OPTICAL NEUROIMAGING TECHNIQUE CAN DETECT LAPAROSCOPIC SURGICAL SKILLS LEARNING AFTER INTENSIVE VIRTUAL REALITY (VR) TRAINING

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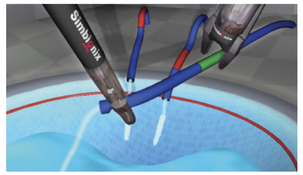
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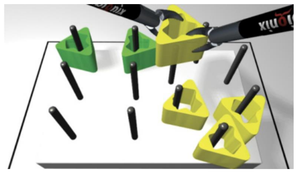
Objective

- Visualizing the changes of oxyhemoglobin (HbO_2) over the prefrontal cortex (PFC), primary motor cortex (PMC), and supplementary motor area (SMA) during the surgical knot-tying task[1].
- Investigate the impact of VR training.

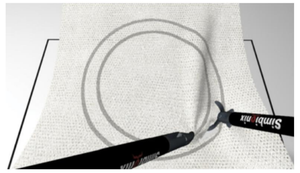
Training Tasks[2]



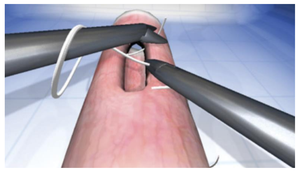
(A) Clipping and Grasping



(B) Peg Transfer



(C) Pattern Cutting



(D) Knot tying

Discussion

- The optical neuroimaging technique offers useful insights for developing future surgical training programs.
- AI-driven analysis of fNIRS data provides real-time insights into surgeons' cognitive states, potentially optimizing training outcomes.

Under the Cap



(A) functional near-infrared spectroscopy (fNIRS) system[3]

A 48-channel continuous measurement of the oxygenated blood level while suturing with intracorporal knot tying

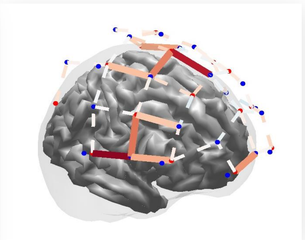
Pre/Post Tests



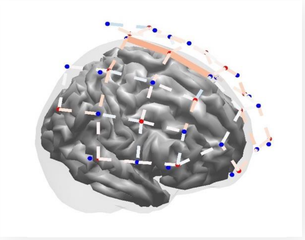
(B) Suture with Intracorporeal Knot

Pre/Post Tests

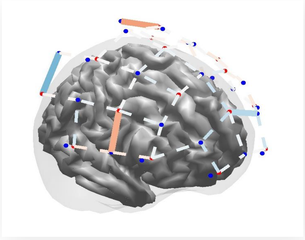
Image of the changes of oxyhemoglobin (HbO_2) in the cortex



Novice (Before VR Training)



Novice (After VR Training)



Expert

1. Gao, Yuanyuan et al. “Decreasing the Surgical Errors by Neurostimulation of Primary Motor Cortex and the Associated Brain Activation via Neuroimaging.” *Frontiers in neuroscience* 2021, doi:10.3389/fnins.2021.651192
2. Images from “LAP Mentor, surgicalscience“ https://surgicalscience.com/simulators/lap-mentor/
3. Image from “NIRx | fNIRS Systems | NIRS Devices” https://nirx.net

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