Anatomical Apps and Smartphones: A Pilot Study with 100 Graduation Students

Article · March 2018

CITATIONS
0

READS
114

5 authors, including:

Lucas Alves Sarmento Pires
Universidade Federal Fluminense
30 PUBLICATIONS **12** CITATIONS
SEE PROFILE

Tulio Fabiano de Oliveira Leite
18 PUBLICATIONS **8** CITATIONS
SEE PROFILE

SMGroup

SM Journal of Clinical Anatomy

Research Article

Anatomical Apps and Smartphones: A Pilot Study with 100 Graduation Students

Lucas Alves Sarmento Pires[1], Tulio Fabiano de Oliveira Leite[2], Albino Fonseca Junior[1], Marcio Antonio Babinski[1] and Carlos Alberto Araujo Chagas[1]

[1]*Morphology Department, Fluminense Federal University, Niterói, Rio de Janeiro, Brazil*
[2]*Interventional Radiology Unit, Radiology Institute, University of São Paulo Medical School, São Paulo, Brazil*

Article Information

Received date: Feb 19, 2018
Accepted date: Feb 26, 2018
Published date: Mar 02, 2018

***Corresponding author**

Lucas Alves Sarmento Pires, Universidade Federal Fluminense, Instituto Biomédico – Departamento de Morfologia. Rua Prof. Hernani Melo, 101-São Domingos, Niterói-RJ, 24210-130, Brazil, Email: lucaspires@id.uff.br

Keywords Smartphone; Anatomy; Learning; Smartphone app

Abstract

Background: Anatomical teaching is going through several changes. Several studies observed that the students are deeming anatomy as outdated and irrelevant. The rates of lectures attendance and interest are declining. In this context, tools such as body painting, board games and team quizzes are appearing in the classroom to aid and motivate the student. Often, these complementary tools showed positive results towards their goals in the learning process of several branches of medicine. The smartphone has also been used for these purposes, although the literature lacks studies regarding anatomy. The study conducted herein aimed to create a pilot version of an anatomical application for the smartphone and disseminate its usage in nursing students.

Methods: A smartphone application was self-produced with the tool known as Fábrica de Aplicativos© (https://fabricadeaplicativos.com.br) and consisted of anatomical terms and their meaning (Dictionary of Anatomy). The students had the opportunity to use this application during the semester and by the end of the period they answered a questionnaire with questions about the quality and efficacy of the app, with the option of submitting suggestions for its improvement.

Results: 100 graduation students were enrolled in this study. The overall evaluation of the dictionary was excellent/great (65%), while critics such as the lack of better images, the lack of a search resource and the lack of sections were pointed out.

Conclusion: As such, it was observed that the smartphone may have a positive effect in the learning process of anatomy, as demonstrated by our study.

Introduction

The smartphone is a widely used tool for numerous daily activities. Its popularity significantly increased with the advent of modern operational systems. In particular, students are among the most common users of the smartphone, thus, it is a tool that is always at the hand of scholars [1].

Despite that, there are numerous reports that observed the negative impact of cell phone abuse and high rates of addiction among young individuals. Moreover, these conditions are significantly related to ailments such as depression, anxiety sleep disturbances and behavioral changes [2,3].

On the other hand, studies that address the positive effect of the smartphone regarding medical prescriptions, knowledge of diseases and patient care/education are exponentially increasing. As such, the smartphone has been considered as an effective tool for aiding the educational process [1,4-6].

Furthermore, several smartphone applications (known as "apps") for the healthcare graduation student and healthcare professionals have been developed, although with more emphasis on nursing and medical practices and their tasks, as well as patient care improvement. However, basic disciplines, such as anatomy or histology are usually contemplated with applications similar to an atlas – according to our searches – and are rarely contemplated in evaluation studies [5-9].

Thus, due to the smartphone being widely used and the lack of anatomical apps that concern the anatomical terms, the study conducted herein aimed to assess the quality and efficacy of an anatomical dictionary app in nursing students from the authors' institution.

