The Use Of Animations And Multimedia For Teaching Physiology & Pharmacology

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Introduction: 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 (Rolfe & Gray 2011). Our original hypothesis was that students would prefer an animated presentation and that their learning would be enhanced by it. However, it has previously been reported that static images worked just as well as animation (Paik & Schraw, 2013). These authors examined the ‘Illusion of Understanding’ which is the idea that students will invest less cognitive effort when viewing an animation that appears to be easier to understand. Therefore we have investigated the use of animations versus static images in an instructional multimedia presentation.

Methods: 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 17 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 (27 in each group) watched one version of the video each and then answered a short 8 minute questionnaire. 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. The marking criteria assigned ‘core’ marks (essential material) and ‘bonus’ marks (correct use of terminology) for each answer. Students were also asked for feedback on the process.

Results: 54 Students (two groups of 27) viewed a 4 minute 3D animation or stills presentation (figure 1). A short 8 minute essay question was then attempted (figure 2). Answers were marked on scale of 0-11. The ‘animation’ group scored 3.7 ± 0.4 whilst the ‘stills’ group scored 3.2 ± 0.4 (figure 2) When split into their respective classes the pharmacology group scored 3.9 ± 0.6 vs 2.8 ± 0.55 for animation vs stills respectively. The physiology group scored 3.5 ± 0.4 vs 3.5 ± 0.7 for animation vs stills respectively. There was no statistically significant difference between any groups. The average bonus marks for each combined group was 0.63 +/- 0.13 vs 0.39 +/- 0.12 for animation vs stills (figure 2). The difference was not statistically significant. Splitting the data into physiology and pharmacology classes revealed a significant difference for the pharmacology group; animation (0.61 +/- 0.20) vs stills (0.13 +/- 0.07), p<0.05 (figure 3b). The physiology animation group scored 0.65 +/- 0.17 bonus marks vs 0.60 +/- 0.20 for stills (n.s.)

Discussion and conclusion: Student feedback was 88% positive showing a clear desire for more of this type of teaching content for revision purposes. However, our results illustrate the ‘Illusion of Understanding’ in that the appetite for animated presentations did not translate into better grades in this form of ‘single view’ assessment. The cognitive load of both animations was high as they contained audio commentary, background music, on-screen text and complex images. Although we observed a trend in favour of animations over stills, this did not reach significance. Future animations of this type will need to have lower extraneous (unnecessary) cognitive loading (i.e. background music) and any assessment should feature multiple views with user playback control. The results of this study further confirm that 3D instructional animations per se will only be of value if appropriate multimedia and cognitive load theories are taken into account (Reed 2006).

References.
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Reed SK (2006), Educational Psychologist, (41)2: 87-98