ORTHOPAEDICS, ARTHROPLASTYT AND ARTHROSCOPY

June 29, 2023 | Webinar

The effectiveness of virtual reality (VR) in arthroplasty training for surgical trainees: a systematic review with meta-analysis

William Beedham

Sandwell and West Birmingham NHS Foundation Trust, UK

Introduction: Virtual Reality (VR) provides high-fidelity simulation, enabling trainees to practice surgical procedures whilst reducing patient risk. The focus in orthopaedic literature has been on basic surgical skills and arthroscopic procedures. Research into arthroplasty simulation resources is under-represented, and yet this currently represents a significant portion of orthopaedic procedures. This systematic review assesses current literature on the effectiveness of VR for arthroplasty training.

Methods: A systematic literature search was conducted across all relevant bibliographic databases. Randomised controlled trials (rcts) meeting the inclusion criteria were selected and assessed by three independent reviewers.

The primary outcome was the standardised mean difference (SMD) in either the global rating score or task-specific checklists at pre/post-intervention. This outcome was extracted using a piloted data extraction tool. Where heterogeneity permitted, studies were combined into a meta-analysis. Studies were also assessed for risk of bias using a piloted risk of bias tool, based on that of Cochrane.

Results: 628 studies were identified, of which 624 did not meet the inclusion criteria. All four studies included within this review were combined into the meta-analysis. This meta-analysis displayed a trend that VR improved surgical competence more than existing methods (SMD 1.57, 95% CI [-0.45 to 3.59]; P=0.13), but this did not meet statistical significance. Secondary outcomes in all studies showed VR improved trainee confidence and provided a more enjoyable experience than traditional teaching methods.

Discussion: VR improved surgical competency and improved trainee confidence in performing arthroplasty procedures, therefore indicating that this training modality could benefit both trainees and patients in the future. However, there is a paucity of evidence for VR in arthroplasty training, making results less precise and creating significant inter-study heterogeneity. This highlights the need for further high-quality rcts to be produced assessing the effectiveness of VR for arthroplasty training.

Recent Publications

1. Lohre R, J.P.Warner J, S.Athwal G, P.Goel D. The Evolution of Virtual Reality in Shoulder and Elbow Surgery. JSES International. 2020 Jun 1;4(2):215–23.

2. Lohre R, Bois AJ, Pollock JW, Lapner P, McIlquham K, Athwal GS, et al. Effectiveness of Immersive Virtual Reality on Orthopaedic Surgical Skills and Knowledge Acquisition among Senior Surgical Residents. JAMA Network Open. 2020 Dec 28;3(12):e2031217.

3. Lohre R, Bois AJ, Athwal GS, Goel DP. Improved Complex Skill Acquisition by Immersive Virtual Reality Training. The Journal of Bone and Joint Surgery. 2020 Mar;102(6):e26.

Email: beedhamwilliam@gmail.com