Material and Methods

The present work was approved by the Morphology Department committee and was conducted according to the ethical principles. No individuals were identified throughout the study.

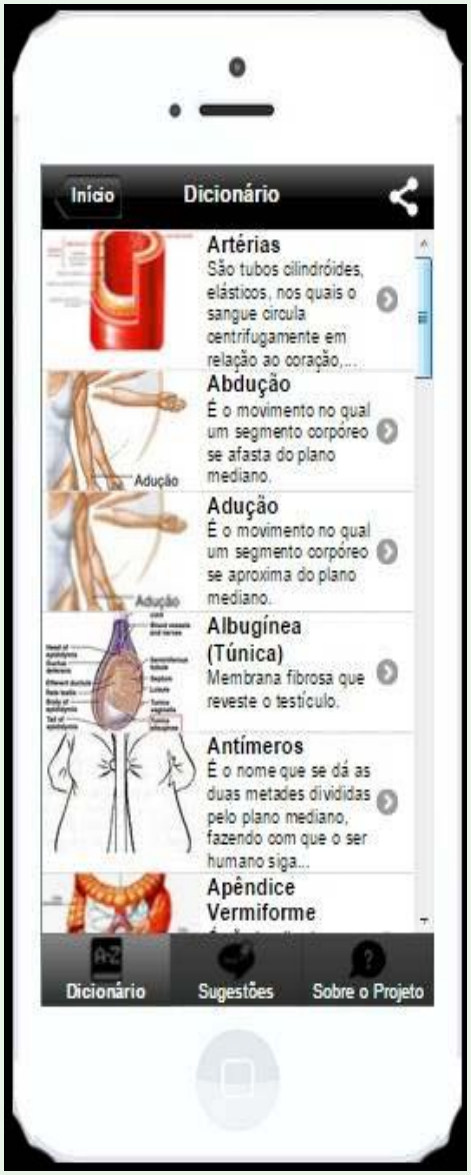

Figure 1: A schematic display of the "Dicionário de Anatomia" (Dictionary of Anatomy) app.

The app and its purpose

A self-produced smartphone app has been created with the purpose of aiding this study. It was produced with the tool known as Fábrica de Aplicativos© (https://fabricadeaplicativos.com.br).

The app was labeled as "Dicionario de Anatomia" (Anatomy Dictionary) and had several anatomical terms (e. g. abduction, pectineal, fascia, synovial joint) and their meaning as well as their etymology (Figure 1). All data was obtained from classic anatomical textbooks. The images included in the app were obtained from Google® and were free of copyright. This app was free of cost and was available for download until the completion of this study.

The authors opted to create a new app due to possible viruses, outdated definitions and lack of significant anatomical terms present in the available apps at the time.

Sample, quality assessment and statistical evaluation

The study was conducted in a single nursing student's class for 1year (2 semesters). At the beginning of Anatomy lectures, they were introduced to the app and were instructed to download it in their smartphones.

By the end of each semester, the students answered a questionnaire regarding multiple aspects of the app. The first seven questions were of Likert type, while the remaining questions were not (Table 1). The survey was created based in previous studies and the questions aimed to assess the usefulness of the app [9]. The student was also able to suggest, criticize and complement the software. The questionnaire was distributed in the last compulsory lecture and the students answered anonymously.

Statistical analysis was performed with the SPSS version 21. The chi-square was used to observe significant differences in the answers of questionnaire among the students ($p < 0.05$ was considered statistically significant).

Results

A total of 100 students participated in this study. 44% ranked the app as "Great", while 23% of students thought it was "excellent" (Figure 2). This was a statistically significant difference ($p < 0.05$).

69% of the students had significant difficulty in learning anatomy and 71% believe that complementary tools are needed to aid anatomical teaching. 67% of the students strongly agreed that the smartphone can be a useful tool to aid the learning process.

