DEVELOPING SPATIAL COGNITION OF BRAIN ANATOMY USING AN IMMERSIVE VIRTUAL ENVIRONMENT

ABSTRACT

Introduction

The application of spatial anatomical knowledge is essential in the radiotherapy process. The development of such knowledge is crucial in light of new standards of care such as Image Guided Radiotherapy.

Purpose

The study aimed to investigate the potential of an immersive virtual environment (IVE) for enhancing student therapeutic radiographers' spatial anatomical cognition of the brain and establish a coherent explanatory framework for how this spatial cognition is developed.

Methods

A convergent parallel mixed methods design was used. A pre and post-test, pragmatic, randomised controlled trial assessed the impact of virtual reality (VR) technology on the extent to which spatial cognition of anatomy could be enhanced compared with the use of plastic anatomical models. Constructivist grounded theory was used to develop a theoretical model of how students develop spatial cognition. A triangulation protocol was used to establish a coherent explanatory framework for the development of spatial anatomical cognition in an IVE.

Results

Engagement with the VR model of the brain in an IVE resulted in statistically significantly greater enhancement in spatial anatomical cognition compared to engagement with an equivalent plastic model of the brain ($p = 0.003$). The effect size (8%, 95%CI: 2.3 – 13.2%, $d = 0.59$) is potentially valuable in practical terms. Students exploit individual traits, prior vocational experiences and features of the model in order to apply personal learning strategies within a constructivist framework to enhance spatial cognition. A more positive learning experience and the additional interaction afforded by the IVE are the most likely explanation for the difference in effect.

Conclusions

Engagement with virtual models in an immersive virtual environment can substantially amplify student therapeutic radiographers' potential to develop spatial knowledge of anatomy. Vocational stimuli are key in influencing how students exploit the design features of a virtual anatomical model to develop spatial understanding. This provides new evidence that will contribute to the development of pedagogy for using immersive virtual reality for the teaching and learning of anatomy.