Assessing Neurosurgical Technical Skills in Medical Students Using a Virtual Reality Simulator

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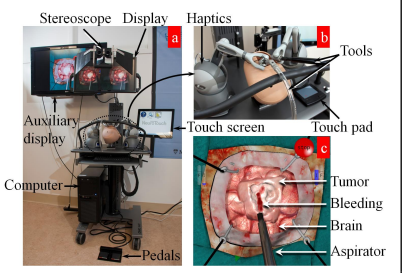
Introduction:

Medical Simulation

- Laparoscopic simulators: reduced learning curves [1]
- Clinical teaching simulators: learning benefits maintained > 1 year [2]

NeuroTouch



The NeuroTouch hardware (a, b) and the virtual craniotomy scene (c)

Neurosurgical virtual-reality simulation

The utilization of neurosurgical virtual reality (VR) simulators and novel metric technologies could address shortcomings in the assessment and teaching of psychomotor skills and has the potential to improve resident selection, training and assessment.

Objectives:

Test

- Cognitive and psychomotor skills in a surgically naïve population during complex simulated neurosurgical tasks

Identify

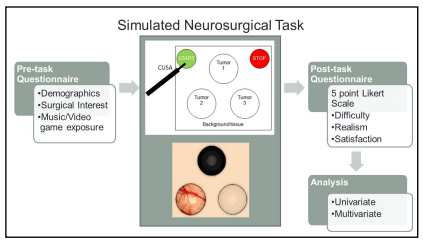
- Medical student characteristics which influence performance in simulated tumour removal tasks

Hypothesis

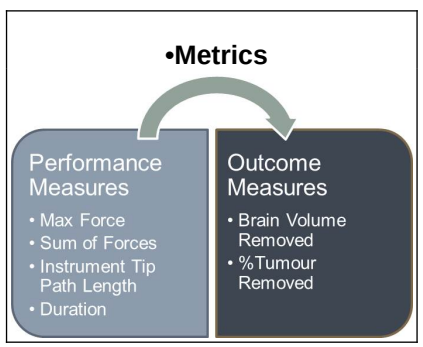
- Student characteristics (e.g. surgery interest) will influence performance

Methods:

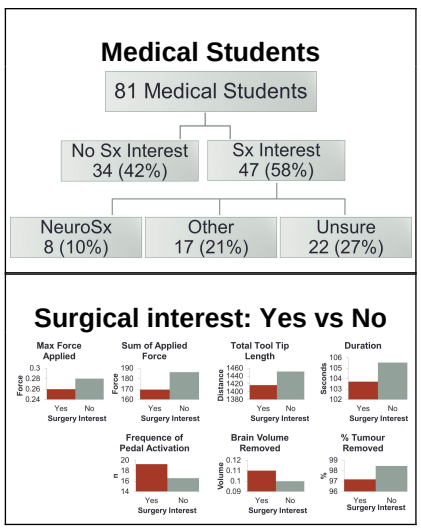
81 medical students across all levels of training were recruited.



Nine different simulated brain tumors were resected.

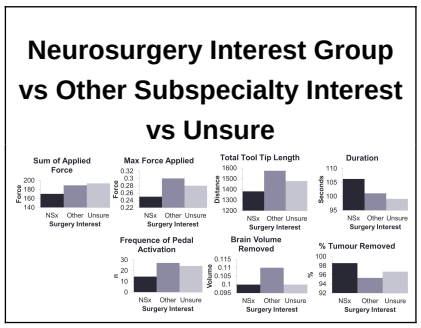


Results:



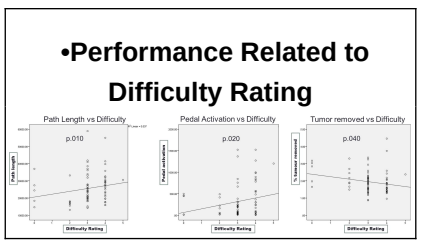
Surgery Interest:

- Decr. force
- Decr. tool tip path
- Decr. duration
- Incr. pedal activation
- Incr. brain vol removed
- Decr. tumour removed



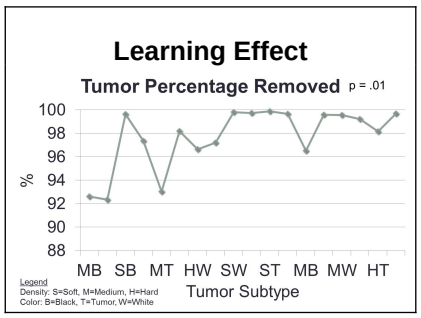
Neurosurgery Interest:

- Decr. force
- Decr. tool tip path
- **Incr. duration**
- **Decr. pedal activation**
- **Decr. brain vol removed**
- **Incr. tumor removed**



As difficulty rating increased:

- tool tip path length increased *p=.010*
- pedal activation increased *p=.020*
- % tumour removed decreased *p=.040*



Progression over scenario:

- Sum Force decreased *p=<.001*
- Max Force decreased *p=<.001*
- Duration decreased *p=<.001*
- Tool tip path increased *p=<.001*
- Brain volume removed decreased *p=.001*
- Tumor % removed increased *p=.010*

Discussion:

Use in resident selection: **Tool for screening exceptional candidates or eliminating those who cannot improve?**

1. Selection process should assess potential to achieve desired competency [3,4].
2. Traditional interview format shown to be unreliable [5,6,7].
3. Neurosurgeon survery: manual dexterity essential [8].
4. VR already used for screening pilot trainees [4].

Predictive validity of surgical simulator performance with OR skill remains unknown.

Conclusion:

In a surgically untrained medical student population, level of surgical interest and subjective rating of difficulty influences surgical performance.

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