Health Professions Education Institute (HPEI)

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Virtual Reality Training is Similar to Saw Bones Training: A Motion Analysis Study

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MEDICAL EDUCATION RESEARCH

Background:
Surgical training faces limitations due to variable factors involving time, patient population, institutional protocols, and resources such as saw bone (SB) models. Emerging technologies, including virtual reality (VR) training, aim to mitigate these challenges. However, studies to compare the physical motion of VR versus SB training are lacking. This study serves to evaluate the movements and timing of an intramedullary nail fixation case performed on a SB model to that performed on a VR simulation.

Objectives:
Evaluate the comparability of VR and SB training methods through physical motion analysis.

Methods/Design:
Orthopaedic surgery residents at Atrium Health Wake Forest Baptist participated in a tibial nail training sequence both on a SB model and a VR system. Both methods (SB and VR) were completed at least twice by each participant. Participants were fitted with a set of 14 retro-reflective tracking markers while a 12-camera, 100hz motion capture system collected real-time data. Tracking markers encompassed the trunk, shoulders, elbows, and wrists to evaluate full range of motion (ROM) and movement velocity. Statistical analysis involved sample comparison using two-tailed t-tests, with significance at $p<0.01$.

Results:
8 orthopaedic surgery residents participated in the study. A total of 43 individual events and 62 different variables (48 ROM and 14 movement velocity) were analyzed. Of 62 total variables, only 20 (32.26%) exhibited a significant difference between VR and SB interventions ($p<0.01$). Of 48 ROM variables, 31 (64.58%) showed no difference between interventions ($p>0.01$). Of 14 movement velocity variables, 11 (78.57%) showed no difference between interventions ($p>0.01$). Total time (in seconds) for the case was similar between VR (190.29) and SB (212.47) groups ($p=0.263$).

Conclusions:
This study is the first-ever to demonstrate that the physical motion of VR training is similar to that of a SB model for intramedullary nail fixation surgery and supports the ability of VR to provide similar training to that of a traditional SB model. The growing utility and accuracy of VR simulations may prompt dialog surrounding its role in the future of surgical education for medical trainees and professionals.