Table 1: Questionnaire used to assess the quality of the Anatomical Dictionary.

Question	Statement text
1	I have difficulty in learning Anatomy.
2	I think other tools beyond lectures can help the student in learning.
3	I believe that the Smartphone can be a complementary tool to the learning process.
4	The presented app was easy to use.
5	The presented app was informative.
6	The presented app did not crash my smartphone.
7	The images used were good.
A	Did you find the app to be an Excellent, Great, Good, Regular, Bad, Awful tool?
B	What could be improved? What were the flaws of this app? Do you have any suggestions?

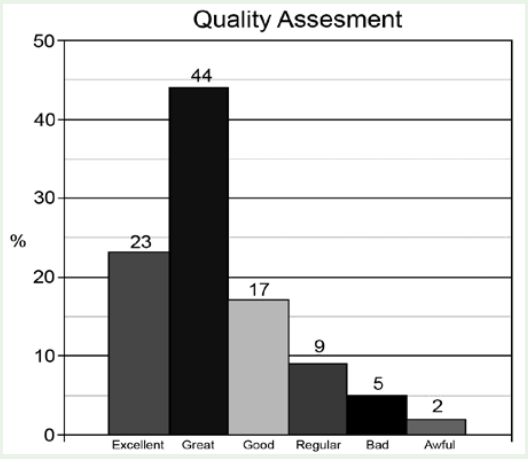

Figure 2: Graphic showing the students opinion regarding the quality of the app. Results are displayed in percentage.

Table 2: Responses to the first 6 questions of the questionnaire (n = 100).

Question	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	p value
1	11%	3%	17%	28%	41%	<0.05
2	10%	0%	13%	18%	59%	
3	16%	7%	0%	9%	67%	
4	0%	0%	9%	15%	78%	
5	3%	5%	9%	19%	64%	
6	0%	0%	0%	6%	94%	
7	2%	31%	7%	19%	41%	

P < 0.05 is considered significant.

Regarding the app, 78% of the sample answered that the app was easy to use, although 31% of the students disapproved the images used in the app. The complete results can be observed in Table 2.

The critics were tabulated as follow: (1) The app lacked off-line access; (2) The app lacked a systematic or alphabetic division (the terms were displayed in a single list); (3) It lacked a search option.

Several students however, pointed out that the app: (1) was easy and fast; (2) had concise and informative definition of terms; (3) It worked in multiple operational systems for smartphones; (4) was clean, as it lacked advertising pop-ups.

Discussion

The anatomy dictionary app had a positive evaluation among the nursing students in the study presented herein. This corroborates the data from other studies performed in graduation students, regardless of gender, age and graduation course, although they used other disciplines, such as surgery, microbiology, emergency, clinics and several specialties (e.g. orthopaedics, neurology, otolaryngology) [1,4-6,10-13].

Essentially, anatomy can be taught in two different ways: through theoretical courses and dissection (practical) courses. According to classic anatomical textbooks, the dissection is primordial to the complete understanding of anatomy [14-16]. Moreover, anatomy may be taught systematically, topographically and clinically. The latter is gaining popularity, as the students are more prone to relate anatomy with their future clinical practice, as such, the popularity of descriptive and systematic anatomical textbooks are declining. This is also due to the misconception of academics (students and teachers alike) that anatomy is outdated and irrelevant [14-18].

In order to reverse this situation, several papers proposed the need of more didactic and ludic techniques to aid and motivate the student [19]. These new resources should be looked as complementary tools, since dissection cannot (and should not) be replaced [20]. However, in Brazil, it is often hard to claim and maintaincadavers for teaching purposes due to several laws, thus resulting in insufficient material for the enormous amount of students. In this fashion, studying new learning tools is relevant and timely [19].

Card games, board games, crossword puzzles, workshops and team quizzes are also promising complementary tools to further enhance knowledge in several disciplines [21-23]. Although with the increase of smartphone usage by graduation students, the cellphone apps are gaining more popularity [1,24].

