The Use OfAnimations And Multimedia For Teaching Physiology & Pharmacology

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Background and Aims: The purpose of the study was to investigate the usefulness of 3D animations and multimedia in teaching complex topics in physiology and pharmacology. Students are increasingly turning to YouTube to source animations, videos and lectures to supplement their study. Whilst it may be predicted that a 3D animation of a biological process may enhance learning, there have been surprisingly few studies on the effectiveness of multimedia as a learning tool. Consideration of types of learners, cognitive load and multimedia theory are important elements of instructional design and should influence the content of any multimedia production. We have recently defined a workflow that enables the use of confocal microscope-based 3D data sets within sophisticated animation software. This provides anatomically accurate scenes on which to build 3D movies. Protein structures can also be extracted from the protein databank to conserve a degree of molecular accuracy for intracellular scenes. This enables the production of high quality, accurate 3D animations. However, will this approach enhance learning?

Summary of work: We created two versions of a 3D animation describing vascular structure and sympathetic neurotransmission within the vascular wall. Version 1 had a full 3D moving animation whilst Version 2 had 15 still images from the animation. Both versions had the same audio commentary and background music. The still images were presented at the appropriate time points and matched the audio commentary. Two groups of level 3 physiology and pharmacology undergraduate students (9 in each group) watched one version of the video each and then answered a short 10 minute question. The purpose was to test the effect of stills compared to moving pictures in aiding understanding. The question was set to be deliberately difficult to ensure that no student would achieve 100% and thus could be judged on how close they got to the correct answer.

Outcomes: The short answers were coded, combined, shuffled and marked blind. The group watching the full animation (Group 1) scored a C-minus average for the question. The group watching the stills-based presentation (Group 2) scored a D grade average. The difference was statistically significant (P<0.05) only when the highest and lowest scores in each group were removed. After a second viewing of the full animation Group 1 amended their answers and scored a C grade (1 point improvement). Group 2 raised their mark by 2 points (to C-minus) after watching the full animation.

Discussion and conclusion: Student recruitment was low in this pilot study, attracting only 18 students from a potential 100. We plan to repeat the study using a different recruitment strategy which aims to attract ~60 Level 3 students. Student feedback was extremely positive and the results indicate a marginal increase in learning between still frames and animation. Multimedia 3D animations are powerful tools for imparting information. However, to be useful learning aids, great care must be taken in the design stage. We believe that a series of studies are required to determine the optimum design and cognitive loading of multimedia-based instructional videos.

References:

Reed SK (2007), Educational Psychologist, (41)2; 87-98