Letter to the Editor

Considerations for the value of immersive virtual reality platforms for neurosurgery trainees' anatomy understanding

Dimitrios Chytas[1], Georgios Paraskevas[2], George Noussios[3], Theano Demesticha[4], Irene Asouhidou[2], Marios Salmas[4]

[1]Basic Sciences Laboratory, Department of Physiotherapy, University of Peloponnese, Sparta, Departments of [2]Medicine and [3]Physical Education and Sports Sciences, Aristotle University of Thessaloniki, Thessaloniki, [4]Department of Medicine, National and Kapodistrian University of Athens, Athens, Greece.

E-mail: *Dimitrios Chytas - dimitrioschytas@gmail.com; Georgios Paraskevas - g_paraskevas@yahoo.gr; George Noussios - gnousios@phed-sr.auth.gr; Theano Demesticha - nonidem@yahoo.gr; Irene Asouhidou - iasouh@aol.com; Marios Salmas - salmasmarios5@gmail.com

*Corresponding author:
Dimitrios Chytas,
Department of Physiotherapy,
University of Peloponnese,
Sparta, Greece.

dimitrioschytas@gmail.com

Dear Editor,

It was our pleasure to read the interesting article by Gonzalez-Romo *et al.*,[4] who assessed an immersive virtual reality (VR) platform for neurosurgery residents' anatomy understanding. It was shown that this method could be promising for enhancing trainees' learning experience and could be proven a valuable educational tool. We agree with the authors that this method has the potential to essentially aid neurosurgical trainees' anatomy understanding, given that it provides three-dimensional (3D) visualization of neuroanatomical structures.

However, as it was pointed out, although the opinions expressed by trainees were positive, there was no objective assessment of residents' knowledge after the educational intervention. We believe that such an assessment would be essential because the literature has shown that, so far, immersive VR platforms have not been proven more effective than other, traditional methods, in terms of improving neuroanatomy knowledge and, especially, neurosurgery residents' anatomical knowledge. We believe that, to add immersive VR in a curriculum, and to support the authors' opinion that it could be an alternative or adjunct to cadaveric dissection, there is need for studies to assess not only the effectiveness of immersive VR platforms for neuroanatomy understanding, but also their effectiveness especially in comparison with cadaveric dissection. To date, there is lack of evidence for effectiveness of this technology as an alternative or adjunct to cadaveric dissection, which is a robust anatomy teaching modality[3] that provides 3D physical visualization. In fact, immersive VR has not been proven more effective than traditional two-dimensional (2D) neuroanatomy education methods,[6,8] while it may lead to considerably more adverse health effects in comparison with other modalities.[2]

Newman *et al.*[7] performed a systematic review on the effectiveness of technology-based neuroanatomy education methods. Although the authors found that there was weak to moderate evidence for effectiveness of several of those methods, there was no evidence that immersive VR was more effective than traditional neuroanatomy teaching modalities.

If we focus on neurosurgery residents' anatomy learning, although the literature has shown that immersive VR has received positive comments, there is lack of evidence to adequately support its effectiveness, in terms of improving residents' knowledge.

More specifically, the randomized study by Greuter *et al.*[5] included neurosurgery residents who were asked to describe several cerebrovascular aneurysm cases, which were either in immersive VR or in traditional 2D images form. Although the use of immersive VR was positively perceived, it did not significantly increase the residents' anatomical knowledge, in comparison with 2D visualization. Thus, the effectiveness of immersive VR for cerebrovascular anatomy teaching was similar to that of 2D images.

Chen *et al.*[1] evaluated the use of an immersive VR simulation module for teaching spinal anatomy and decompression techniques to neurosurgery and orthopedics residents. The participants underwent a pre-intervention and post-intervention anatomical knowledge assessment. Again, although the educational method was positively perceived by the participants, their knowledge improvement was insignificant.

Thus, although we certainly believe that the study by Gonzalez-Romo *et al.*[4] is very interesting and could enable researchers to further explore the value of immersive VR, the literature so far has shown that its effectiveness is not superior to that of conventional neuroanatomy education methods, although 3D visualization could be potentially helpful. We consider that this study may certainly attract future researchers' interest to investigate if the positive residents' opinions will be accompanied by learning effectiveness.

Declaration of patient consent

Patient's consent not required as there are no patients in this study.

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Conflicts of interest

There are no conflicts of interest.

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