Multidisciplinary approaches, the association with surface anatomy and imaging techniques, body painting and plastic models has been used to aid the student [18,25].

These various methods showed great benefit towards learning and increasing attendance rates. The students obtained capacity of self-study and increase in focus and concentration. Furthermore, after these methods were employed, the follow-up was very positive [11,19,21,22]

Another relevant point for the success of these complementary tools is the formaldehyde toxicity and exposition. It is known that formaldehyde is toxic and can produce discomfort, severe allergic reactions and exposition to it has been associated with cancer [26,27]. Thus, students are often discouraged to frequent dissection courses and to frequent the anatomy laboratory itself [19]. Furthermore, a recent study observed that not even 50% of 663 students deemed lectures classes as essential, and roughly 40% of them believes that the classes are "boring". This reflects the need to promote newer activities in the educational field, as the non-attendance rates are increasing [28].

The smartphone, however, has several contra points: it is associated with behavioral changes, depression, low self-esteem, anxiety, while abusive usage can cause addiction [2,3,29]. Some studies propose that its use in education is not completely positive, since factors such as distraction from the lectures and dependency can pose a threat for the learning experience [30].

Despite the low number of enrolled students in the present study, the positive effects of the anatomical app were clearly observed. The study conducted herein may serve as a "pilot" for the creation of more elaborate apps and inclusion of a larger pool of students. Another limitation of the study was the enrollment of only nursing students and the lack of a more refined questionnaire.

Conclusions

Anatomy and other disciplines may benefit from complementary tools like body painting, simulation, quizzes and board games. With the rapid increase in smartphone usage rates, this technology can also be a tool to aid and enhance the learning process.

However, smartphone usage should be cautious, especially when dealing with graduation students. More studies are needed in order to evaluate the positive and negative effects of this possible complementary tool in teaching, despite the positive results presented in this study.

Acknowledgements

The authors wish to thank the students that participated in this study.

