Augmenting Anatomy Education with Virtual Reality

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Abstract

Anatomy is one of the cornerstones of clinical education, and mastery of anatomy is crucial for learning diagnostics and treatments. In recent years there are several innovative technologies entering anatomy education that providing alternatives to cadaveric dissection. One of these technologies is virtual reality. Virtual reality is a technology that allows for students to be fully immersed in various models and scenarios that has application ranging from anatomy education to clinical setting. It has the potential to increase student's knowledge and retention of anatomy information, while increasing student engagement through its interactive environments and models. Despite its promise, the use of virtual reality as a part of anatomy education in allied health programs has not been well studied. The study aims to assess the effectiveness of virtual reality in anatomy education, as part of a larger multimodal approach. Using the Oculus Quest 2 as the virtual reality platform, the Dissection Master XR software will be incorporated into the graduate anatomy courses at FranU, primarily in the laboratory component of courses. Students will use the Dissection Master software, in addition to the current anatomical resources. The students' anatomy knowledge will be assessed through a standardized anatomy test, delivered in a pretest/post-test design. Student perception and attitudes toward virtual reality will be assessed through a combination of surveys and focus groups, for more open-ended questions.

Introduction

Background

Traditionally, the laboratory setting of anatomy education has relied on the dissection of cadavers. The dissection can either be completed by students, or by instructors and then student view the completed dissection (prosection). In some cases, anatomy lab can be comparative (dissecting other animals and comparing to human). If dissection is not available, often some of the traditional alternatives would include plastic models and anatomical atlases.

Currently, there is a trend to incorporate technology into the classroom, and anatomy lab is no exception. From virtual cadavers and software-based dissection, to virtual reality (VR) applications, the alternatives to cadaveric dissection are becoming more technologically advanced. VR is a relatively new technology that allow users to engage in 3-D experiences. Through various applications, VR can immerse students in anatomical models and real cadaveric images. Currently, most of the anatomical education is conducted in the undergrad and medical settings, leaving the allied heath setting understudied.

Protocol

The study outlined here aims to assess the effectiveness of VR as part of a larger multimodal approach to anatomy education.

Objectives

The study has the following objectives:

1. Integrate VR into the graduate anatomy courses, as part of a larger multimodal approach
2. Assess the effectiveness of VR in improving student knowledge of anatomy
3. Assess students' perception of VR as part of a larger multimodal approach
4. Contribute to the larger body of knowledge regarding VR in education in the allied heath setting

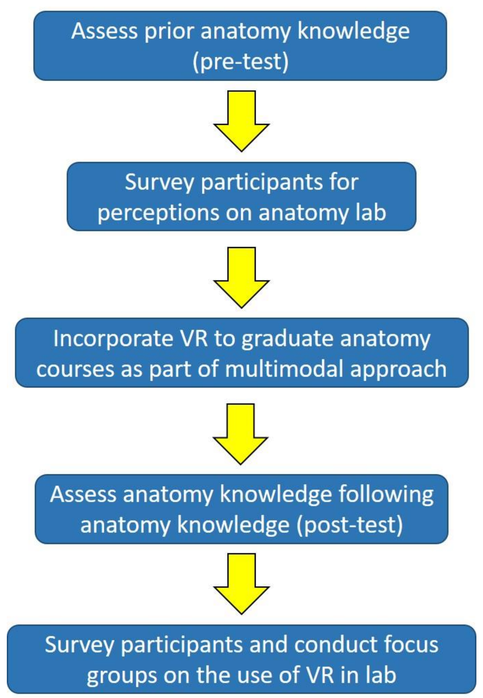

Figure 1: Flowchart of the protocol

Materials

This study would use the following materials

- Human Anatomy and Physiology Society (HAPS) standardized exam for assessing anatomy knowledge. This exam will be administered as a pre-test/post-test format
- REDCap for disseminating and storage of surveys that will assess students' perceptions
- 5 Oculus Quest 2 VR headsets (Meta, CA, USA), loaded with Dissection Master XR software (Medicalholodeck, Switzerland).

Protocol cont.

Figure 2: Image of the Oculus Quest 2 VR headset.

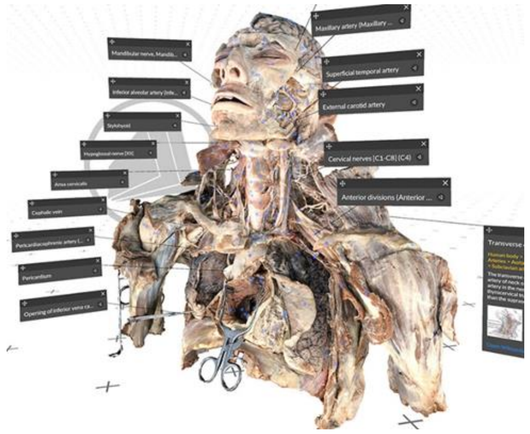

Figure 3: Image of the Dissection Master XR software displaying head and neck dissection. Image credit: https://www.medicalholodeck.com/en/human-anatomy-lab-virtual-reality/

Methods

- Participants for the study will be recruited and consented from the graduate anatomy courses (DPTH 7411 & DPTH 7412) at FranU. Participation is not mandatory and there is no penalty. (Students who choose not to participate will still have access to VR and software)
- Participants' knowledge of anatomy will be assessed prior to the start of the intervention using the HAPS exam
- Participants' perception of anatomy lab will be assessed prior to the intervention
- VR and Dissection Master will be incorporated as part of the graduate anatomy labs throughout the semesters. Specific activities that utilize the software will be developed.
- A post-test to assess any changes in participants' anatomy knowledge (HAPS exam) will be administered following the intervention
- Participants will be surveyed and asked to participate in small focus groups for qualitative data

Why VR?

There are a number of technological alternatives to cadaveric dissection. VR was chosen because it was seen as a good compliment to what FranU already has available (Anatomage, Plastinated cadavers, etc.). VR is immersive and can help to provide a sense of 3D. The Dissection Master XR software was selected for its user interface and because it is based on real cadavers. The use of real cadaveric images is important in anatomy education since it better reflects variations in human anatomy. VR also has other applications outside of anatomy, and can be used in other courses, research, and potentially in the clinical setting.

Future Directions

Future directions for VR and this project:
Because VR can run several software types, it has applications outside of anatomy. VR can be utilized in other clinical courses, such as Orthopedic Physical Therapy or Neurologic Physical Therapy. This study can be modified for each of these courses, and assess the effectiveness of VR, and the appropriate software.
If appropriate software is not available, then a custom 3D video can be recorded. Through custom 3D videos and scenarios, VR can be applied to several research and therapeutic settings. A similar study could be used to assess the effectiveness of VR outside of the academic setting.

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References available upon request