibility of anatomical variants of the aortic arch has significant importance in surgical and interventional radiological procedures.

Traditionally, knowledge of these anatomical variants would have been gained by cadaveric dissection or by reading detailed anatomical textbooks such as Gray's Anatomy©. However, newer, modern teaching aids such as anatomy flashcards, online videos and smartphone apps are now gaining precedence over textbooks for modern medical students. There is a lack of data evaluating how much detail about anatomical variation is delivered by these modern resources.

Therefore, the aims of this study was twofold:

- The primary aim was to critically assess modern learning resources' coverage of anatomical variation.
- Secondly, we wished to evaluate the incidence of anatomy app usage amongst first year medical students at our institution.

Methods

Prior to initiating the study, nine clinically relevant anatomical variations were chosen as tools to assess various anatomy learning resources.

These included the circle of Willis, thyroid ima artery, sciatic nerve, biliary tree, palmaris longus, cervical rib, arch of aorta, accessory pancreatic duct and position of the vermiform appendix.

Resources assessed included smartphone apps, Acland's anatomy©, Netter's flashcards© and Grays anatomy© and were compared against relevant peer-reviewed articles.

In order to objectively compare each resource, a score from 0-3 was allocated to each resource for each anatomical variation (see table 1 below).

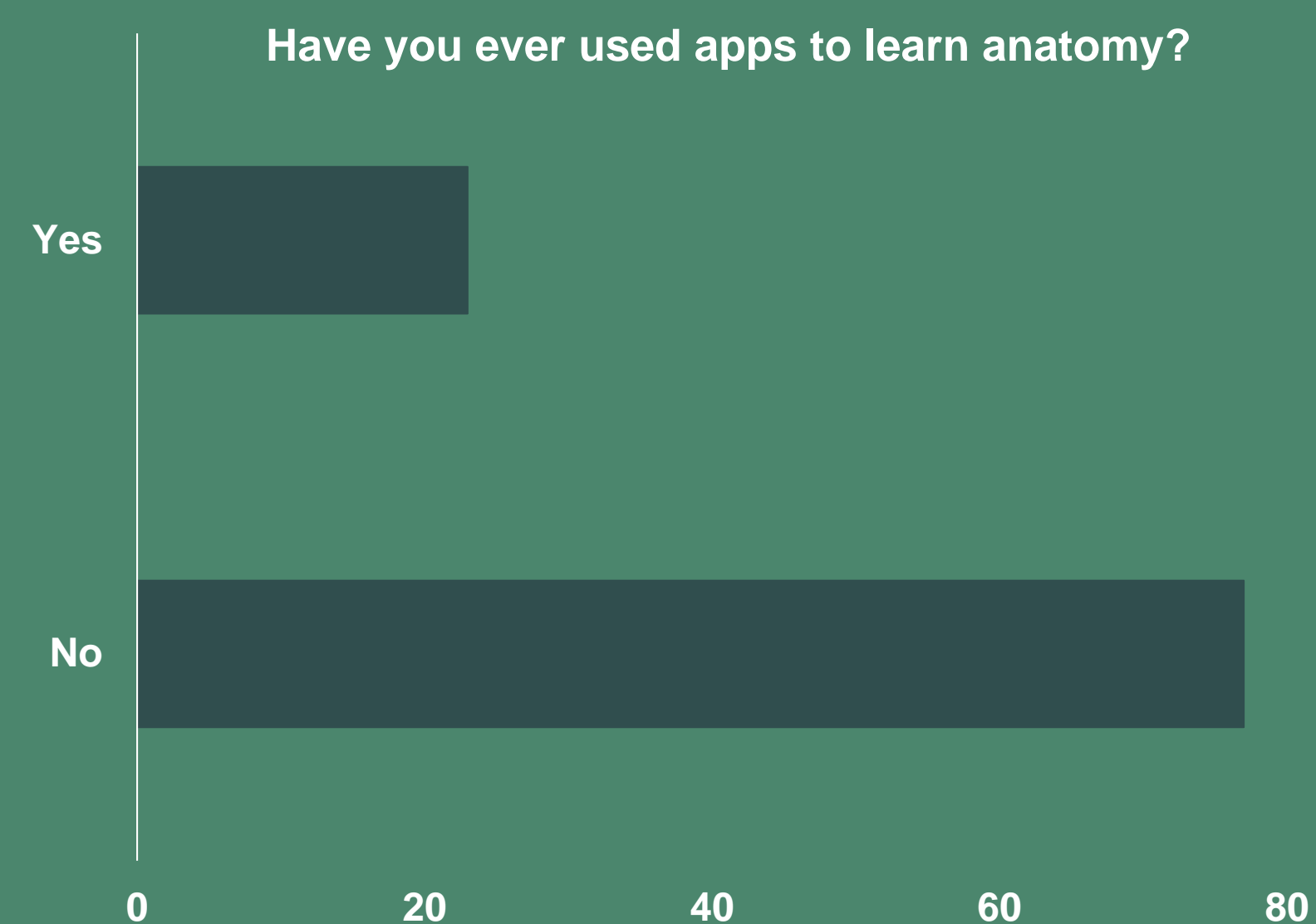
First year medical students were then invited to complete a follow-up survey to evaluate whether they used anatomy apps to learn anatomy. Ethical approval for the survey was granted by the Research Ethics Committee at TCD.

No.	Table 1: Details of anatomical variation
0	No content.
1	Variation briefly mentioned without further description or details about incidence.
2	Variation described in some detail with information provided regarding incidence.
3	Variation discussed in detail with information provided on incidence and relevant clinical implications

Results

Student Survey

- 84/181 surveys were returned for a 46% completion rate. Of those returned, 19 students (23%) claimed they use apps to learn anatomy.



Critical Appraisal of anatomy Resources

- Gray's Anatomy scored highest with a total score of 23 of a maximum 27.
- Anatomy apps scores ranged between 0 – 11 and it was noted that paid apps were significantly more likely to discuss anatomical variation.
- *Acland's video atlas and Netters Flashcards both performed poorly with scores of 3 and 4 respectively (see table 2).*

Table 2: Resources	Score (ex 27)
Grays Anatomy	23
Acland's Anatomy	3
Netters Flashcards	4
Paid anatomy apps	
Teach me Anatomy	8
Pocket Anatomy	11
Essential Anatomy	3
Free Anatomy Apps	
Bio-digital Human	4
RCSI Surgical Quiz	0
Anatomy Learning	0

Conclusions

Almost one fifth of our students admit to using anatomy apps to learn anatomy. This finding is significant to modern educators, and it indicates a need to critically assess apps as learning tools. In response, we have created table 1 for use as a template for to assess different teaching tools.

When critically assessed, we discovered that modern learning resources such as online videos, flashcards and free apps poorly discuss or omit anatomical variation. Discussion about anatomical variation became more comprehensive in paid apps when compared to free apps but Gray's anatomy remains the gold-standard for reading about anatomical variation (with the exception of scientific journals).

In conclusion, both students and educators alike should be aware of the limitations of these modern resources.