References

1. Gavali MY, Khismatrao DS, Gavali YV, Patil KB. Smartphone, the New Learning Aid amongst Medical Students. J Clin Diagn Res. 2017; 11: 05-08.
2. Wang P, Zhao M, Wang X, Xie X, Wang Y, Lei L. Peer relationship and adolescent smartphone addiction: The mediating role of self-esteem and the moderating role of the need to belong. J Behav Addict. 2017; 6: 708-717.
3. Elhai JD, Levine JC, Dvorak RD, Hall BJ. Fear of missing out, need for touch, anxiety and depression are related to problematic smartphone use. Computers in Human Behavior. 2016; 63: 509-516.
4. Haffey F, Brady RR, Maxwell S. Smartphone apps to support hospital prescribing and pharmacology education: a review of current provision. Br J Clin Pharmacol. 2014; 77: 31-38.
5. Hsueh WD, Bent JP, Moskowitz HS. An app to enhance resident education in otolaryngology. Laryngoscope. 2017; 152: 638-643.
6. Liu RF, Wang FY, Yen H, Sun PL, Yang CH. A new mobile learning module using smartphone wallpapers in identification of medical fungi for medical students and residents. Int J Dermatol. 2018.
7. Aungst TD, Clauson KA, Misra S, Lewis TL, Husain I. How to identify, assess and utilise mobile medical applications in clinical practice. Int J Clin Pract. 2014; 68: 155-162.
8. Hussain M, Al-Haiqi A, Zaidan AA, Zaidan BB, Kiah ML, Anuar NB, et al. The landscape of research on smartphone medical apps: Coherent taxonomy, motivations, open challenges and recommendations. Comput Methods Programs Biomed. 2015; 122: 393-408.
9. Robinson T, Cronin T, Ibrahim H, Jinks M, Molitor T, Newman J, et al. Smartphone use and acceptability among clinical medical students: a questionnaire-based study. J Med Syst. 2013; 37: 9936.
10. Wong SJ, Robertson GA, Connor KL, Brady RR, Wood AM. Smartphone apps for orthopaedic sports medicine - a smart move? BMC Sports Sci Med Rehabil. 2015; 7: 23.
11. Zaki M, Drazin D. Smartphone use in neurosurgery? APP-solutely! Surg Neurol Int. 2014; 5: 113.
12. Hanna MG, Parwani AV, Pantanowitz L, Punjabi V, Singh R. Smartphone applications: A contemporary resource for dermatopathology. J Pathol Inform. 2015; 6: 44.
13. Keeley K, Potteiger K, Brown CD. Athletic Training Education: There's an App for That. Athletic Training Education Journal. 2015; 10:190-199.
14. Goss CM, editor. Gray's Anatomy of the Human Body. 29th edn. Philadelphia: Lea & Febiger. 1973.
15. Testut L, Latarjet A. Tratado de Anatomía Humana. Barcelona: Salvat. 1958.
16. Pais D, Moxham BJ. Should Gross Anatomy be taught systemically or regionally? Eur J Anat. 2013; 17: 43-47.
17. Habbal O. Anatomical Research: Misconceptions and opportunities. Sultan Qaboos Univ Med J. 2017; 17: 1-2.
18. Sugand K, Abrahams P, Khurana A. The anatomy of anatomy: a review for its modernization. Anat Sci Educ. 2010; 3: 83-93.
19. Ribeiro FS, Soares BO, Santos IF, Da Silva Júnior EX. NEUROGAME An Alternative and Complementary Method in the Teaching and Learning Process of Neuroanatomy. Inter J Res Methodol Soc Sci. 2017; 3: 62-71.
20. Marques Pontinha C, Soeiro C. A dissecação como ferramenta pedagógica no ensino da Anatomia em Portugal. Interface (Botucatu). 2014; 18: 165-175.
21. Anyanwu EG. Anatomy adventure: a board game for enhancing understanding of anatomy. Anat Sci Educ. 2014; 7: 153-160.
22. Abdulmajed H, Park YS, Tekian A. Assessment of educational games for health professions: a systematic review of trends and outcomes. Med Teach. 2015; 37: 27-32.
23. Reichert L, Lin K, Farishta D, Pine H, McCammon S. Low-Cost Models for Simulation as a Tool for Increasing Medical Student Interest in and Understanding of Otolaryngology. SM J Clin Anat. 2017; 1: 1003.
24. Mosa ASM, Yoo I, Sheets L. A Systematic Review of Healthcare Applications for Smartphones. BMC Med Inform Decis Mak. 2012; 12: 67.
25. Cookson NE, Aka JJ, Finn GM. An exploration of anatomists' views toward the use of body painting in anatomical and medical education: An international study. Anat Sci Educ. 2017.
26. Hayashi S, Naito M, Kawata S, Qu N, Hatayama N, Hirai S, et al. History and future of human cadaver preservation for surgical training: from formalin to saturated salt solution method. Anat Sci Int. 2016; 91: 1-7.
27. Lombardero M, Yllera MM, Costa ESA, Oliveira MJ, Ferreira PG. Saturated salt solution: a further step to a formaldehyde-free embalming method for veterinary gross anatomy. J Anat. 2017; 231: 309-317.
28. Bati AH, Mandiracioglu A, Orgun F, Govsa F. Why do students miss lectures? A study of lecture attendance amongst students of health science. Nurse Educ Today. 2013; 33: 596-601.
29. Haug S, Castro RP, Kwon M, Filler A, Kowatsch T, Schaub MP. Smartphone use and smartphone addiction among young people in Switzerland. J Behav Addict. 2015; 4: 299-307.
30. Anshari M, Almunawar MN, Shahrill M, Wicaksono DK, Huda M. Smartphones usage in the classrooms: Learning aid or interference? Education and Information Technologies. 2017; 22: 3063-3079.