

Muscle Structure & Function – Students Apply New Knowledge in the Context of Yoga

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Introduction

Undergraduate university courses are mostly lecture-based with high enrollments. This is especially true for the Anatomy and Physiology courses (e.g. ANP1106), which usually have enrollments of 250 to 300 students. This makes it hard to provide students with hands-on laboratory experience and for them to apply what they have learned in class to real life contexts. With this in mind, a multimedia learning tool was created to help facilitate students' understanding and learning of muscles through application of what they have learned to a real life example. Multimedia learning is using words, either spoken or printed, with pictures which are either static or animated (Moreno & Mayer, 2003).

Through the rationale that people learn better when picture and words are presented together (Mayer, 2005), a series of videos were created showing students the connection between muscle functions and several different yoga poses. It is anticipated that the reinforcement of knowledge within an applied context will promote student engagement, support consolidation of related pieces of knowledge pertaining to different muscles spanning a joint, and will lead to improved outcomes on summative examinations.

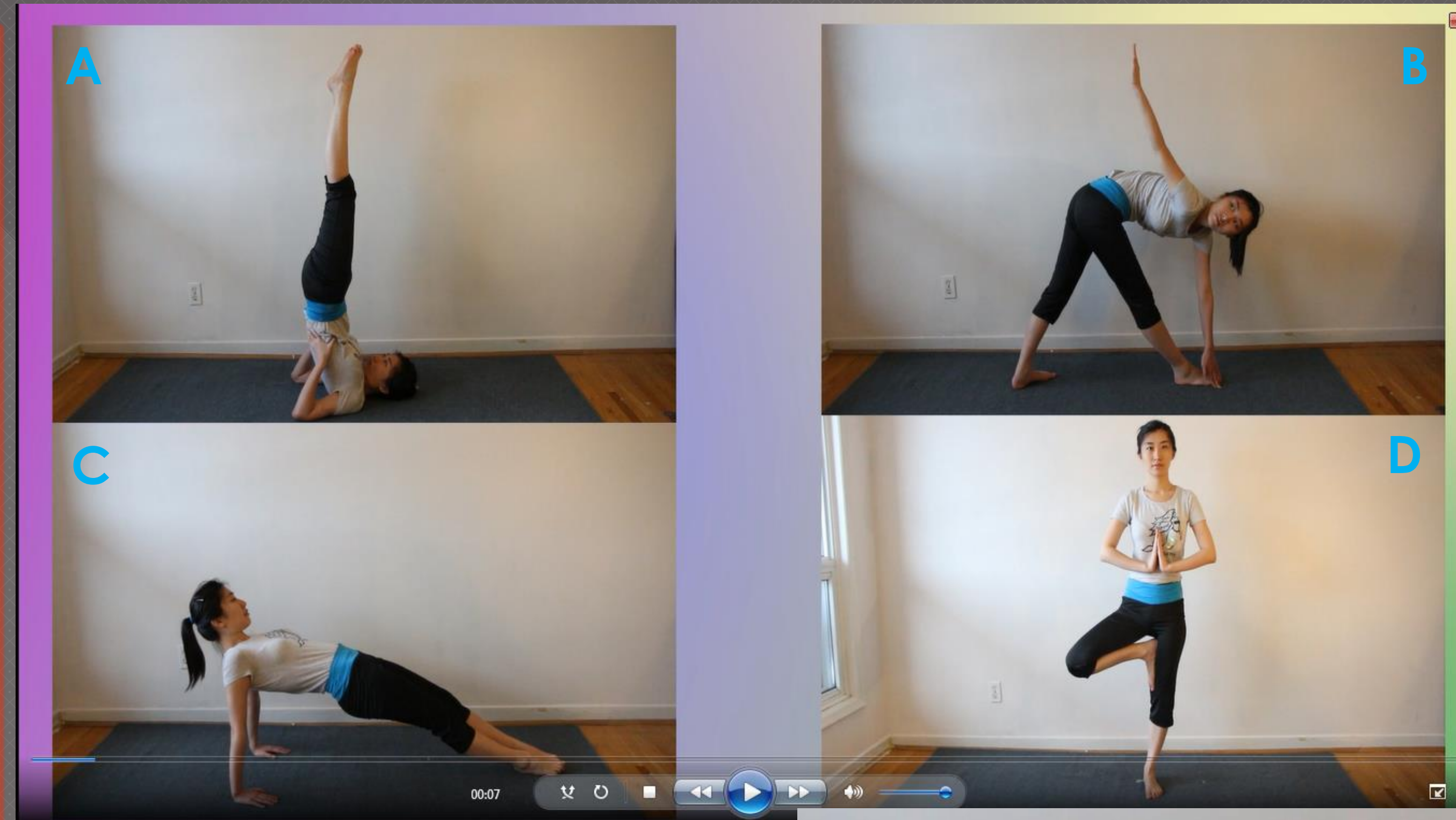


Figure 1 (left): The videos feature 4 yoga poses – the Supported Shoulderstand (A), the Revolved Triangle (B), the Upward Plank Pose (C) and the Tree Pose (D).

Figure 2 (right): The hamstrings are holding the pose by extending thighs, as well, they trigger a slight knee flexing motion.



How many of these can you name?

Iliopsoas
Sartorius
Adductors
Rectus femoris

Figure 3 (left): Muscles of the thighs and an in video question to promote student engagement

Methods

The actions of muscles that are covered in the ANP1106 classes were applied to four yoga poses – the Supported Shoulderstand, the Revolved Triangle, the Tree Pose, and the Upward Plank Pose. Using Adobe AfterEffects®, a series of videos were created to explain step-by-step the muscles that were activated while a person completes the yoga pose. The video split screens or alternated between scenes of a real person enacting each step of the pose and labeled anatomical diagrams showing the individual muscles. Meanwhile, the audio in the background described the muscles and explained each action.

A set of multiple choice questions was also developed using Hot Potatoes® to help students consolidate their learning after watching the videos. Hot Potatoes is an application that enables the creation of interactive exercises such as multiple choice questions or short answers that students can then answer online. This learning module will be made available via the course website so that students can use it to consolidate their understanding of muscle anatomy before writing their midterm exam.

Results

This learning tool will be made available to students in the Winter 2014 ANP1106 session. Student outcomes on the muscle and joint components of summative examinations will be compared between classes that did not have access to this learning tool (previous academic year) and those that will (this academic year).

Discussion

The main goal of the development of this learning tool is for students taking anatomy and physiology courses to obtain applicable knowledge and further their learning of muscle structures and functions. Thus, when designing the videos, cognitive load theory was incorporated when possible. This means allowing students to engage substantial cognitive processes but not exceeding learners' cognitive capacity (Moreno & Mayer, 2003).

Since humans process information through an audio channel and a visual channel (Pavio, 1986), the series of yoga videos were created with a visual representation and an audio to explain the images. Each diagram of muscle also had animated labels that were timed with the audio. Extraneous muscles that were not mentioned in the clip were not labeled to prevent confusion. Each clip was also made into manageable chunks of around 3 minutes instead of one long video to promote information retention and interest. Finally, questions were asked in the video and after the video (through the multiple choice questions) to engage the students in active learning and to encourage them to reflect on what was learned in class.

This learning tool aims to give students an alternative view point to the study of muscle structures and functions and demonstrates to students how learning about muscles could be applied to every day contexts. As this project will be shown to the winter 2014 classes, further student feedback could help to modify future learning tools to make them more interesting and useful to watch. If these multimedia learning tools are shown to be effective in deepening students' understanding in this subject matter, more similar types of learning tools can be offered to future students to allow them to more easily understand and apply the course material.

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