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Title: Evaluation of a Virtual Reality Simulator for Shoulder Arthroscopy: Face validity, construct validity and training effect

Authors/Address: RJH Emery (1); S Bayona (2); C Gupte (1); F Bello (3);
(1) Department Of Surgery & Cancer, Imperial College London &Amp; Imperial College Healthcare Nhs Trust, London, UNITED KINGDOM; (2) Department Of Computer Architecture And Technology, Computing Sciences, And Artificial Intelligence, Universidad Rey Juan Carlos, Madrid, SPAIN; (3) Department Of Surgery & Cancer, Imperial College London, London, UNITED KINGDOM;

Speaker : RJH Emery

Abstract:

Purpose
This paper evaluates the training effect, face (extent to which the simulator resembles reality) and construct validity (ability to differentiate between subjects with varying levels of experience) of a VR shoulder arthroscopy simulator.

Material and Methods
We analysed the performance of 40 subjects (with different levels of experience) on the simulator (which records objective metrics). We divided participants into a control group (20 subjects), and an experimental group (20 subjects who followed a training programme with the simulator until some thresholds were achieved). All subjects did a final evaluation on the simulator and completed a questionnaire.

Results
85% participants agreed the simulator provided insight into the experience of a real arthroscopy. 95% agreed (or strongly agreed) that the simulator is useful for training. 82.5% thought the simulator should be used to provide additional information on the assessment of technical skills. Results from the simulated final diagnostic arthroscopy showed that training produced significant improvement in completion time, path length covered by the arthroscope, and arthroscope roughness (p-value<0.05). Furthermore, the simulator was able to discriminate between experts, intermediates and novices, proving construct validity for the following metrics : the time of completion (p-value<0.001), the path length covered by the arthroscope (p-value<0.001), and the roughness when handling the arthroscope (p-value $= 0.003$).

Conclusion
Results prove face validity, demonstrating the simulator succeeds in resembling real arthroscopy. Training on the simulator had a statistically significant improving effect on the objective metrics. The simulator discriminated between subjects according to arthroscopic experience, proving construct validity. Further work should be done to prove transferability of skills to the operating room and to integrate VR arthroscopy training into the surgical curriculum.

Structure: Shoulder - others (AC joint, stiff shoulder, sports injuries...)

Presentation: Oral presentation

Already presented : No

Membership status of the 1st author : Ordinary SECEC member

Membership information: **SECEC/ESSSE Member :** Yes
Membership Fee Paid : Yes

Engagement of transfer of my rights to SECEC : Yes